NORTHROP GRUMMAN DEFINING THE FUTURE

Mission Systems

January 29, 2003

Enterprise Process Improvement Approach

Conference on the Acquisition of Software-Intensive Systems
Arlington, Virginia

Linda Mills
Vice President, Six Sigma

Agenda

§ **Business Drivers**

§ **Synergies – CMMI and Six Sigma**

§ **Mission Systems' Enterprise Approach to Improvement**

§ **Institutionalizing our Success**

§ **Lessons Learned**

Northrop Grumman Mission Systems

§ **A leading global integrator of complex systems**

  – **Based on information technology and systems engineering expertise**

  – **Integrated solutions: architecture, development and sustainment**

§ **Many customers and markets in transformation**

§ **Six Sigma – a cornerstone of our transformation**

Treasury Communications System
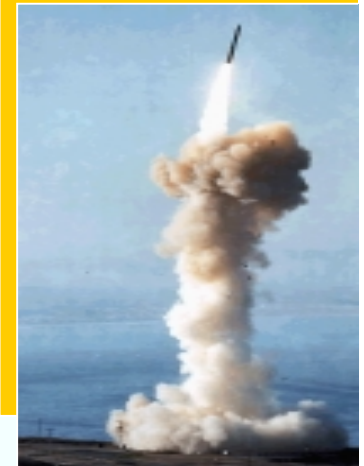
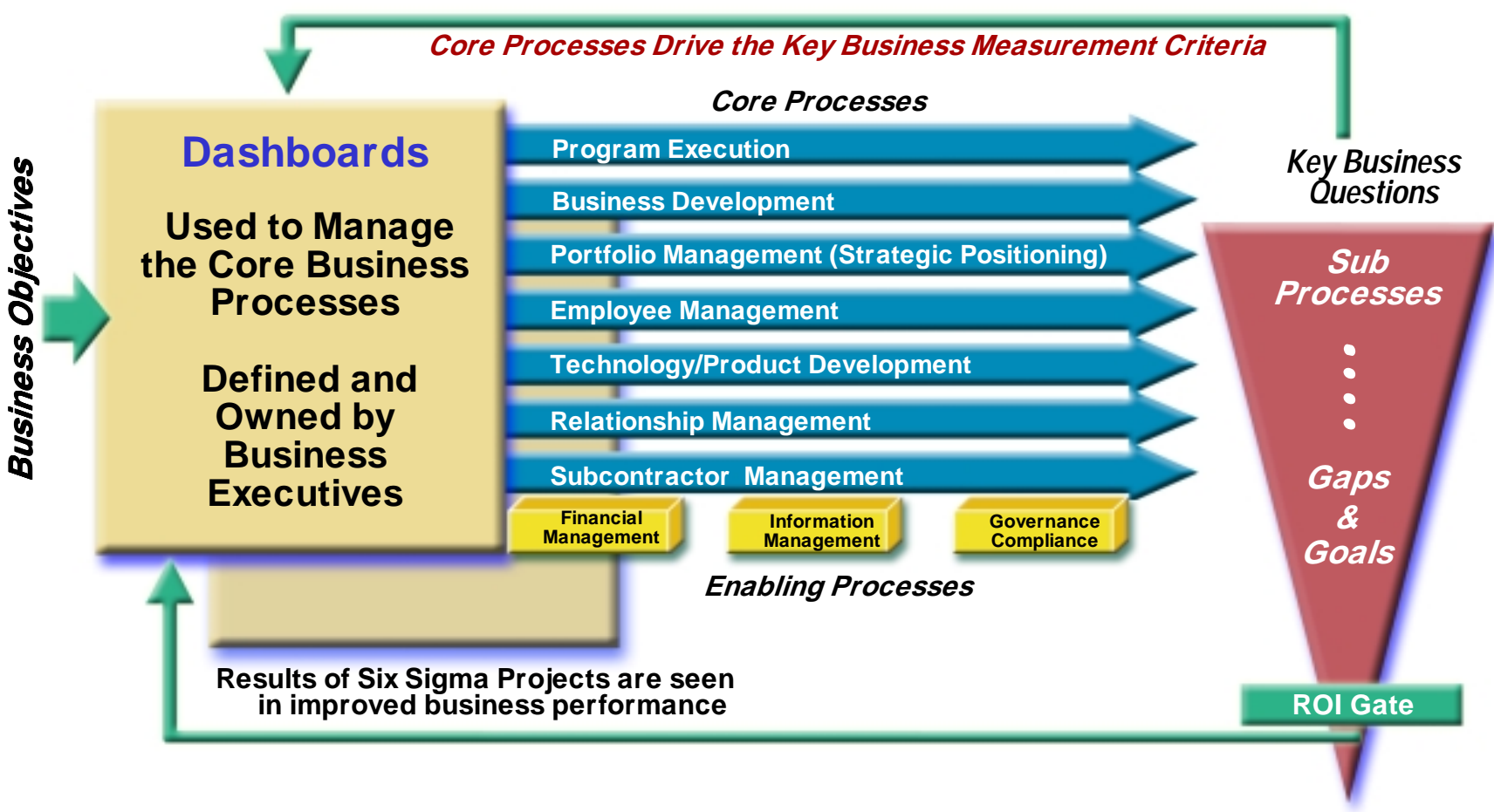**Intercontinental Ballistic Missile Program**

Ohio MARCS

Business Drivers

- § **Competitive advantage through lower costs and lower risks**
  - § **Ability to predictably deliver on time and within schedule**
  - § **Increased customer satisfaction and associated growth**
- § **Better business management through management by data**
  - § **Quantitatively understand performance and quality drivers**
  - § **More strategic and less tactical**
- § **Enterprise approach to process improvement**
  - § **Ability to capitalize on knowledge from all across the organization**
  - § **Common infrastructure for all improvement initiatives**
  - § **Common policies, processes, and training**

Driving the Business Model

Core Processes Drive the Key Business Measurement Criteria

Core Processes

Business Objectives

Dashboards

Used to Manage the Core Business Processes

Defined and Owned by Business Executives

- Program Execution
- Business Development
- Portfolio Management (Strategic Positioning)
- Employee Management
- Technology/Product Development
- Relationship Management
- Subcontractor Management

Financial Management

Information Management

Governance Compliance

Enabling Processes

Key Business Questions

Sub Processes
•
•
•
•
Gaps & Goals

ROI Gate

Results of Six Sigma Projects are seen in improved business performance

Typical Challenges During Acquisition

- **Acquisition process starts very early during strategy development, where leverage is greatest**
  - Teaming and other Supplier arrangements
  - Technology, "Fit", and other competitive factors

- **Gathering information relative to Suppliers and Teammates typically focuses on individual contract performance**
  - Enterprise and Strategic view generally have additional metrics

- **Significant inter-relationships among all teammates**
  - As evidenced by the degree of subcontracting

NORTHROP GRUMMAN
Mission Systems

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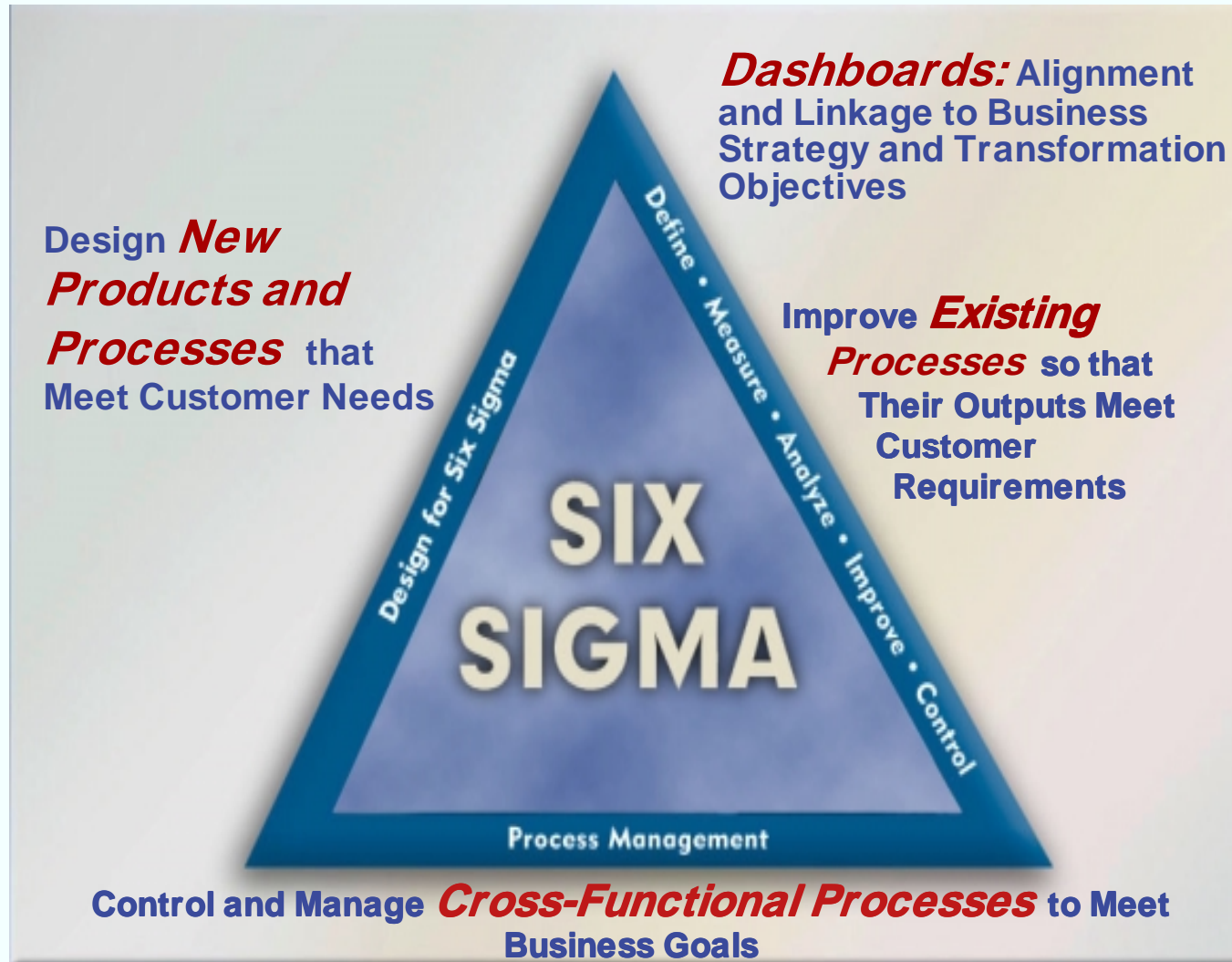n **Institutionalizing our Success**

n **Lessons Learned**

What is Six Sigma?

- **A disciplined, data-driven methodology for improving program and business performance**
  - **Focuses on process performance by eliminating defects and reducing variation**
  - **Establishes a common language and set of tools**
  - **Identifies what's critical to quality in the eyes of the customer**
  - **Uses metrics to measure process capability**
- **Links process improvement to organizational strategic objectives**
  - **Decomposes larger, strategic goals / gaps into a series of projects**
  - **Prioritized based upon expected financial benefit expected**

Six Sigma is about satisfying customer needs economically

Six Sigma Methodologies

Dashboards: Alignment and Linkage to Business Strategy and Transformation Objectives

Design *New Products and Processes* that Meet Customer Needs

Improve *Existing Processes* so that Their Outputs Meet Customer Requirements

Control and Manage *Cross-Functional Processes* to Meet Business Goals

D – DEFINE
Each project must have a business case and sponsor

M – MEASURE
You can't manage what you don't measure

A – ANALYZE
Solve the problem, not the symptoms

I – IMPROVE
Push for innovations, breakthrough thinking

C – CONTROL
Who is accountable for making the fix stick?

CMMI Relationship to Six Sigma

Level	Focus	Process Areas
5 Optimizing	*process improvement*	Organizational Process Technology Innovation Causal Analysis and Resolution*
4 Quantitatively Managed	*Quantitative management*	Organizational Process Performance Quantitative Project Management
3 Defined	*Process standardization*	Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management* Risk Management Decision Analysis and Resolution Requirements Development Technical Solution Product Integration Verification Validation
2 Managed	*Basic project management*	Requirements Management * Project Planning* Project Monitoring and Control* Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance* Configuration Management
1 Performed		* Areas of ISO Focus

Six Sigma Control

Six Sigma Improve

Six Sigma Analyze

Six Sigma Measure

Six Sigma Define

Comparison of CMMI to Six Sigma

For an individual process:

- n CMMI identifies *what* activities are expected (industry best-practice)
- n Six Sigma identifies *how* activities might be improved (more efficient, more effective, ...)

SG 1   **Establish Estimates**
   SP 1.1   Estimate the Scope of the Project
   SP 1.2   Establish Estimates of Project
             Attributes
   SP 1.3   Define Project Life Cycle
   SP 1.4   Determine Estimates of Effort and Cost
SG 2   **Develop a Project Plan**
   SP 2.1   Establish the Budget and Schedule
   SP 2.2   Identify Project Risks
   SP 2.3   Plan for Data Management
   SP 2.4   Plan for Project Resources
   SP 2.5   Plan for Needed Knowledge and Skills
   SP 2.6   Plan Stakeholder Involvement
   SP 2.7   Establish the Project Plan
SG 3   **Obtain Commitment to the Plan**
   SP 3.1   Review Subordinate Plans
   SP 3.2   Reconcile Work and Resource Levels
   SP 3.3   Obtain Plan Commitment

Example –
Project Planning in CMMI

Could fully meet CMMI goals and practices, but still write poor plans

Six Sigma can be used to improve planning process and write better plans

Comparison of CMMI to Six Sigma (Cont'd.)

For the organizational infrastructure:

- Six Sigma identifies *what* activities are used for improvement (DMAIC, DMADV)
- CMMI identifies *how* those activities might be implemented (Process Groups, Training Offices)

SG 1 Determine Process Improvement Opportunities

      SP 1.1   Establish Organizational Process Needs

      SP 1.2   Assess the Organization's Processes

      SP 1.3   Identify the Organization's Process Improvements

SG 2 Plan and Implement Process Improvement Activities

      SP 2.1   Establish Process Action Plans

      SP 2.2   Implement Process Action Plans

      SP 2.3   Deploy Process and Related Process Assets

      SP 2.4   Incorporate Process-Related Experiences into the Organization's Process Assets

GG 3 Institutionalize a Defined Process

Example – Organizational Process Focus in CMMI

Six Sigma doesn't assess overall organizational capability

CMMI provides an approach to setting up the infrastructure

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Organized Enterprise-Wide for Accomplishments

n **We leverage our Six Sigma efforts off our successful CMMI infrastructure**

§ **Common Process Management program office and reporting structure**

§ **Shared staff with skills in both areas**

§ **Information sharing from Enterprise to Division to Project**
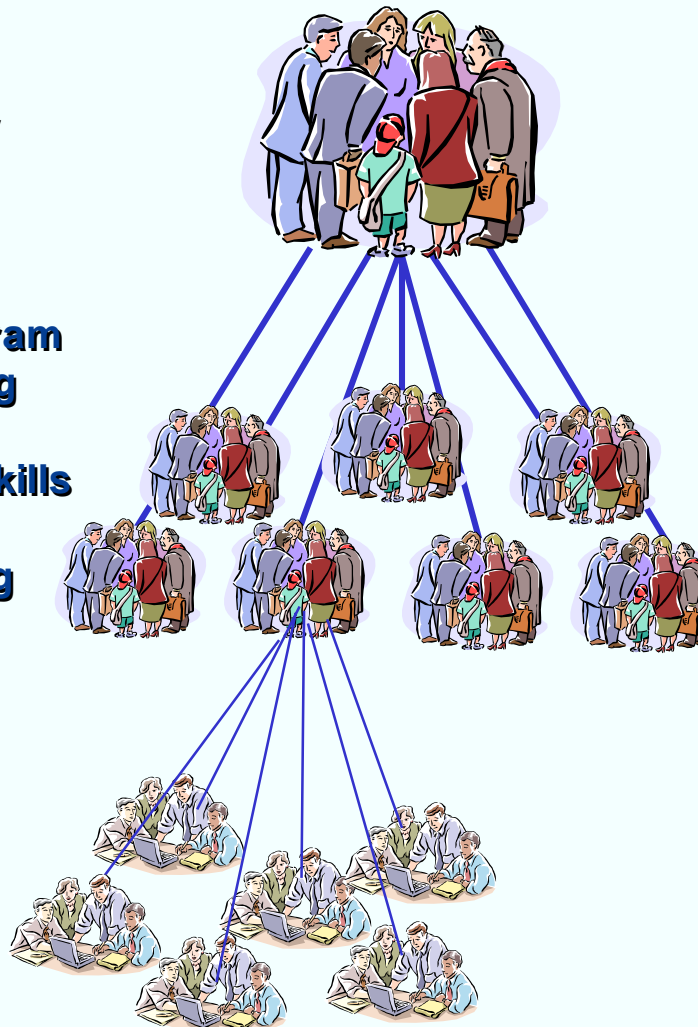
Mission Systems
- *Process Management staff*
- *Mission Systems Process Group*
- *Office of Cost Estimation*
- *Six Sigma Training Office*
- *Dashboards*

Divisions
- *Division Champions*
- *Division Process Groups*
- *Training Offices (engineering, management)*

Projects
- *Self-Assessment Tool*
- *Corrective Action System*

Six Sigma Projects
- *StartIt! Database*
- *Best Practice Sharing*

Highlights of Our Approach

Enterprise-Wide Institutionalization

• **Policy & Requirements Manual**
• **Standard Process Manual**
• **Training**

PRM

SPM
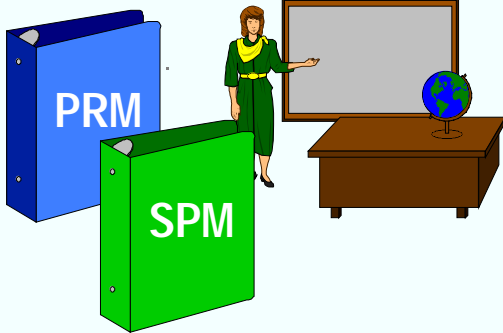
Quantitatively Measured

• **Metrics Manual**
• **Measurement repository**

MM
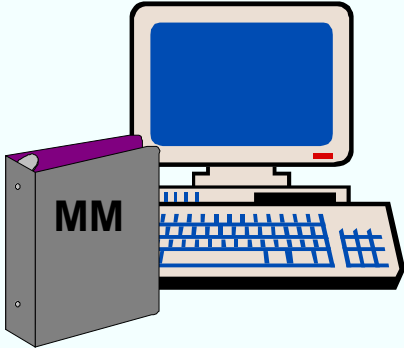
Projects

Six Sigma Teams

• **DMAIC / DFSS**
• **Tools & methods**

CMMI Assessments

• **Self-Assessment Tool**
• **Internal / external formal assessments**

CMMI / Six Sigma Synergy

• **Project Reviews / Summits**
• **Integrated strategies**
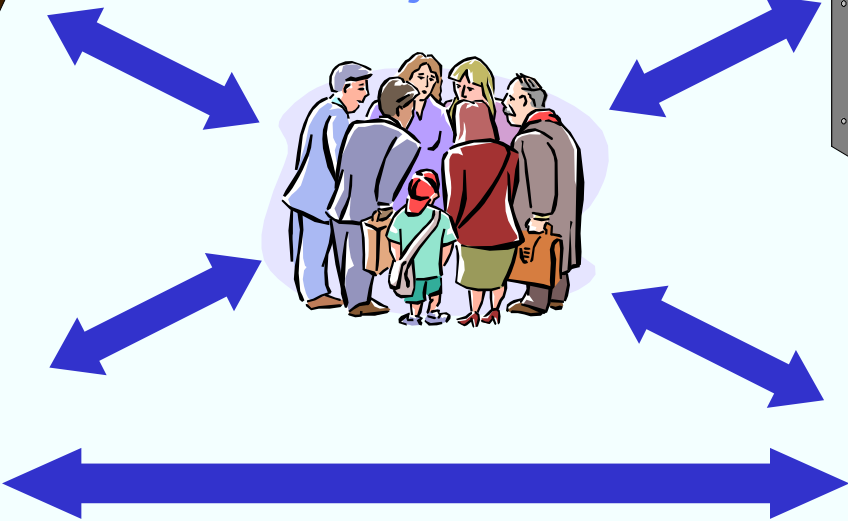
Six Sigma Lifecycle

Analyze

Define

Measure

Map Projects

Improve

Six Sigma
Business Goals
& Metric Category
Linkage

High Level Priorities
(Quantified Gap
Analysis)

Control

Prioritize &
Select
Projects

VOC

Dashboard

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Institutionalizing Our Improvements

Industry/Government Standards

CMMI

ISO

Customer Specific

§ **Communications**
§ **Sharing best-practices**
§ **Measurement & dashboards**

Organizational Policies & Processes

Organizational Training & Tools

Project Plans

Process Improvement

Metrics Database

Project Results
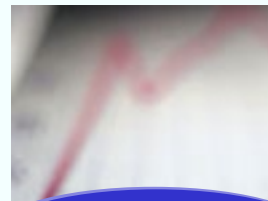
Project Schedules & Budgets

Organizational Performance

Project Performance

Communication via On Line Resources

Web site

StartIt!
Program Management

GB Primer

Monthly
Newsletter

Six Sigma on-line resources facilitate communication, project management and sharing of best practices

Sharing of Best Practices Through Online Collaboration

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Lessons Learned: Keys to Success

§ **Executive leadership and sponsorship mandatory to achieving long-term, sustaining results or "management by data**

§ **Integrated, enterprise-wide approach provides a cost-effective way of institutionalizing processes**
- § **Common policies, processes, metrics, training and assessment methodology**
- § **Promotes sharing of best practices and lessons learned**

§ *Communicate* **plan, approach, and most importantly,** *results*

§ **Understanding variation in process performance allows more insight into estimation**
- § **What's likely cost of work? For ourselves? Our Teammates?**
- § **What's probability we can perform work for $____?**

Summary

- **Mission Systems has a broad, enterprise-wide framework in place for process improvement**
    - **Focused on metrics to drive improvements**
    - **Part of overall business strategy**
    - **Common policies and processes**

- **Institutionalization re-enforced through collaborative on-line environment and common tools**
    - **Centralized metrics data base, lessons learned and best practices on-line**
    - **Synergy between Six Sigma and CMMI**

- **Enterprise investment strategies are long-term and broadly focused across the entire customer base**
    - **To influence investments, government agencies should consider long-term preferences for investment**
    - **"Registration" significant step in increasing consistency in evaluations**