Implementing Measurement and Risk Management in CMMI

*Fifth Annual
PSM Users' Group
Conference*

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25 July 2001

Practical Software and Systems Measurement

What are TACOM ARDEC Improvement Efforts?

US Army TACOM-ARDEC

- **Pilot Site** for CMMI

- Our *Focus – Measurement and Analysis (M&A) and Risk Management* Process Areas

- *Describe Implementation of*
  - o *Process Areas*
  - o *Lessons Learned*

Transitioning to a New Software Enterprise

- ## A Lot of Fast-paced Change

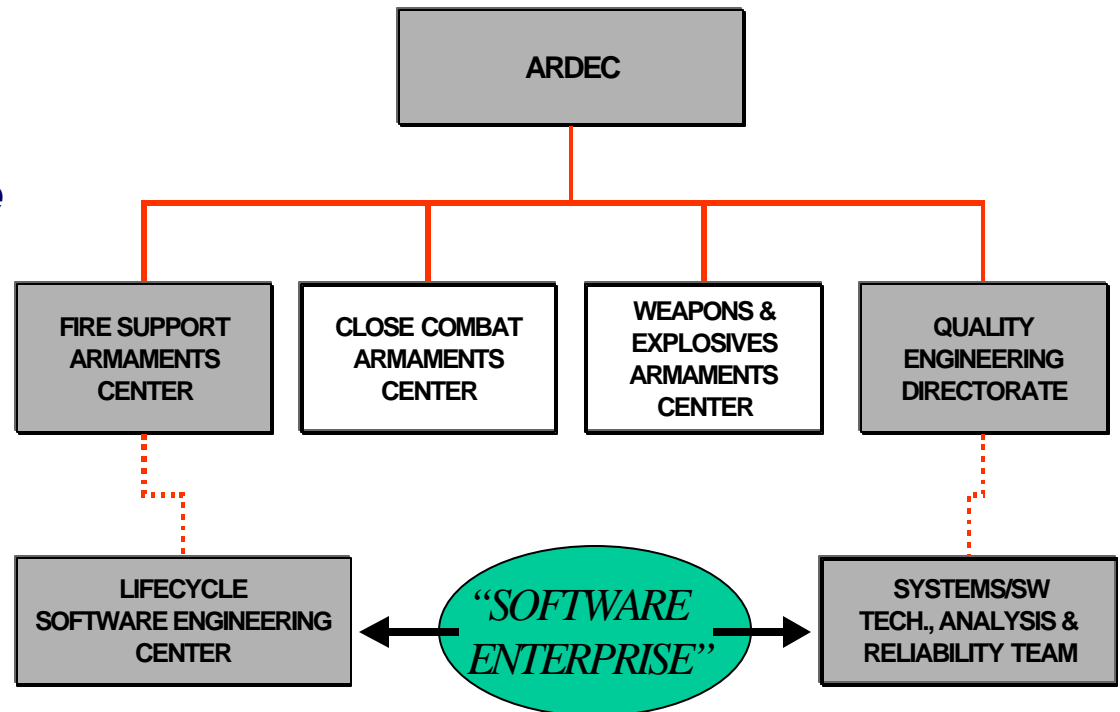- ## Organizational Change **Combine the Software Missions Of:**

  - *Quality Engineering Directorate (QED),*

  and

  2) Lifecycle Support Engineering Center (LCSEC)

- ## Implement Process Improvement

ARDEC Organizational Structure

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                    │  ARDEC   │
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│   FIRE   │ │  CLOSE   │ │ WEAPONS &│ │ QUALITY  │
│ SUPPORT  │ │  COMBAT  │ │EXPLOSIVES│ │ENGINEERING│
│ARMAMENTS │ │ARMAMENTS │ │ARMAMENTS │ │DIRECTORATE│
│  CENTER  │ │  CENTER  │ │  CENTER  │ │          │
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FIRE SUPPORT ARMAMENTS CENTER	CLOSE COMBAT ARMAMENTS CENTER	WEAPONS & EXPLOSIVES ARMAMENTS CENTER	QUALITY ENGINEERING DIRECTORATE

LIFECYCLE SOFTWARE ENGINEERING CENTER ◄— *"SOFTWARE ENTERPRISE"* —► **SYSTEMS/SW TECH., ANALYSIS & RELIABILITY TEAM**
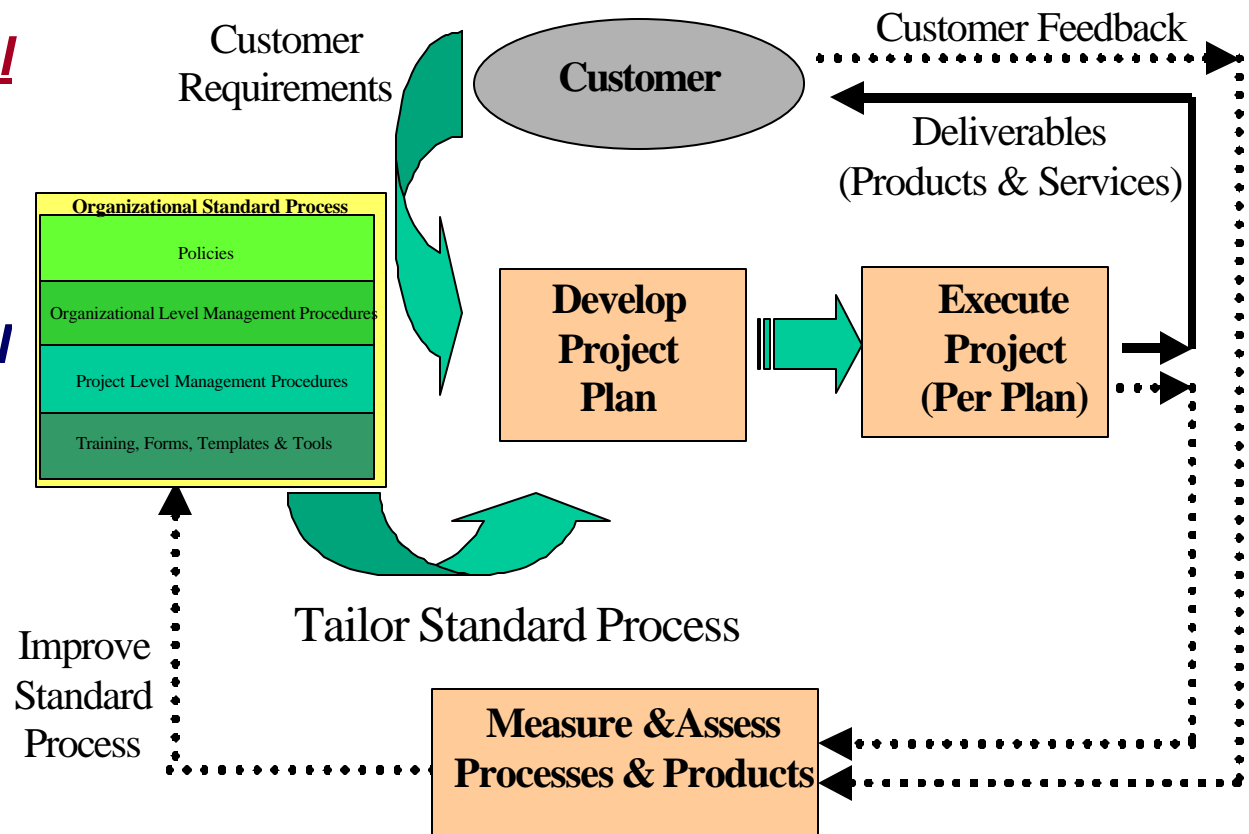
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Objective - Be Primary Source for Army Software Expertise.

- **Common Vision- _Integrated Organizational Processes_ Assuring Quality Products and Services to All Customers**

- **_Processes Go_ Beyond the Government and _Into Our Business Partners_**

Process Implementation Model

Organizational Standard Process
- Policies
- Organizational Level Management Procedures
- Project Level Management Procedures
- Training, Forms, Templates & Tools

Customer Requirements

Customer

Customer Feedback

Deliverables (Products & Services)

Develop Project Plan

Execute Project (Per Plan)

Tailor Standard Process

Improve Standard Process

Measure &Assess Processes & Products

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Short-Term Goal

- *Achieve CMMI Level 3 Within Next 6 Months* *to Be Consistent With DOD Directive*

- *Implement M&A and Risk Management* *Processes With Approved Plans on at Least 14 Projects of Various Types*

  - o *Mission Software Development or Acquisition Support- E.G. Crusader, Paladin (8)*

  - o *Infrastructure Support – CM, QA, PEG, LSM (4)*

  - o *Technical Support – PSM, TAI (2)*

  - o *Additional Upcoming New Starts/restarts (4)*

Constraints

- ***Aggressive Implementation Schedule***
  - o ***CMMI Audit Jan 01 – Assessed at Level 2 with 4 projects***
  - o ***Target CMMI Level 3 by end of FY 01 or early FY02***

- ***New Processes** are Just Being Implemented*

- ***Middle Management Support***

- ***Cultural Change***

- ***Previous Process Improvement Efforts Failed** in Parts of Organization*

Assumptions

- **_Clearly Defined Objectives and Tasks_**

  for Each Project

- **_Trained and Experienced Workforce_**

  Capability

- **_Workforce and Management Buy-In_**

Proactive Approach to Risk and M&A Processes

Org Std Process	**Policy Procedures**	**Policies and Procedures Tailored to Project**
Project Plan	**Task Definition**	**WBS, Schedule Process, Product Objectives**
App A	**Risks**	**Context** **- Objectives (see Project Plan)** **- Assumptions, Constraints** **Risks / Problems / Obstacles** ** (detailed profiles)**
App B	**Measures**	**Information Needs Project-Specific and Applicable Organizational Measures**

Proactive – Integrated Approach to Risk Management and Measurement Planning Upfront, as Part of Project Planning

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Established the Foundation

Performance Management Policy

- **Risk Management Procedure**

- **Measurement and Analysis Procedure**

- **Estimation Procedure**

Risk Management Procedure

- ***Complies with IEEE Standard 1540***
- ***Requires Projects > 1 Staff Month of Effort to:***
  - o ***Identify Project Objectives, Constraints, and Assumptions***
  - o ***Develop and Prioritize Risk Profiles***
  - o ***Identify Measures to Monitor Risks***
  - o ***Document in Risk Management Plan***
  - o ***Link to Measurement Plan***

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Risk Management Plan

Project Plan

Risk Plan-Appendix A

- **Risk Management Plan is Appendix A of Project Plan**

<u>**Link**</u>
- **Project Objectives**
- **Constraints**
- **Assumptions**
- <u>**Risks/Obstacles to achieving:**</u>
  - o <u>**Project Objectives**</u>
  - o <u>**Project Tasks**</u>
- **Measurement & Analysis**

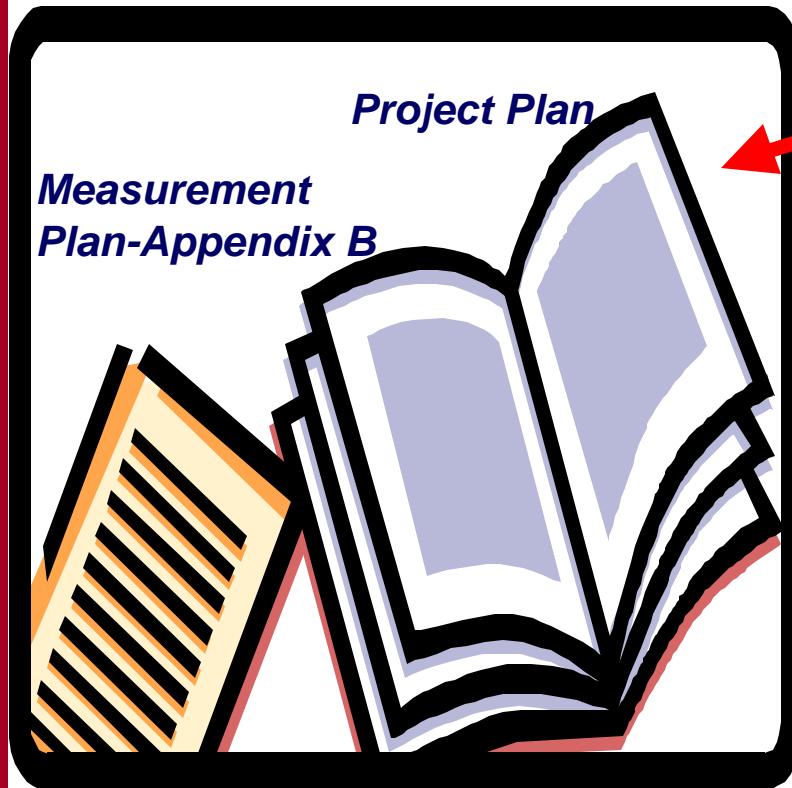- **Risk Plan Outline**
  - o **Contained in Risk Management Procedures**

Measurement and Analysis Procedure

- *PSM is the Basis*
- *Requires Projects > 1 Staff Month of Effort to:*
  - *Identify Project Specific Issues*
  - *Specify Measures*
  - *Consider Organizational Measures*
  - *Document in Measurement Plan and Measurement Specification*

Measurement and Analysis Plan

Project Plan

**Measurement
Plan-Appendix B**

- **Measurement Plan is
  Appendix B of Project Plan**

Identify

- **Project Specific Issues and
  Link to Risks/Obstacles**
- **Consider Organizational
  Measures**
- **Specify Measures**

- **Measurement Plan Outline**
  - o **Contained in Measurement
    Procedures**

Estimation Procedure

- *Extracted from PSM*

- *Plans for further development*

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Determined Multi-Level Requirements

Enterprise Management
- Performance Measurement
- Normative Performance Baselines
- Technical and Business Policy
- Investment Decisions & Analysis

Organizational Management
- Process Improvement
- Program Planning Guidelines
- Performance Based Acquisition
- Organizational Norms & Benchmarks

Program Management
- Program Estimation and Planning
- Program Performance Tracking
- Program Tradeoff Analysis
- Resource Management

Risk Management Process

Issue-Driven Measurement Process

Determined Multi-Level Measurement Requirements Through Workshops at Executive and Project levels

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Executive Level Workshop

- **Organizational *Objectives and Information Needs Identified***

- **Organizational *Measures Identified and Prioritized***
  - o ***Started With Prioritized Common Measures***
    - ➢ **Cost**
    - ➢ **Schedule**
    - ➢ **Effort**
    - ➢ **Size**
    - ➢ **Defects**
    - ➢ **QA Audits**

Organizational Measures

- *Sample Organizational Measures*
    - o *Sample Tailoring*
    - o *Projects Tailor Measures to Their Type of Project*
- *Documented in Organizational Measurement Plan*
- *Collected in Organizational Measurement Repository*

Project Level Workshop

Identified <u>Project-specific information Needs, Issues and Risks</u>

- *Identified High Priority Process Elements and Products*

- *Integrated Organizational, Project, and Customer Information Needs*

- *Leveraged and Selected Applicable Organization-level Measures*

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Follow-on Support

• Provided *Training Sessions* in PSM and Procedures

• Conducted *Project Specific Workshops* and Discussions

• Provided *Tailoring and Implementation Guidance*

• *Peer Reviewed* Risk and Measurement Plans

Lessons Learned

Best Advice – Start By Thinking

- **Identify What Your Job Is, Is Not**
  - o Technical tasks, activities, and WBS elements vs. go to meetings and answer the phone
  - o Provides a starting point

- **Identify Objectives, Constraints, Assumptions and Information Needs**

- **Identify Risks and Issues and Go From There**

- Maintain the **Link Among the Risks, Issues and Measures**

Process Improvement Takes an Investment

Time

- o *Shortcuts Take Longer – Watch Out for Rework, Quality Suffers*
- o *Watch Lag Time Between Defining Process on Paper and People Actually Doing the Work*
- o *You Can't Schedule a Culture Change*

Money/Effort

- o *To Reap the Benefits, You Have to Invest First*
- o *It's Not Cheap*
- o *Check-in-the-box Processes Without Thinking Doesn't Work*
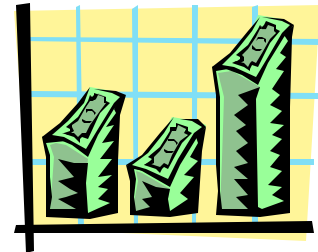
People

- o *One-on-one Discussions and Face Time Get the Heart of the Matter*
- o *All Levels of Management Need Face Time, Not Ghost Time*

Training
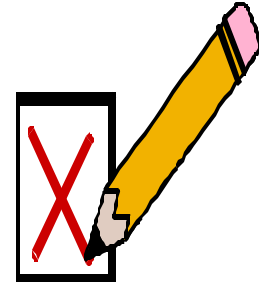
- o *Focus on the Fundamentals, Core Knowledge*
- o *Processes Don't Mean Much Without the Core Knowledge*

Check-in-the-Box Syndrome
Templates Work and Don't Work

- *They Identify What Needs to Be Done*

- *They May Save Time*

- *It's Easy to Bypass the Thinking Behind Them*

- *Some People Felt Obligated to Use Prescribed Format Instead of Doing What Made Sense; Especially With Different Projects Types*

- *Focus Initially on the Project Level*

Some People Were Confused With Tailoring

- *Ended up Copying and Pasting the Procedure Instead of Making It Specific to Their Project*

- *People Were Getting Confused When Talking About Organizational Needs*

- *Put Benefits in Terms of What It Means for Your Job, Your Project*

- *Need the Workforce and Project-level Buy-in in Order to Get to the Organizational Level*

Getting It To Work

Go Back to the PSM Basic Principles

- Issues and Objectives to Drive Measurement Requirements
- Measures Based on Technical and Management Processes
- Level of Detail Sufficient to Identify and Isolate Risks & Problems
- Independent Analysis Capability Implemented
- Systemic Analysis Process to Trace Measures to Decisions
- Measurement Results in Context of Other Project Information
- Measurement Integrated Throughout Life Cycle
- Measurement Process As a Basis for Objective Communications
- Focus Initially on Project Level Analysis

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