

Capability Maturity Model Integration (CMMI®) From a Project Management Perspective

Jesse Martak, President

Martak Consulting Services, Inc.

March 30, 2004

The Software Engineering Institute (SEI)



- Federally Funded Research & Development Center (FFRDC) at Carnegie Mellon University
- Mission is to foster improvement of project and software processes
- Developed Capability Maturity Model[®] (CMM[®]) and Assessment Methodology (CBA IPI)
- Developed Capability Maturity Model Integration (CMMI[®]) and Appraisal Methodology (SCAMPISM)
- SEI authorizes lead appraisers to facilitate CBA IPI and SCAMPISM appraisals

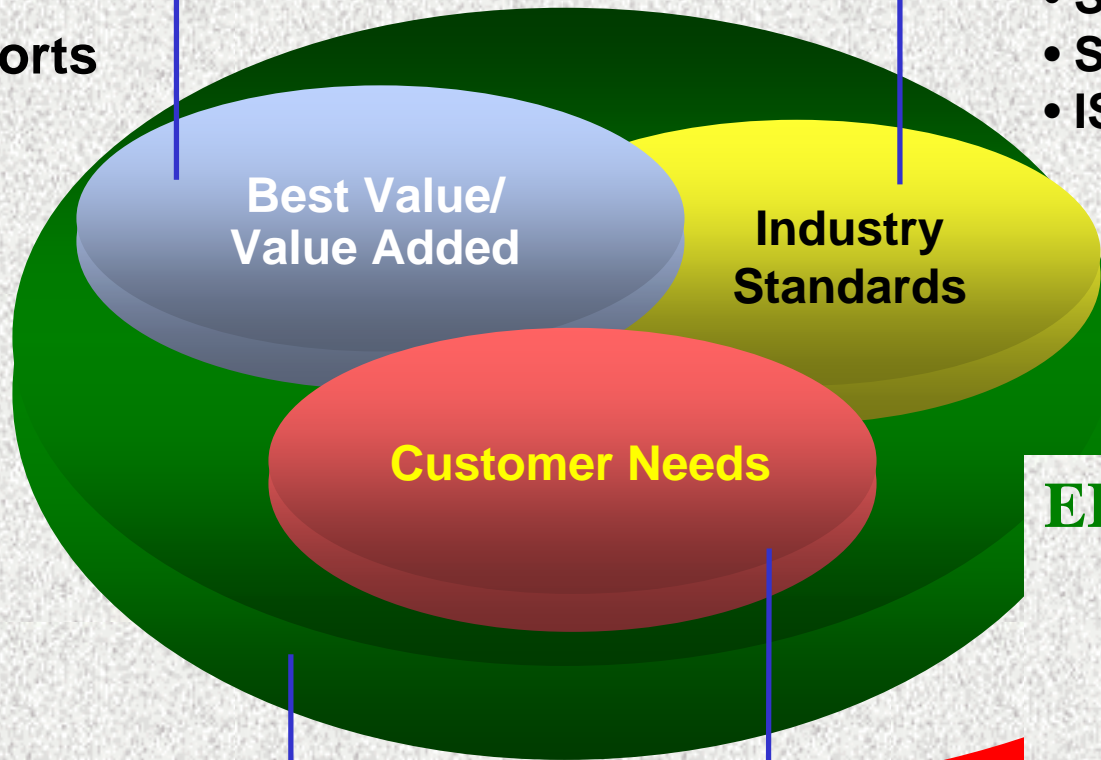
The Evolution of CMMI from Other Models

Best Value/Best Practice

- Organization
- Industry Reports

Industry Standards

- SEI CMM
- SE CM & EIA 731
- ISO



Best Value/
Value Added

Industry
Standards

Customer Needs

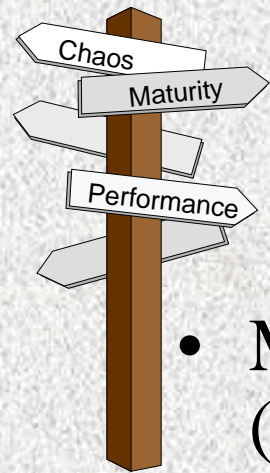
**EIA/IS 731 Key
to Rapid
CMMI
Transition**

Capability Model Integration

- CMMI

Prime Contractor Specs

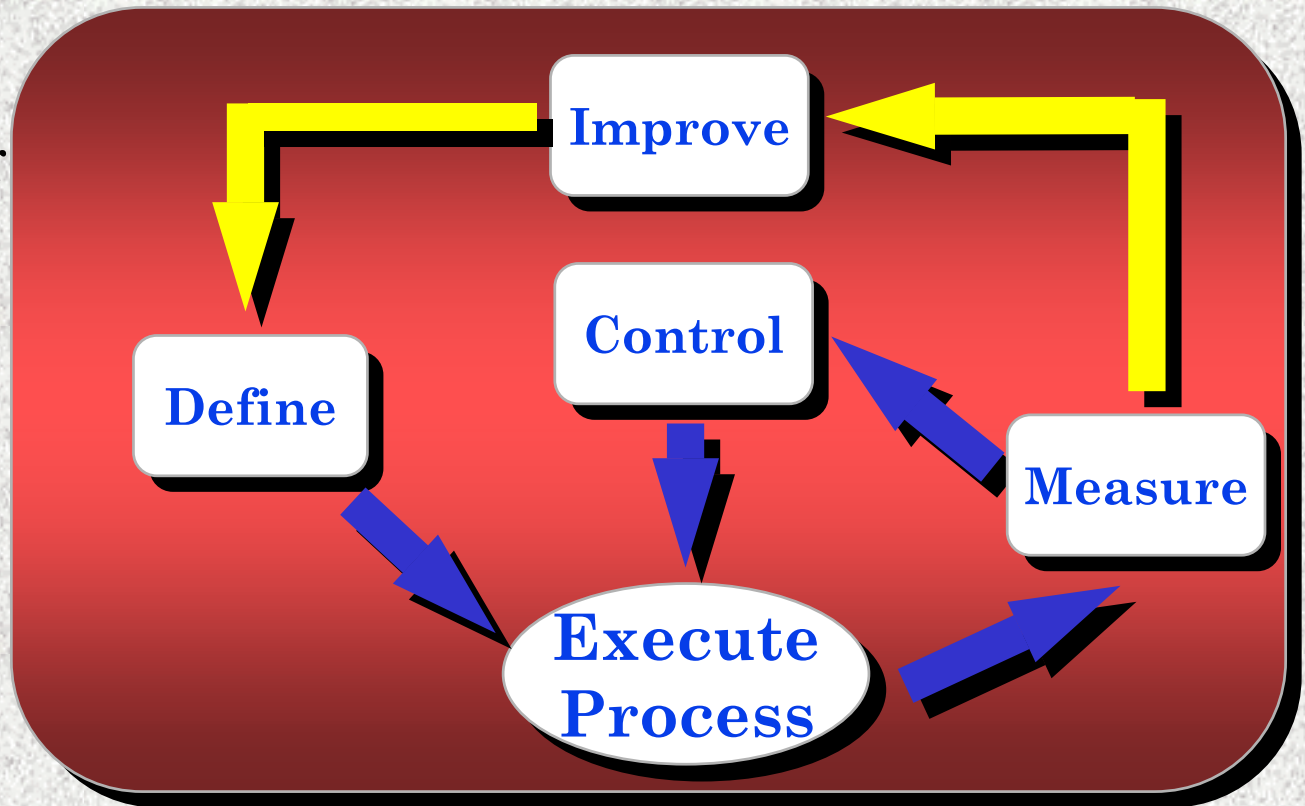
What are the CMM[®] and CMMI[®]?



- Models for organizational Process Improvement (PI) and improved practices
 - They benchmark the process not the product
- Community-owned PI framework to support an organization's process improvement project
 - Facilitates identifying, importing, and adopting best practices
 - Framework includes reference models, training products and appraisal methods
- An underlying structure for reliable and consistent project and organization process appraisals

Process Management Premise

- An undefined process cannot be controlled (or measured)
- An uncontrolled process cannot be improved
- Attempting to improve an unstable process yields further instability



Adapted from SEI

CMMI® Models and Representations

- CMMI® Models
 - CMMI® - SW (Software only)
 - CMMI® - SE/SW (Systems & Software)
 - CMMI® - SE/SW/IPPD (+Integrated Product & Process Development)
 - CMMI® - SE/SW/IPPD/SS (+Supplier Sourcing)
- CMMI® Representations
 - Staged Representation
 - Continuous Representation

The Evolution of Process Areas from CMM[®] to CMMI[®]

Level	CMM Key Process Areas (KPA's)	CMMI Process Areas (PAs)
<p>5 Optimizing</p>	<p>Process Change Management Technology Change Management Defect Prevention</p>	<p>Organizational Innovation and Deployment Causal Analysis and Resolution</p>
<p>4 Quantitatively Managed</p>	<p>Software Quality Management Quantitative Process Management</p>	<p>Organizational Process Performance Quantitative Project Management</p>
<p>3 Defined</p>	<p>Software Product Engineering Peer Reviews</p> <p>Organizational Process Focus</p> <p>Organizational Process Definition</p> <p>Training Program</p> <p>Intergroup Coordination Integrated software Management</p>	<p>Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training</p> <p>Integrated Project Management for IPPD Risk Management Integrated Teaming Integrated Supplier Management Decision Analysis and Resolution Organizational Environment for Integration</p>
<p>2 Managed</p>	<p>Requirements Management Software Project Planning Software Project Tracking & Oversight Software Sub-contract Management</p> <p>Software Quality Assurance Software Configuration Management</p>	<p>Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management</p>
<p>1 Initial</p>		

The Continuous Representation Has Six Capability Levels

5 Optimizing

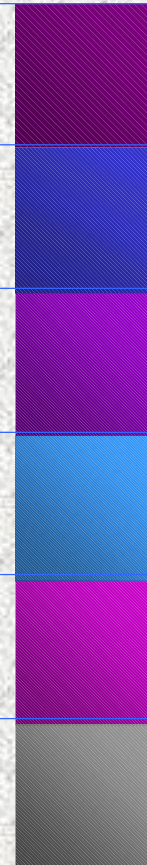
4 Quantitatively Managed

3 Defined

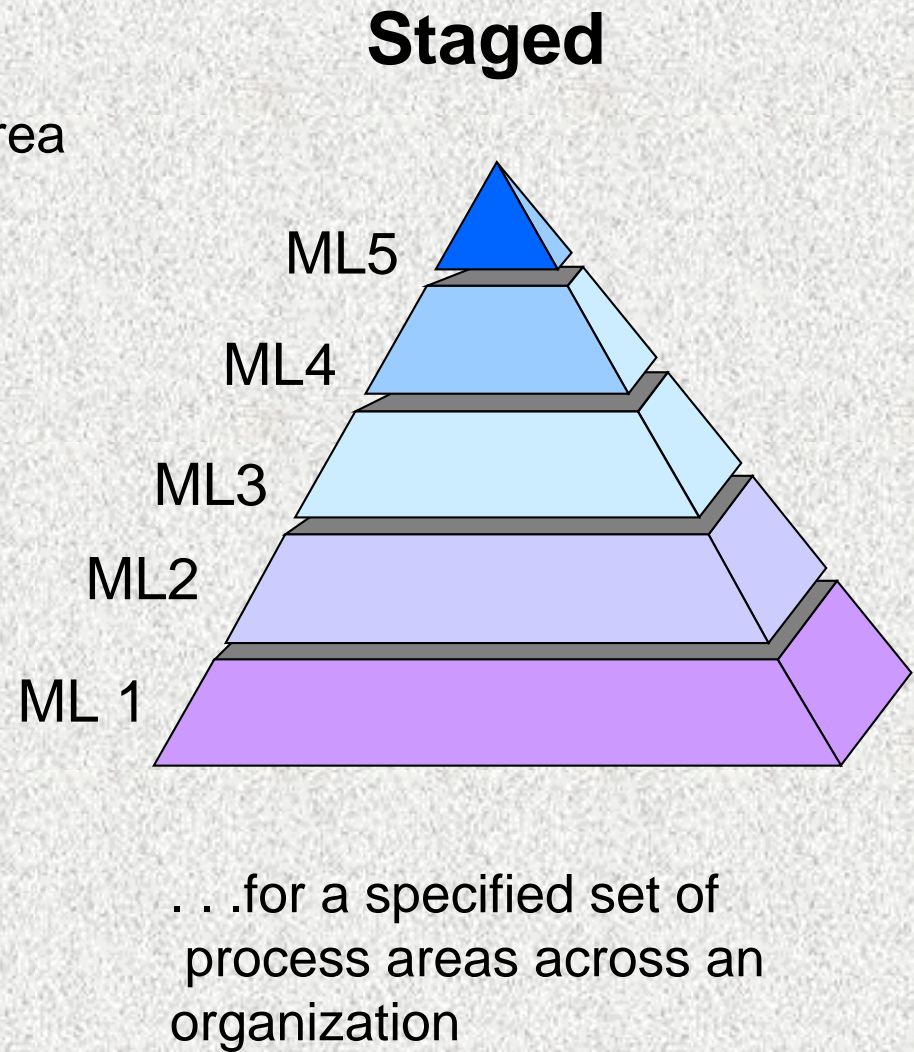
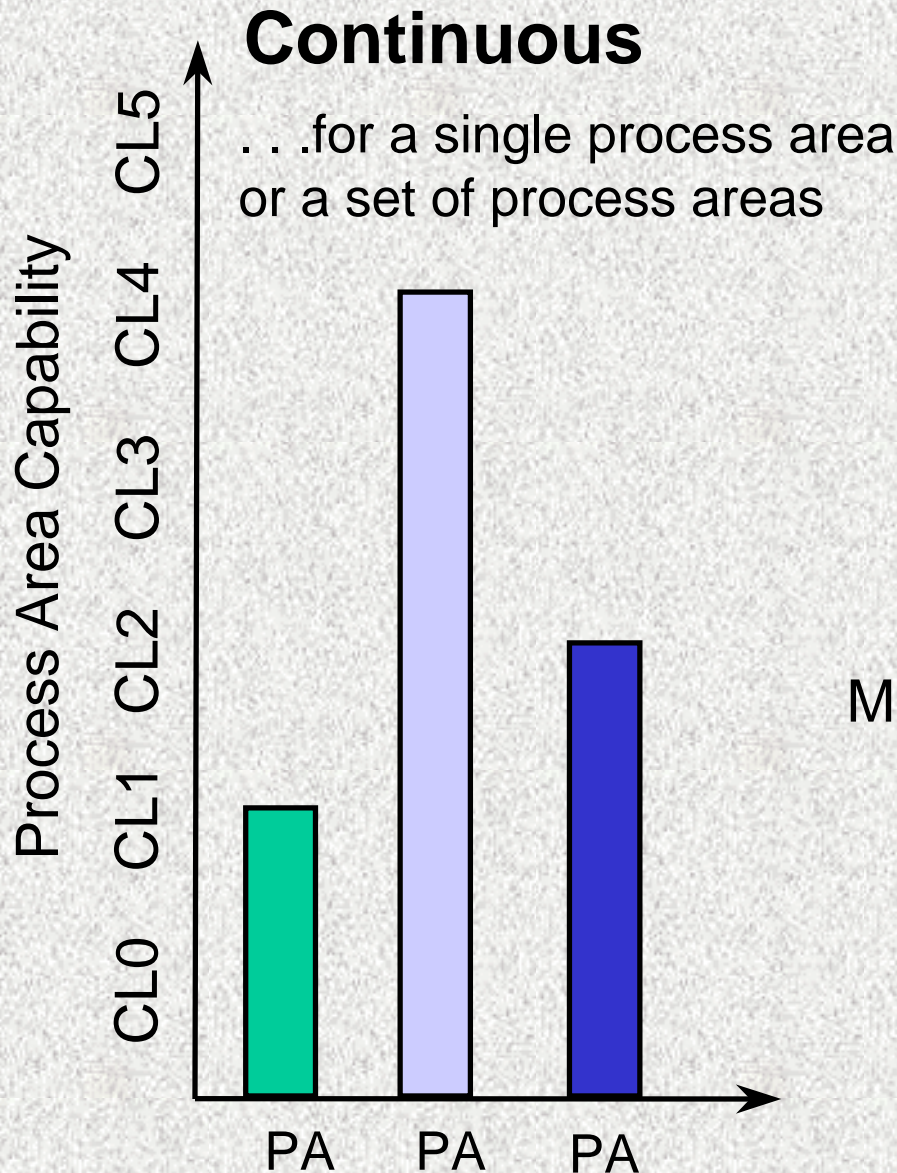
2 Managed

1 Performed

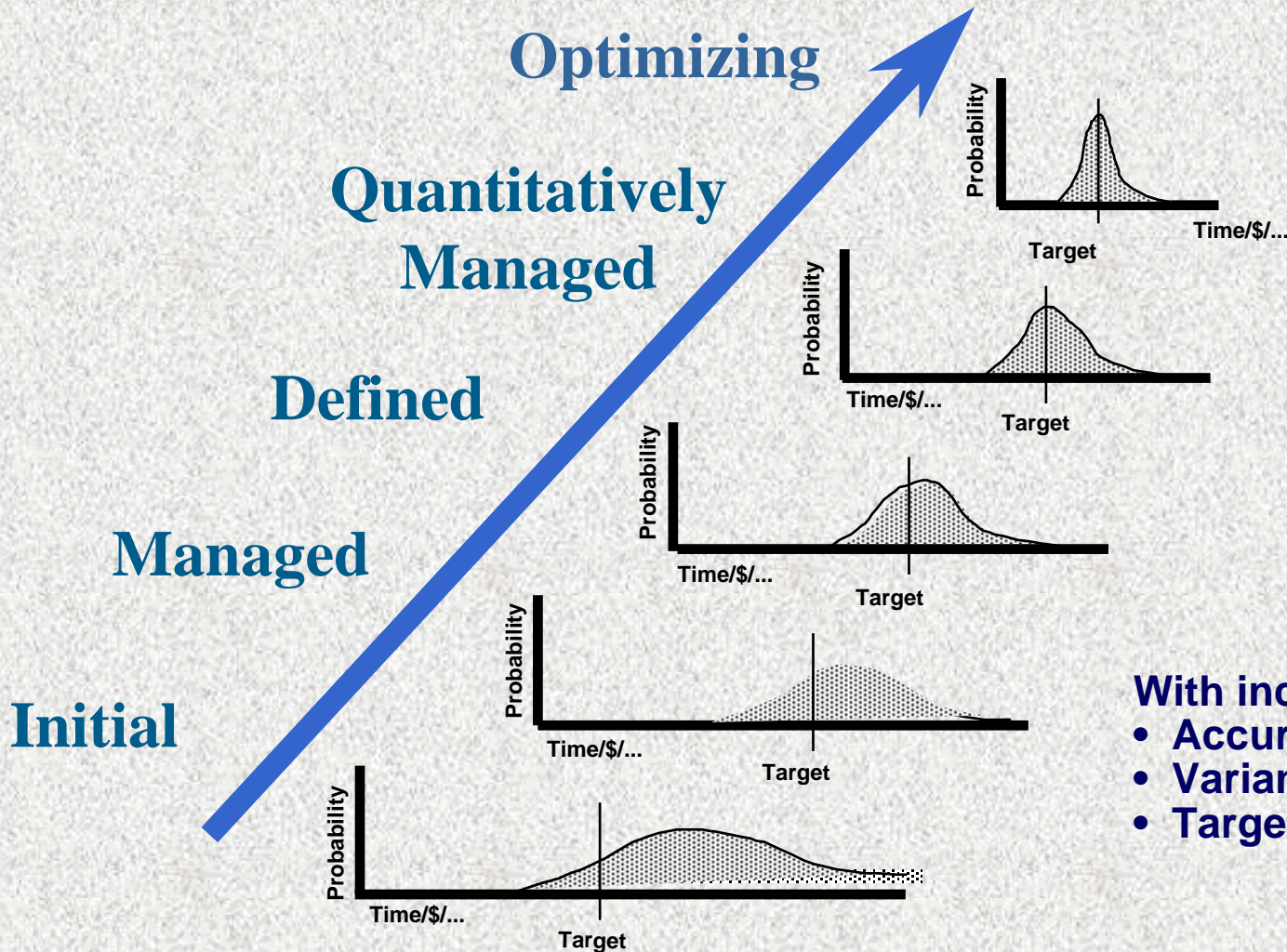
0 Incomplete



A Comparison of the Staged and the Continuous



Reduced Risk; Improved Productivity and Quality



- With increasing maturity
- Accuracy increases
 - Variance reduces
 - Target improves

How CMMI® Supports Planning and Managing a Project

- Project Management process areas
- Engineering process areas
- Support process areas
- Process Management process areas



Primary Focus of Project Management Process Areas

Project Planning	<ul style="list-style-type: none">• Establish and maintain estimates• Develop a project plan• Obtain commitments to the plan
Project Monitoring & Control	<ul style="list-style-type: none">• Monitor project against the plan• Manage corrective actions to closure
Risk Management	<ul style="list-style-type: none">• Prepare for risk management• Identify and analyze risks• Mitigate risks
Supplier Agreement Management	<ul style="list-style-type: none">• Establish supplier agreements• Satisfy supplier agreements

Primary Focus of Engineering Process Areas

Requirements Management	<ul style="list-style-type: none">•Manage requirements and reconcile inconsistencies
Requirements Development	<ul style="list-style-type: none">•Develop customer requirements•Develop product requirements•Analyze and validate requirements
Technical Solution	<ul style="list-style-type: none">•Select product-component solutions•Develop the design•Implement the design
Product Integration	<ul style="list-style-type: none">•Prepare for product integration•Ensure interface compatibility•Assemble product components & deliver product
Verification & Validation	<p>Prepare for & perform Verification & Validation</p> <p>Perform peer reviews</p>

Primary Focus of Support Process Areas

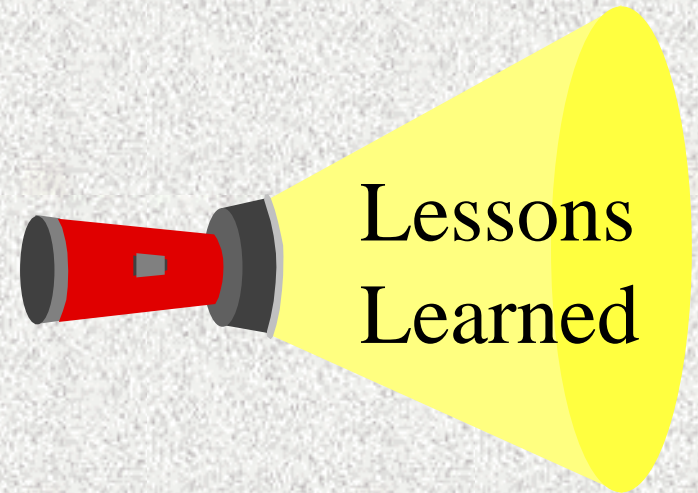
Configuration Management	<ul style="list-style-type: none">• Establish product baselines• Track and control changes• Establish baseline integrity
Quality Assurance	<ul style="list-style-type: none">• Objectively evaluate processes and products• Provide objective insight to engineering & management
Measurement & Analysis	<ul style="list-style-type: none">• Business focus for measurement & analysis activities• Provide measurement results
Decision Analysis & Resolution	<ul style="list-style-type: none">• Evaluate alternatives using established criteria

Primary Focus of Process Management Process Areas

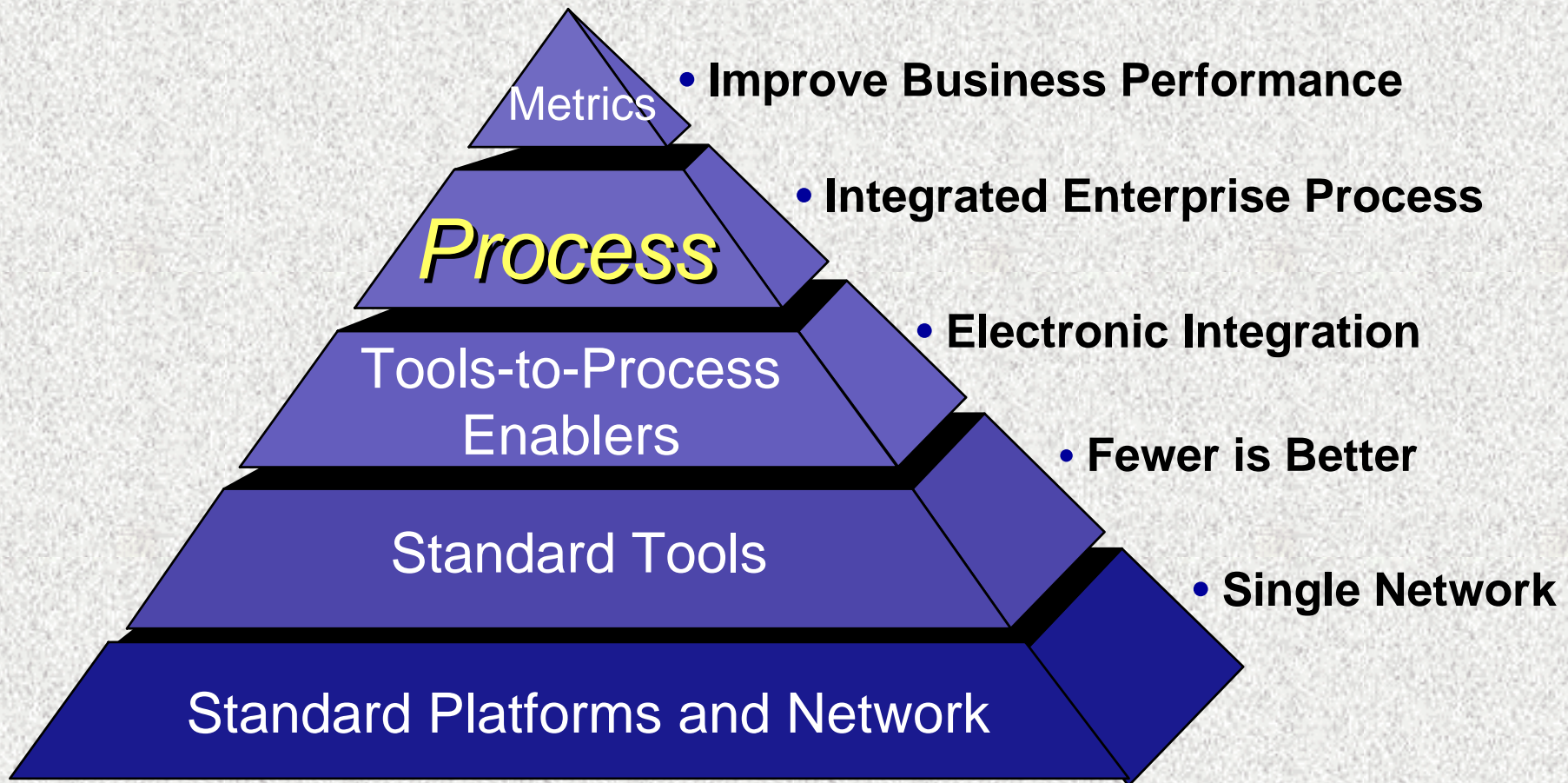
Organizational Process Focus	<ul style="list-style-type: none">•Determine process improvement opportunities•Plan and implement process improvement opportunities
Organizational Process Definition	<ul style="list-style-type: none">•Establish organizational process assets
Organizational Training	<ul style="list-style-type: none">•Establish an organizational training capability•Provide the necessary training
Integrated Project Management	<ul style="list-style-type: none">•Use organizational assets to establish project's process•Manage the project using integrated plans•Coordinate and collaborate with relevant stakeholders

Lessons Learned When Implementing CMM® and CMMI®

- Establish infrastructure early
- Manage process improvement like a project
- Include project personnel
- Pilot on select projects prior to deployment
- Process training essential to success
- Consider an integrated program plan across all disciplines

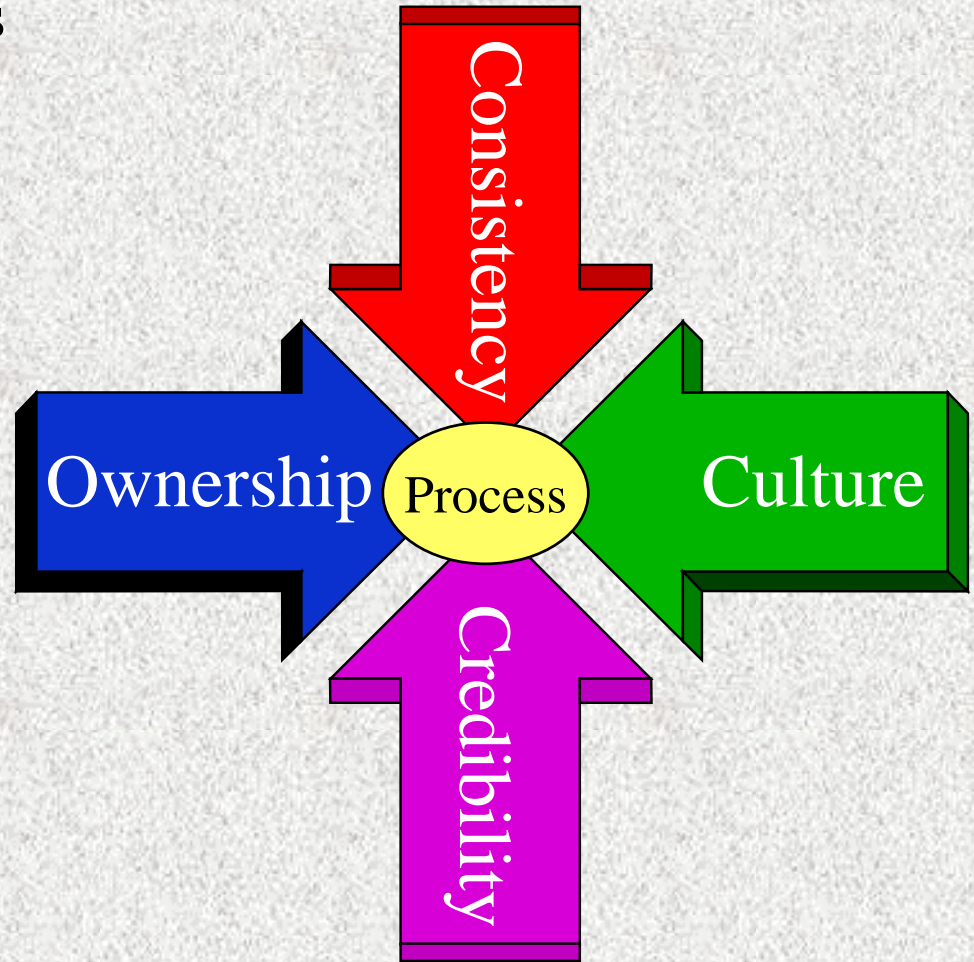


Infrastructure Creates Efficiency and Improvement



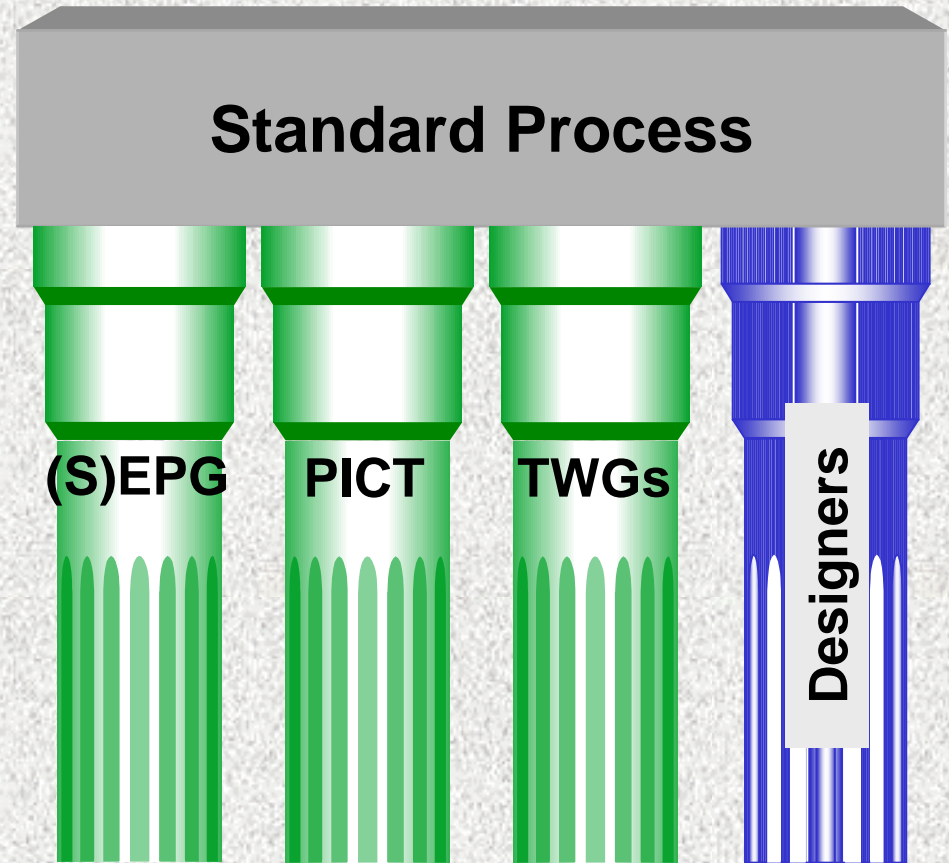
Basics of Getting Started

- Select the appropriate process group staff to achieve goals
 - Project experience
 - QA & CM reps
 - Core group full time
 - Working groups channel part-time resources
 - Outside resources
- Establish the (S)EPG, PAL, Training DB & Measurement System as soon as possible – Level 2 as foundation for higher levels



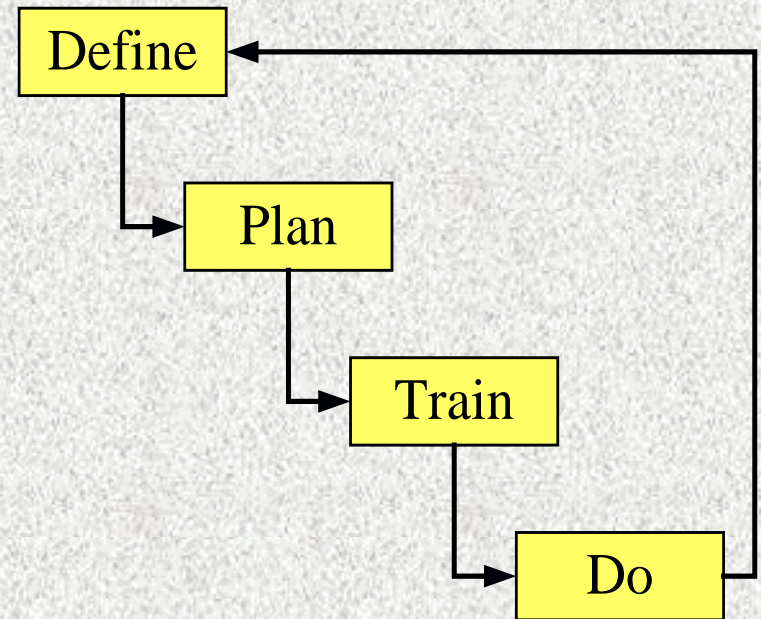
Successful Planning *Includes* Designers

- (S)EPG/PCCB: Process Group
- PICT: Process Improvement Core Team (Users' Group)
- TWG: Technology Working Groups
- *Systems, Hardware and Software Engineers*



Process Improvement is a “Project” of Itself – Not an Organizational Task

- Requirements must be well defined
- Build a little; test a little for proof of concept & methods
- Use experts to kick start the process
- Long Range Strategic Plan - vision
- Monthly Senior Mgmt reviews
- “Peer Reviews” for “buy-in”
- Staffing Needs and Capabilities Evolve over Time

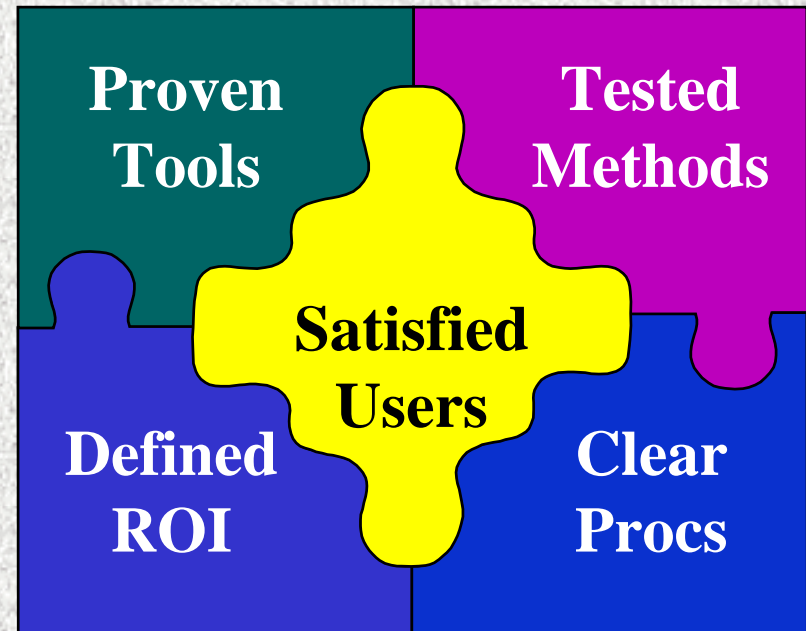


Piloting Gets The Kinks Out Early

Reducing User Dissatisfaction

- Small set of 1 to 3 projects
 - Mature
 - Open minded
- Midcourse Corrections
- Effective (S)EPG Support
- Formal Reviews
- Alternate Funding Sources
- Advantages
 - Verify process & data
 - Obtain buy-in of projects

Before rolling out process to the total organization ...



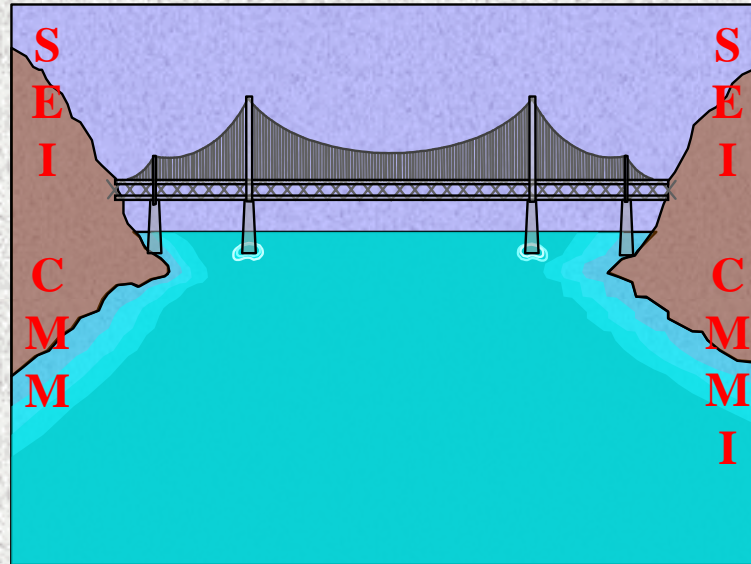
... mature the process and tools to neutralize the “nay-sayers”

Educating the Work Force

- Use classroom, mentoring and just-in-time training
- Advantages of just-in-time training
 - Mentor/trainer assigned to projects
 - Real project artifacts as homework problems
 - Mentor/trainer helps project tailor process
 - More time efficient for project leaders
- Select right personnel for mentors/trainers

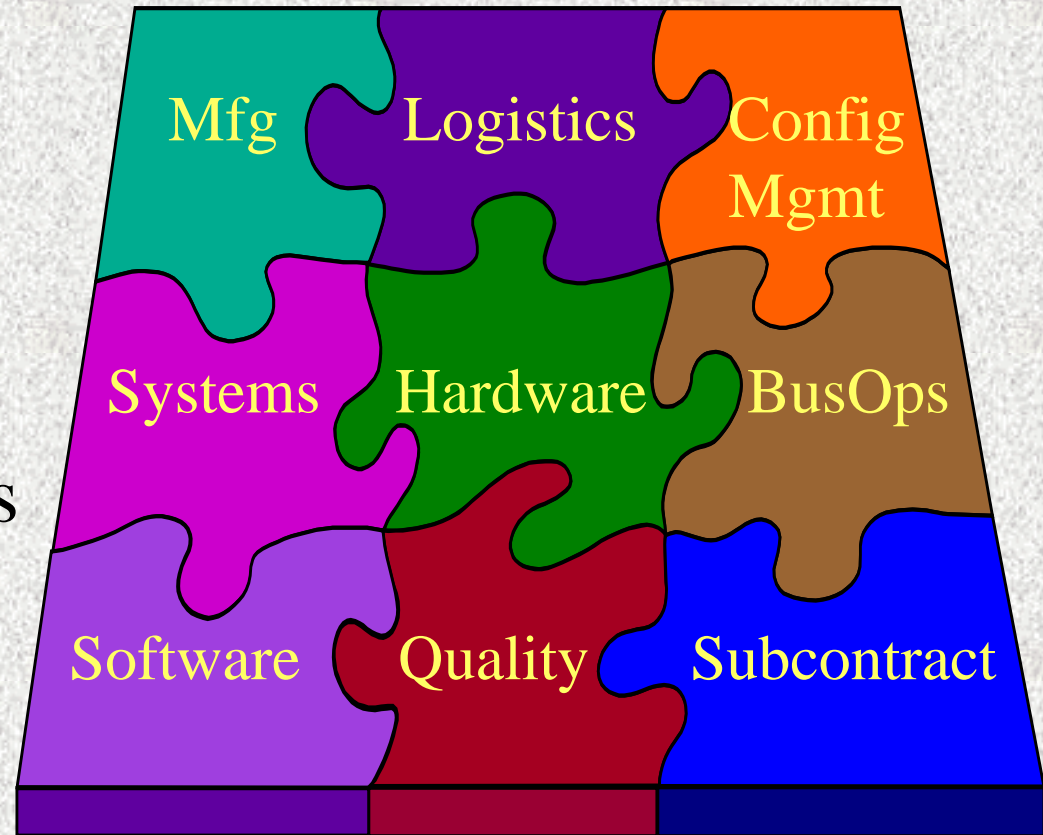


Transition to CMMI Introduced Process Integration Requirements as well as Unique Cultural Issues with Systems and Hardware Engineering



Integrated Program Plan Is Key Element

- Total Program Plan
 - Program Overview
 - Program Organization
 - Integrated Schedules
 - Integrated Metrics
- Comprehensive Plans
 - Processes
 - Work Products
 - Key Milestones
 - Acceptance Criteria
 - Responsibility



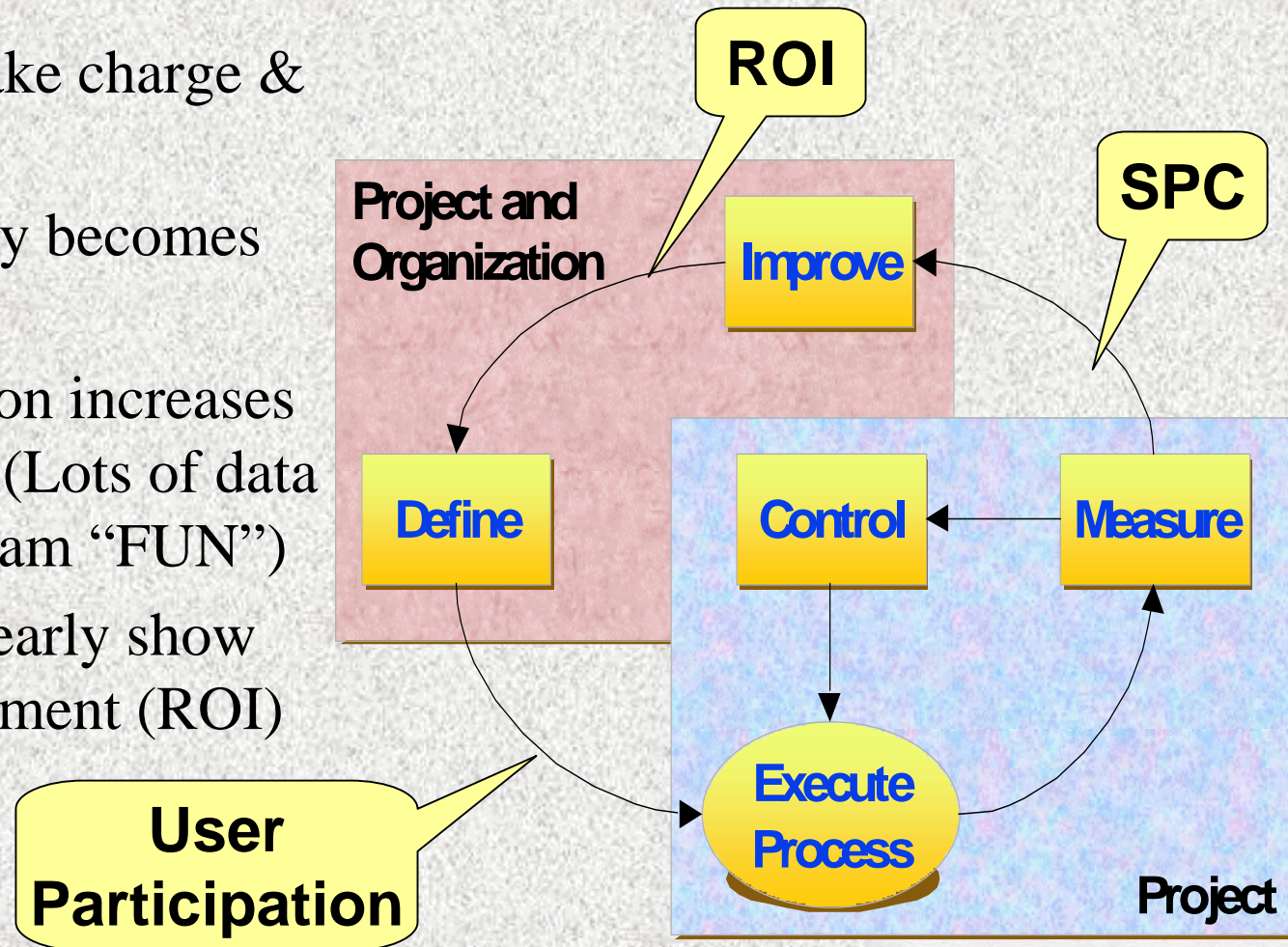
Cooperative Effort Yields Success

- Evaluate and adopt software processes that demonstrate value added, such as peer reviews
- Expand software quality role to include “total” process evaluations to program plans
- Eliminate “stovepipe” plans (unless contractual)
- Select program managers & pilots with innovative nature



Higher Levels Focus on Optimizing ROI

- Projects must take charge & drive process
- Data consistency becomes critical
- User participation increases at higher levels (Lots of data - engineer's dream "FUN")
- Results must clearly show return on investment (ROI)



Keys to Success – CMM or CMMI

- Get support of *senior management*
- Install *strong managers* in pilot programs
- Include *process lead* in project's budget
- Provide *mentors* to programs
- Start small - select a few key *pilot projects*
- Maintain involvement of designers as *team members*
- Provide an easy to use *system interface*
- Use *statistics* to provide feedback and improve products

Acknowledgements

- **® CMM, CMMI and Capability Maturity Model are registered in the U.S. Patent and Trademark Office by Carnegie Mellon University**
- **SM SCAMPI and IDEAL are service marks of Carnegie Mellon University**

Q&A



Contact Information

**Jesse Martak, President
Martak Consulting Services, Inc.**

**3959 White Rose Way
Ellicott City, MD – 21042**

Jmartak@aol.com

410-465-3923 (office)

410-804-8954 (cell)