Implementing Capability Maturity Model-Integrated (CMMI®) in a Diverse Organization

Process Improvement for the 21st Century (PI-21), Inc.
Process Improvement Associates (PIA)
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Presentation Overview

Background

Approach

Status

® CMMI is a registered trademark of the SEI

® CMM is a registered trademark of the SEI

The Organization

- Approximately 1200 people across 10 divisions
- System Integrator whose primary client is the federal government
- In business since 1986
- Process Improvement Program established in 2001
- Several divisions at various SW CMM and CMMI Maturity Levels
  - Most divisions preferred their own processes

Process Improvement (PI) Program

- Rationale for PI Program
  - Improve Competitive Posture
  - Adapt to Organizational Changes
- Goals & Objectives
  - Achieve and Maintain CMMI ML 3 for the Sector:
    - Establish Standard Processes
    - Train Staff
    - Establish Quality Implementation Support and Audit Capability
    - Establish Process Improvement Capability to maintain rating and improve as needed

The Sector PI Plan

- Ten Technical Working Groups (TWGs) formed to develop standard processes for the 18 Process Areas that comprise CMMI ML 3
- TWGs conducted in four Groups…
  - One: Process Management (OPF, OPD)
  - Two: Organizational Training (OT), Formal Decision (DAR), Requirements (REQM, RD) and Metrics (MA)
  - Three: Project Management (PP, PMC, SAM, IPM, RSKM), Quality Assurance (PPQA), and Config Mgmt (CM)
  - Four: Design & Implementation (TS), Integration, Verification and Validation (PI, VER, VAL)
- Subject Matter Experts (SMEs) representing all operations & divisions needed for each TWG
- Each TWG has a lead and secondary lead from the EPG
- PI-21 facilitate TWG training and workshops
- At least 11 candidate projects will be selected for Sector-wide SCAMPI (basically one for each division to ensure a valid cross section)

TWG Plan

- 'As is' and 'To be' high level processes developed in a series of half day meetings and reviews of existing and developed processes (SME time commitment kept to a minimum)
- EPG leads review/use existing process documentation to develop new standard process for Sector (maximize reuse)
- TWGs and divisions review resultant new processes
- MSG approves final version
- Process training is conducted as processes are rolled out
- Processes implemented as they are approved and according to each division's transition plan (pilots may be used)

Process Areas of CMMI

Category	Process Area
Process Management	**Organizational Process Focus** **Organizational Process Definition** **Organizational Training** Organizational Process Performance Organizational Innovation and Deployment
Project Management	**Project Planning** **Project Monitoring and Control** **Supplier Agreement Management** **Integrated Project Management** for IPPD **Risk Management** Integrated Teaming Integrated Supplier Management Quantitative Project Management
Engineering	**Requirements Management** **Requirements Development** **Technical Solution** **Product Integration** **Verification** **Validation**
Support	**Configuration Management** **Process and Product Quality Assurance** **Measurement and Analysis** **Decision Analysis and Resolution** Organizational Environment for Integration Causal Analysis and Resolution

Prerequisites to Process Improvement (PI)

- A process exists.
- Critical business issues driving the need to improve the process
- Organizational PI champion with...
  - A comprehensive understanding of the development process
  - An over-riding belief that work products can be developed better, cheaper and faster
  - A belief that the quality of a work product is a function of the quality of the process used to produce it
  - A working knowledge of the methods, benefits and risks associated with model-based process improvement

Enabling Improvement

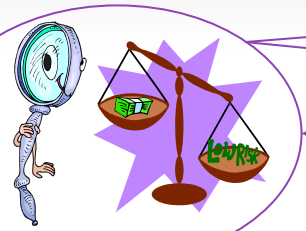
- Infrastructure building
  - generating sponsorship and commitment
  - baselining current processes
  - identifying sponsors, Subject Matter Experts (SMEs), and Pilot Projects
  - creating and maintaining the data repository
- Status Reporting
- Defining Sector-Wide Processes
- Transitioning to Sector-Wide Processes

Process Improvement (PI) Support

- The PI program supports the Sector by establishing:
  - common or “shared” processes and associated support infrastructure
  - procedures for applying common processes to project(s)
  - common measurements and organizationally focused training

Process Development Steps

Continuous Process Improvement

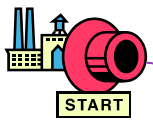


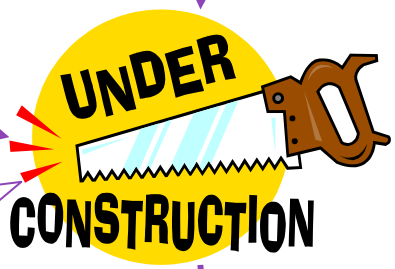
Implement and Monitor Effectiveness

New Process

Tailor and Pilot Improvements

Infrastructure



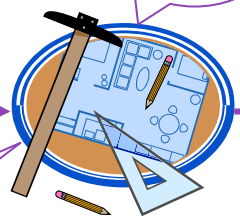


TWG Plan

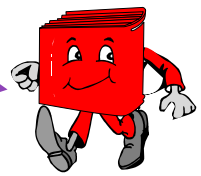
Transition Plan

Review “as is”
Define “to be”

Needs



Model “to be”

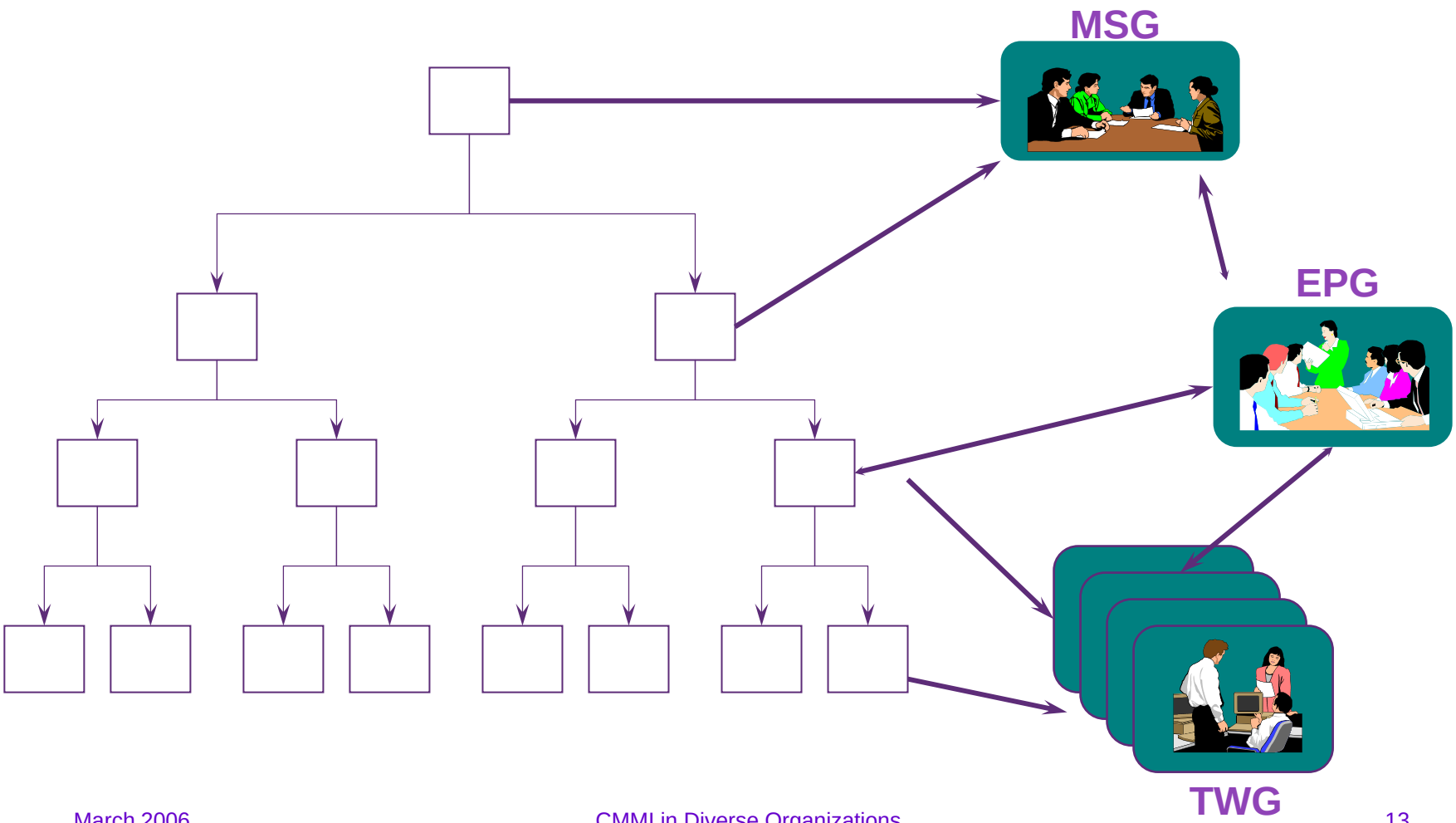


Process

PI Roles and Responsibilities

PI Role	Definition
Management Steering Group (MSG)	Responsible for: • linking the PI program to the organization's vision/mission, • demonstrating sponsorship, • allocating resources, • monitoring progress, and • providing guidance and correction.
Engineering Process Group (EPG)	Chartered by Management to: • build sponsorship of PI, • nurture/sustain improvement activities, • manage PI effort, and • ensure PI effort coordination.
Technical Working Group (TWG)	Groups (usually temporary) created to address a particular PI program focus.

Sector PI Organization



Technical Working Groups

- Purpose – Develop solutions for the PI program.
- Objectives – Document and assess current processes; improve current processes; develop plan to pilot improved process.
- Tasks – Research problem; identify/formulate solutions; present possible and proposed solutions; develop/revise TWG plan; select piloting method; document lessons learned.

TWG Membership

- Leader – Owner of the process being developed (EPG member(s))
- Subject Matter Experts (SMEs) should include managers or practitioners who:
  - Are knowledgeable in the target process as it is implemented within their group
  - work in and/or with the process (users)
  - would be affected by the new Sector process (stakeholders)

TWG Develops Process Assets

- Process assets include:
  - TWG Plan and Schedule
  - Process Model
  - Sector standard process
  - Associated Templates
  - Guidelines and criteria for tailoring the organization's standard process
  - Suggested metrics to measure process
  - Suggested pilot project characteristics and/or implementation plan

TWG Plan

- Goals and Objectives
- TWG Member Roles and Responsibilities
- High Level Activities

Process Analysis

- Prior to TWG Kick off:
  - TWG Members provide existing process documentation.
  - TWG Lead develops Draft TWG Plan.
  - TWG Members review existing documentation (Optional).
- During TWG Kick off:
  - Objectives and Requirements Review
  - Review and agree upon TWG Plan and Schedule
  - Discuss and agree upon Models to be developed to meet the objectives for the TWG
  - Provide overview of existing processes across divisions
- TWG Lead develops draft process model based on the “as is” process(es) (Optional).
- During TWG Process Definition Workshop:
  - Draft process model is reviewed, updated, and agreed upon.
  - Review existing process documents to use when documenting CGS process.
  - Determine next steps
- TWG Lead documents process based on process model and existing process documents.

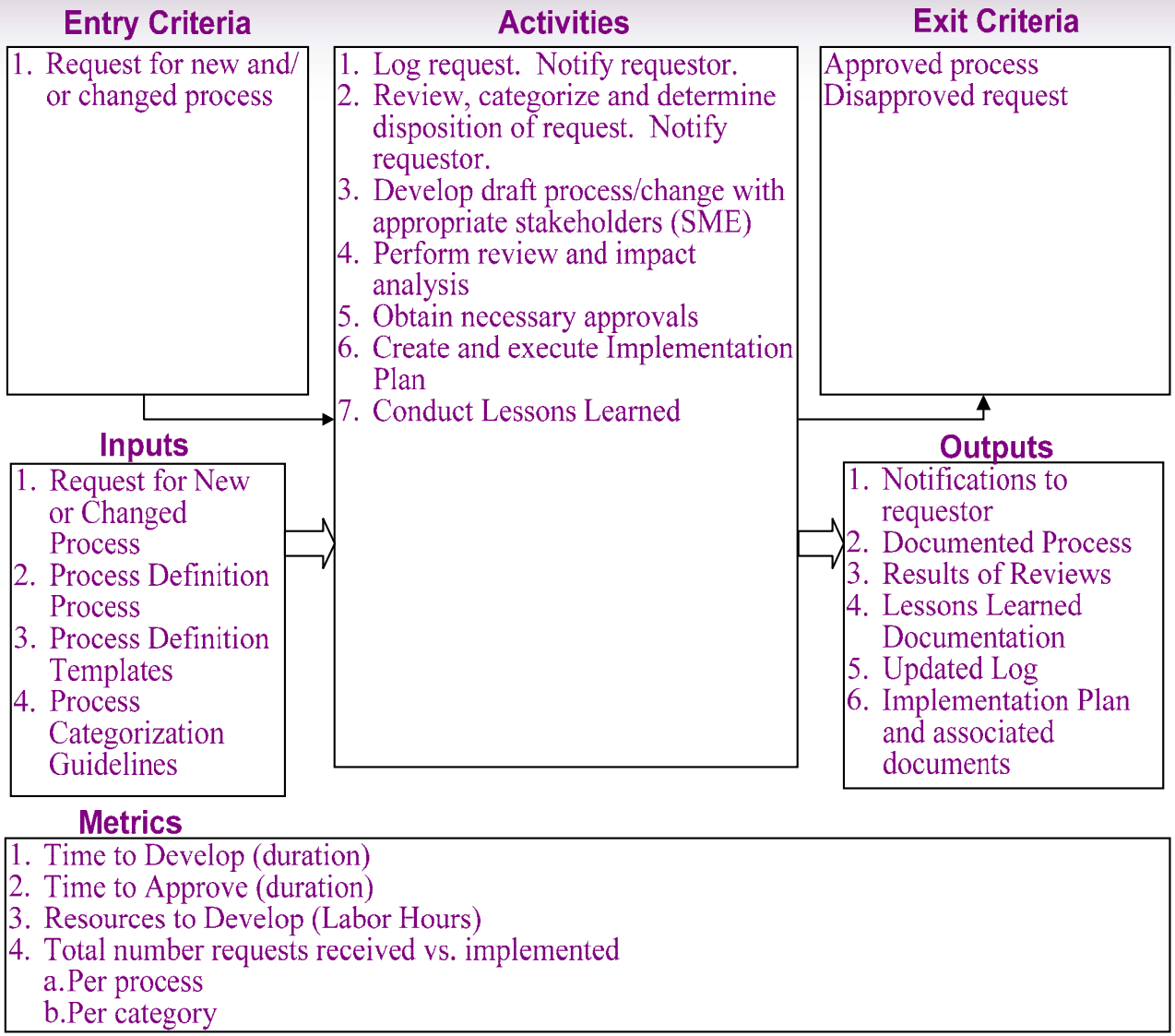
Process Modeling Workshops

- Process practitioners must be included in the description activities.
- Facilitated meetings are needed to capture the details necessary for describing the process.
- Metrics selection must initially be focused on a small set of metrics.

Process Model

- Involves modeling the process, based on the requirements gathered
  - Process details are determined.
  - Metrics to be collected are considered.
  - The design model is built.
- Process details are gathered iteratively via
  - Brainstorming sessions.
  - Interviews with people experienced in the process.
  - Analysis of how the process has been performed in the past.

Process Model Example



Process Model Completion

- Block Definition
  - **Entry Criteria** – the predecessors required to begin this process
  - **Input** – information, documentation, etc. required to begin this process
  - **Activities** – activities required to implement this process
  - **Exit Criteria** – the successors required to end this process
  - **Outputs** – information, documentation, etc. produced by this process
  - **Metrics and Notes** – metrics required for this process and include applicable explanatory notes and information for this process
- Options for completing the Process Models
  - Use of sticky notes
  - Electronically with projection system
  - Use of transparencies
  - Begin with draft from lead and use one of the above to finalize

Content of the Process Definitions

- Measurement information also needs to be included:
  - What will the key measurements be relative to this process?
- Measurements should show the results of improvements made to the process.
- Procedures or techniques to carry out activities are also part of the process description content.
- Other supporting information can include:
  - Change history for maintenance purposes.
  - Tailoring rules.
  - Verification and training.

TWG Results

- So what is the end product of the process definition activity?
  - A useful model (representation) of the activities, products, and roles.
  - The required relationships among these.
  - The behavior of the activities, roles, and products over time.
- In addition, the process definition documents (guidebooks).

Process Definition Priorities

- Process Management (1) TWG
- TWG Group 1
  - Requirements
  - Training (1)
  - Formal Decisions
  - Measurements
- TWG Group 2
  - Project Management
  - Quality Assurance
  - Configuration Management
- TWG Group 3
  - Design and Implementation
  - Integration, Validation and Verification
  - Process Management (2)
  - Training (2)

Lessons Learned

- Understanding the divisions' "as is" process(es) is the first step towards creating the Sector "to be" process.
- Process modeling involves systematic and formal decomposition of activities into descriptions that can be implemented across all of Sector.
- New processes, once defined, must first be piloted and refined prior to rolling them out throughout the Sector in order to minimize implementation risk.
- Training, piloting, and communication activities are central to effective deployment.

Next Steps

- Conduct Division specific SCAMPIs as needed
- Conduct Division SCAMPI on Pilot division for most Sector-wide processes
- Continue to roll out Sector-wide processes
- Conduct Sector-wide SCAMPI B
- Conduct Sector-wide SCAMPI A

About the Authors – 1

Barbara Hilden, CEO, has over nineteen years of experience in the computer industry. She is an authorized SCAMPI Lead Assessor and CMMI Instructor, Lead Evaluator (SCE V3.0) and internal auditor for ISO 9000. She has implemented process improvement initiatives, including CMMI, SW CMM, SA CMM, and ISO 9000, at various corporations. Ms. Hilden has led or participated in over 40 formal appraisals and multiple audits and mini-appraisal for the SW-CMM, the FAA-iCMM, ISO 9000, EIA/IS 731 SE CM, and the CMMI in a wide variety of organizations from very small to global organizations.

Acting as a consultant, Ms. Hilden has assisted organizations in determining and subsequently implementing effective strategies for process improvement efforts at a wide variety of organizations. She taught and developed a wide variety of computer science, software engineering, systems engineering and process improvement courses. Ms. Hilden has been responsible for managing government systems development programs as a government contractor and has led numerous research and development programs in the field of signal processing while working as an instructor in the university environment. Ms. Hilden has published and presented numerous papers and books on management, software engineering methodologies, and process improvement.

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About the Authors – 2

Lyn Dellinger has extensive experience in project management, software development management, acquisition, process engineering and education. She was an Acquisition Management Professor at Defense Systems Management College, and was a member of the Steering Group for developing the Software Acquisition Capability Maturity Model® at the Software Engineering Institute (SEI) and was a reviewer of the CMMI®. She was a consultant for the US Congress for acquisition reform and information technology. Ms. Dellinger has published and presented papers on management, software acquisition, software engineering methodologies, and process improvement. She is a Certified Computer Professional, a Project Management Institute certified Professional Project Manager, and was an authorized SW and SA CMM Lead Evaluator under the SEI Lead Appraiser program.

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