



Cepeda Systems & Software Analysis, Inc.

CMMI[®] - Staged or Continuous?

Presented by:

Sandra L. Cepeda

President and CEO

Cepeda Systems and Software Analysis, Inc.

Sponsored by AMRDEC Software Engineering Directorate

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voice.256.527.8749

fax.256.461.7985

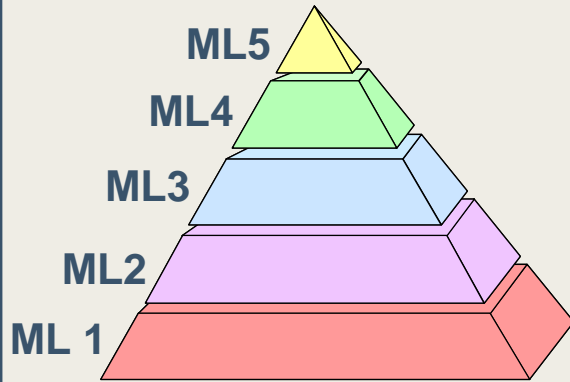
sandra.cepeda@knology.net

- ❖ What Is the CMMI?
- ❖ Staged and Continuous Representations
 - Understanding Each Representation
 - Advantages of Each Representation
 - Improving a Process Area (Continuous Representation)
 - Improving Maturity Levels (Staged Representation)
- ❖ Examples of Uses of Each Representation
- ❖ Equivalence Staging
- ❖ Summary and Recommendations

What Is the CMMI?

- ❖ CMMI Is a Process-Improvement Model That Provides a Set of Best Practices That Address Productivity, Performance, Costs, and Stakeholder Satisfaction
- ❖ CMMI Is *NOT* a Set of “Bolt-On Processes” That Last Only As Long As the Wheel Is Squeaking. CMMI Provides a Consistent, Enduring Framework That Accommodates New Initiatives
- ❖ CMMI Focuses on the Total-System Problem, Unlike Other Predecessor CMMs
- ❖ CMMI Facilitates Enterprise-Wide Process Improvement, Unlike Single-Discipline Models

Staged



Organization

Maturity Level 5 OID, CAR

Maturity Level 4 OPP, QPM

Maturity Level 3 RD, TS, PI, VER, VAL, OPF, OPD, OT, IPM, RSKM, DAR, OEI, IT, ISM

Maturity Level 2 REQM, PP, PMC, MA, PPQA, CM, SAM

Process Areas (SE/SW/IPPD/SS)

Organizational Innovation & Deployment (OID)
Causal Analysis and Resolution (CAR)

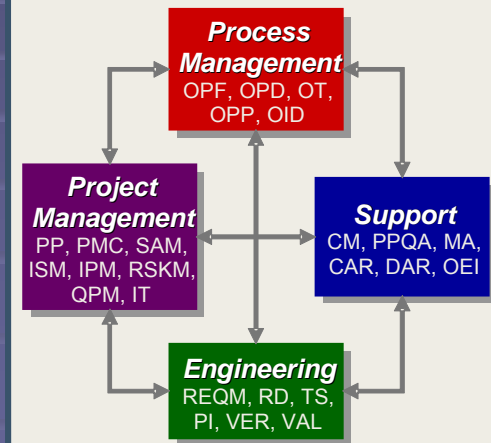
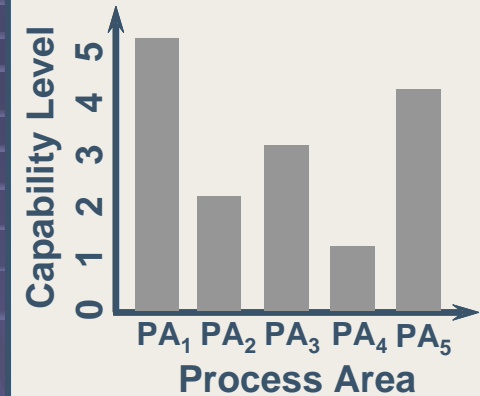
Organizational Process Performance (OPP)
Quantitative Project Management (QPM)

Requirements Development (RD)
Technical Solution (TS)
Product Integration (PI)
Verification (VER)
Validation (VAL)

Organizational Process Focus (OPF)
Organizational Process Definition (OPD)
Organizational Training (OT)
Integrated Project Management (IPM)
Risk Management (RSKM)
Decision Analysis and Resolution (DAR)
Organizational Environment for Integration (OEI)
Integrated Teaming (IT)
Integrated Supplier Management (ISM)

Requirements Management (REQM)
Project Planning (PP)
Project Monitoring and Control (PMC)
Measurement and Analysis (MA)
Process and Product Quality Assurance (PPQA)
Configuration Management (CM)
Supplier Agreement Management (SAM)

Continuous



- ❖ **Two Representations Per CMMI Model**
- ❖ **Essentially the Same Content But Organized in a Different Way**

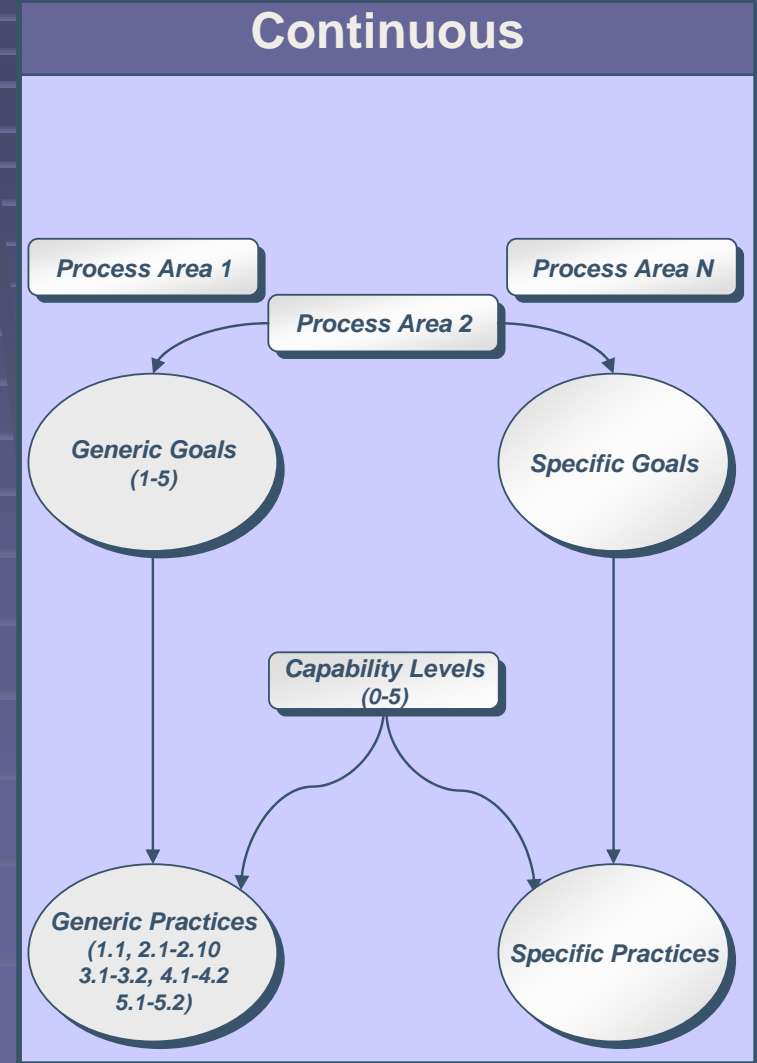
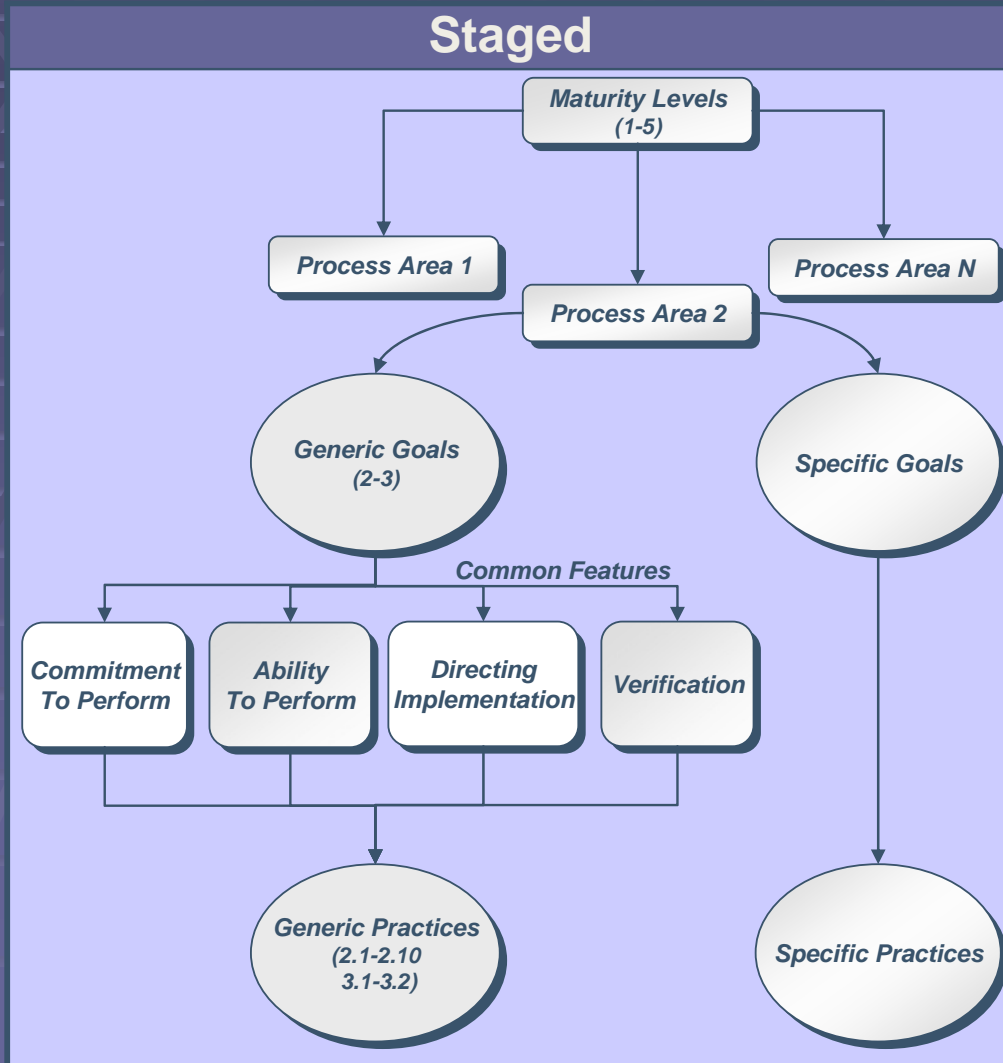
- ❖ A Representation Allows an Organization to Pursue Different Improvement Objectives and Presents Model Components Differently
 - **Staged** Representation Uses **Maturity** Levels to Measure Process Improvement
 - Maturity Levels Apply to an Organization's **Overall Maturity**
 - **Pre-Defined** Sets of Process Areas Define an Improvement Path for the Organization
 - **Continuous** Representation Uses **Capability** Levels to Measure Process Improvement
 - Capability Levels Apply to an Organization's Process-Improvement Achievement for **Each Process Area (PA)**
 - Improvements Are Characterized Relative to an Individual PA
- ❖ The Content Is **Nearly Identical** in Both Representations
- ❖ So Why Both?
 - The Representation of Each Source Model Was Different
 - Software CMM—Staged
 - SE-CMM, SECM—Continuous
 - Ease of Adoption by Legacy Communities
 - Both Representations Provide Inherent Benefits

| Continuous Representation | Staged Representation |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ❖ Maximum Flexibility for Prioritizing Process Improvements and Aligning Them With Business Objectives (Requires Understanding of PA Relationships) | <ul style="list-style-type: none"> ❖ Predefined and Proven Path With Case Study and ROI Data (Reduces Guess-Work) |
| <ul style="list-style-type: none"> ❖ Enables Increased Visibility of Improvement Within Process Areas ❖ Quick Wins Can Be Easily Defined to Increase Buy-In ❖ Increases Focus on Risks Specific to Each Process Area | <ul style="list-style-type: none"> ❖ Focuses on Organizational Improvement |
| <ul style="list-style-type: none"> ❖ Improvement of Process Areas Can Occur at Different Rates ❖ Less Upfront Investment Might Be Required | <ul style="list-style-type: none"> ❖ Overall Results Summarized in a Maturity Level ❖ Provides Familiar Benchmarking Capability (Normally Used to Qualify Bidders) |
| <ul style="list-style-type: none"> ❖ Easy Upgrade From SE-CMM and SECM | <ul style="list-style-type: none"> ❖ Easy Upgrade From SW-CMM |



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Improving Process Area Capability and Maturity Levels

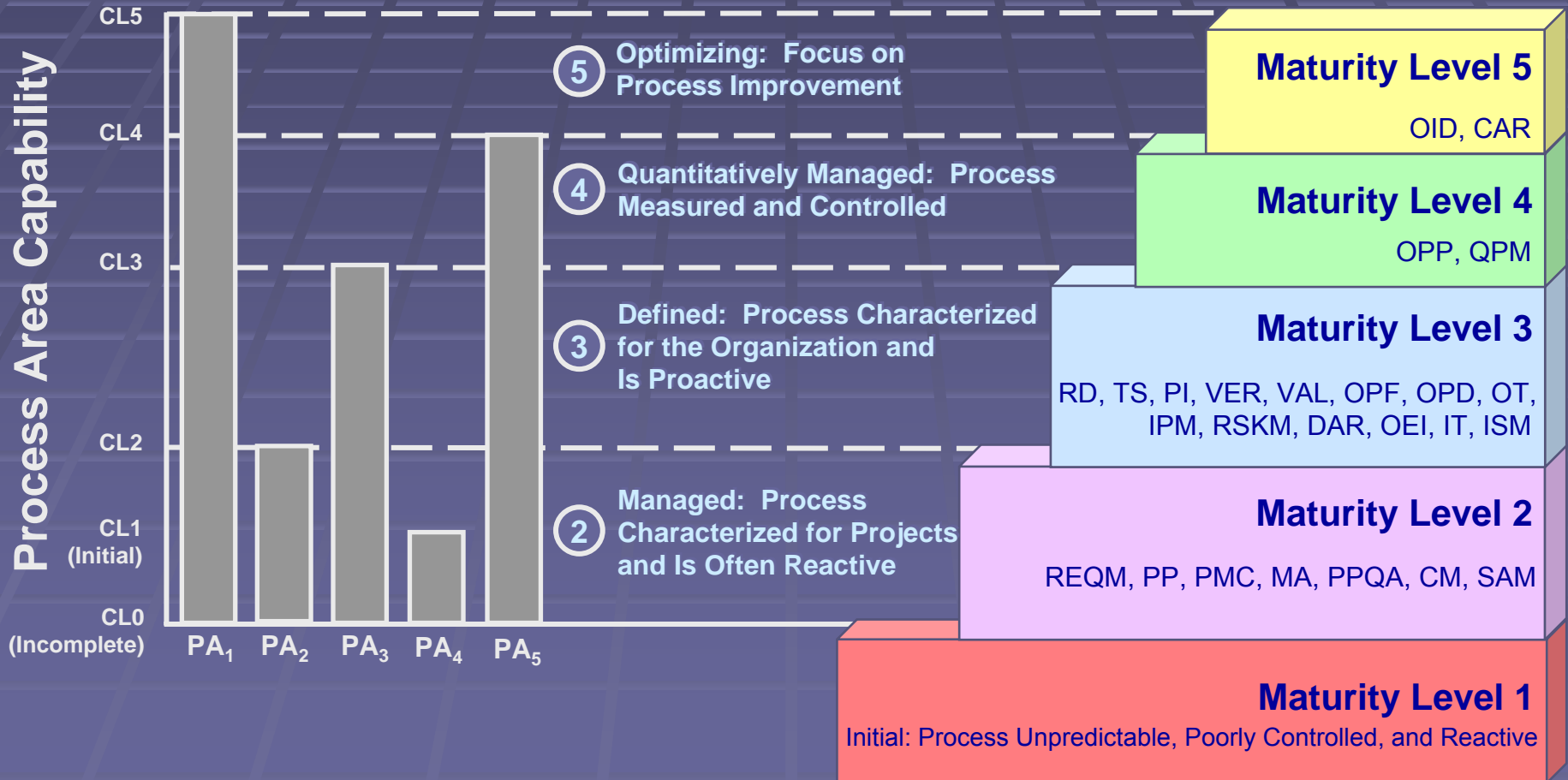


Continuous

...for a Single Process Area or Selected Set of Process Areas

Staged

...for a Pre-Defined Set of Process Areas Across an Organization



SE/SW/IPPD/SS Version 1.1

| | Process Area | Acronym | Maturity Level |
|---------------------------|----------------------------------------------------------|-------------|----------------|
| PROCESS MANAGEMENT | Organizational Process Focus | OPF | 3 |
| | Organizational Process Definition | OPD | 3 |
| | Organizational Training | OT | 3 |
| | Organizational Process Performance | OPP | 4 |
| | Organizational Innovation and Deployment | OID | 5 |
| PROJECT MANAGEMENT | Project Planning | PP | 2 |
| | Project Monitoring and Control | PMC | 2 |
| | Supplier Agreement Management | SAM | 2 |
| | Integrated Project Management for IPPD (IPPD) | IPM | 3 |
| | Risk Management | RSKM | 3 |
| | Integrated Teaming (IPPD) | IT | 3 |
| | Integrated Supplier Management (SS) | ISM | 3 |
| | Quantitative Project Management | QPM | 4 |
| ENGINEERING | Requirements Management | REQM | 2 |
| | Requirements Development | RD | 3 |
| | Technical Solution | TS | 3 |
| | Product Integration | PI | 3 |
| | Verification | VER | 3 |
| | Validation | VAL | 3 |
| SUPPORT | Configuration Management | CM | 2 |
| | Process and Product Quality Assurance | PPQA | 2 |
| | Measurement and Analysis | MA | 2 |
| | Decision Analysis and Resolution | DAR | 3 |
| | Organizational Environment for Integration (IPPD) | OEI | 3 |
| | Causal Analysis and Resolution | CAR | 5 |

- ❖ A Specific Goal Describes the **Unique** Characteristics That Must Be Present to Satisfy a Process Area
 - “Requirements Are Managed and Inconsistencies With Project Plans and Work Products Are Identified”

- ❖ A Specific Practice Is the Description of an Activity That Is Considered Important in Achieving the Associated Specific Goal
 - “Manage Changes to the Requirements As They Evolve During the Project”

Institutionalizing Processes - Generic Goals and Generic Practices

Capability Level *Generic Goals* *Generic Practices* *Common Features Mapping*

| Capability Level | Generic Goals | Generic Practices |
|------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CL 1 | GG1: Achieve Specific Goals | GP 1.1: Perform Base Practices |
| CL 2 | GG2: Institutionalize a Managed Process | GP 2.1: Establish an Organizational Policy GP 2.2: Plan the Process GP 2.3: Provide Resources GP 2.4: Assign Responsibility GP 2.5: Train People GP 2.6: Manage Configurations GP 2.7: Identify and Involve Relevant Stakeholders GP 2.8: Monitor and Control the Process GP 2.9: Objectively Evaluate Adherence GP 2.10: Review Status with Higher Level Management |
| CL 3 | GG3: Institutionalize a Defined Process | GP 3.1: Establish a Defined Process GP 3.2: Collect Improvement Information |
| CL 4 | GG4: Institutionalize a Quantitatively Managed Process | GP 4.1: Establish Quantitative Objectives for the Process GP 4.2: Stabilize Subprocess Performance |
| CL 5 | GG5: Institutionalize an Optimizing Process | GP 5.1: Ensure Continuous Process Improvement GP 5.2: Correct Root Causes of Problems |

ML 2

ML 3
ML 4
ML 5

Commitment to Perform

Ability to Perform

Directing Implementation

Verifying Implementation

Improving A Process Area (Continuous Representation)

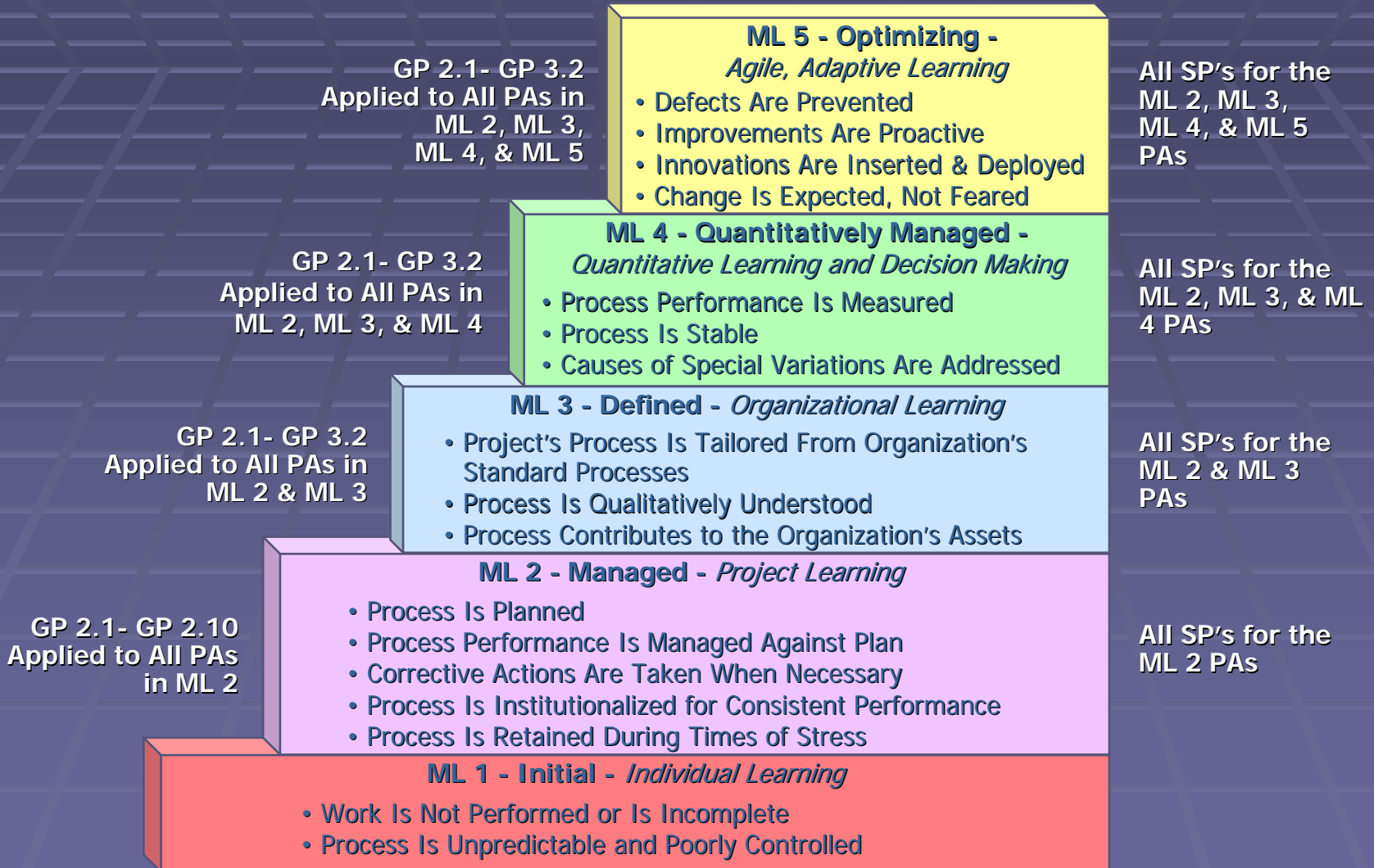
Process Area Capability

| | | | |
|-----|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| CL5 | GP1.1 - GP5.2 | <p>Optimizing – Agile, Adaptive Learning</p> <ul style="list-style-type: none"> Defects Are Prevented Improvements Are Proactive Innovations Are Inserted and Deployed Change Is Expected, Not Feared | CL1+CL2*+CL3* SPs |
| CL4 | GP1.1 - GP4.2 | <p>Quantitatively Managed – Quantitative Learning and Decision Making</p> <ul style="list-style-type: none"> Process Performance Is Measured Process Is Stable Causes of Special Variations Are Addressed | CL1+CL2*+CL3* SPs |
| CL3 | GP1.1 - GP3.2 | <p>Defined – Organizational Learning</p> <ul style="list-style-type: none"> Project's Process Is Tailored From Organization's Standard Processes Process Is Qualitatively Understood Process Contributes to the Organization's Assets | CL1+CL2*+CL3* SPs |
| CL2 | GP1.1 - GP2.10 | <p>Managed – Project Learning</p> <ul style="list-style-type: none"> Process Is Planned Process Performance Is Managed Against Plan Corrective Actions Are Taken When Necessary Process Is Institutionalized for Consistent Performance Process Is Retained During Times of Stress | CL1+CL2* SPs |
| CL1 | GP1.1 | <p>Performed – Individual Learning</p> <ul style="list-style-type: none"> Work Is Performed Performance Is Dependent on Individual Practitioner | CL1 (Base) SPs |
| CL0 | No GPs Exist | <p>Incomplete</p> <ul style="list-style-type: none"> Work Is Not Performed or Is Incomplete Process Is Unpredictable and Poorly Controlled | No SPs Exist |

PA₁

* Advanced Practices Exist Only in the Engineering PAs

Improving Maturity Levels (Staged Representation)



❖ Small Company Perspective From AMRDEC SED Pilot in Huntsville, AL

As the pilot proceeded, our emphasis of wanting to embrace CMMI changed from an original desire to “get certified” to a focus of improving in smaller “chunks” in areas identified by business analysis

The implementation of specific process areas without the overriding goal of Level attainment makes the use of the model more meaningful for our small organization

We realize now that we can use the CMMI in the areas that naturally add value to our organization and quality to our end products by improving activities where we need them the most

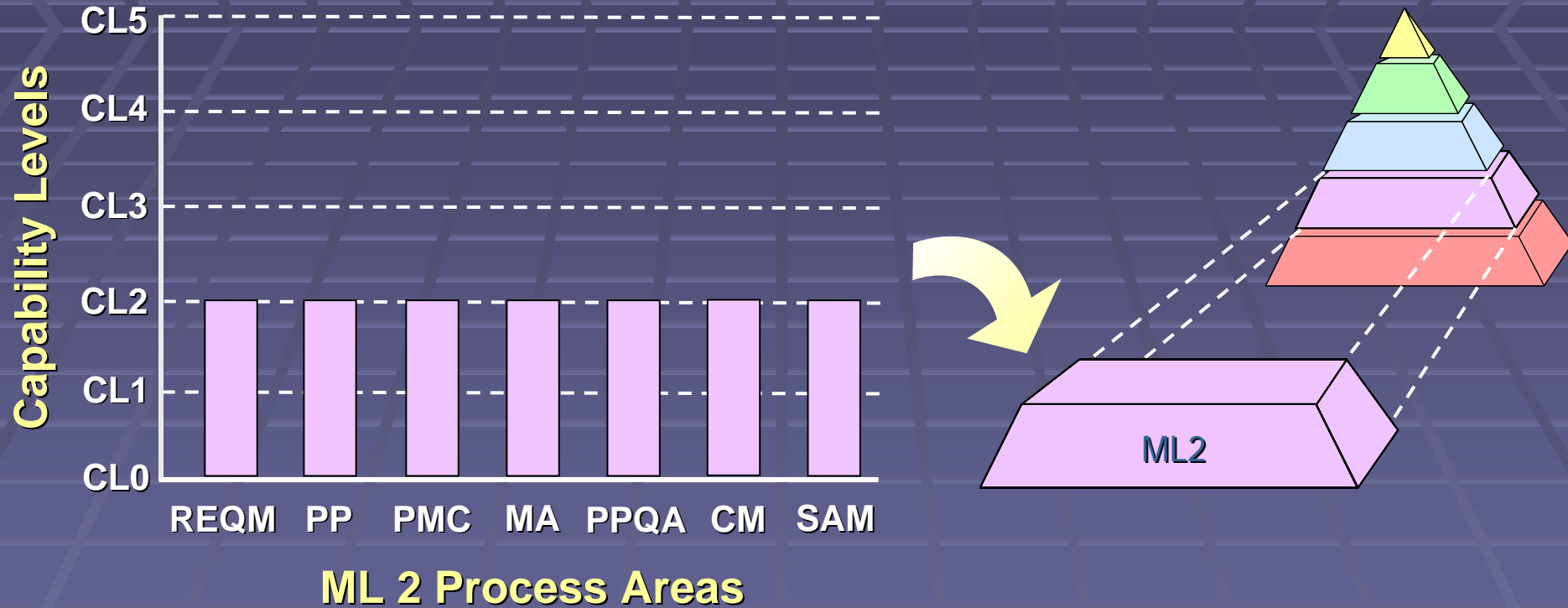
❖ Consultants From Pilot Sponsored by AMRDEC SED in Huntsville, AL

The Continuous Representation allows small companies to focus on improvements that have the highest payoff for the company

❖ In General, the Continuous Representation Is Useful When the Organization

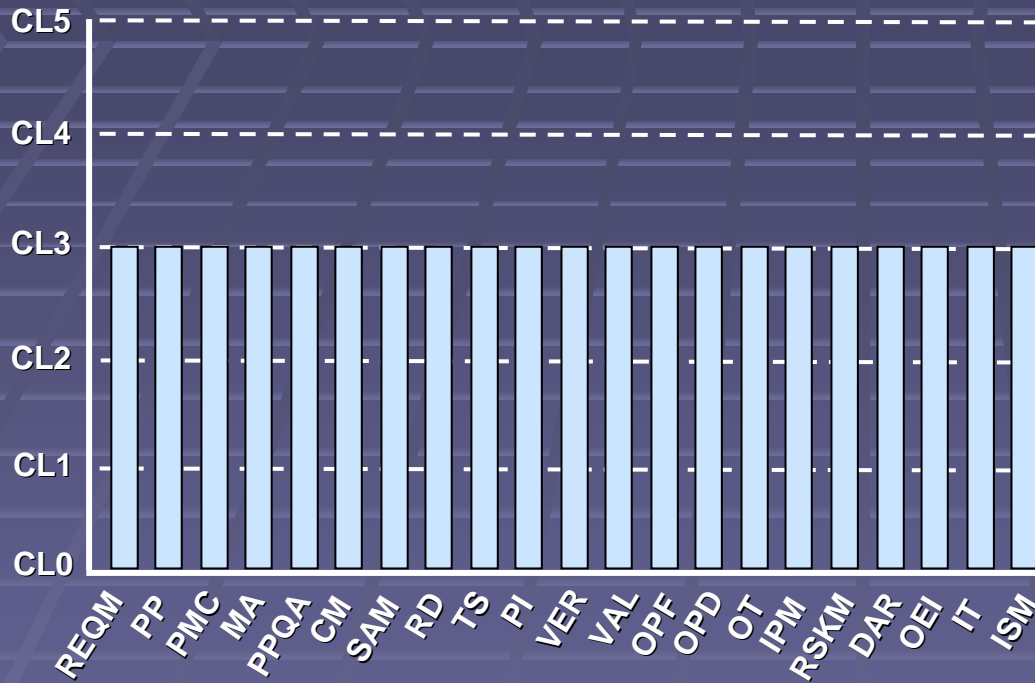
- Understands How CMMI Can Address Business Objectives
- Has Identified Specific Improvements Needed
- Has Limited Budget for Process Improvement
- Understands Process Areas Relationships
- Can Benefit From “Quick Wins”

- ❖ The Staged Representation Provides an Excellent Path for Organizations
 - Transitioning From SW-CMM to CMMI
 - Doing Business With Government Organizations That Require a Maturity Level for Their Procurements
 - Not Familiar With the Dependencies Among Process Areas
 - Much of the Guess-Work in Process Improvement Is Reduced by the Pre-Defined Set of Process Areas at Each Maturity Level
- ❖ Equivalence Staging Allows Comparison of Results From Both Representations

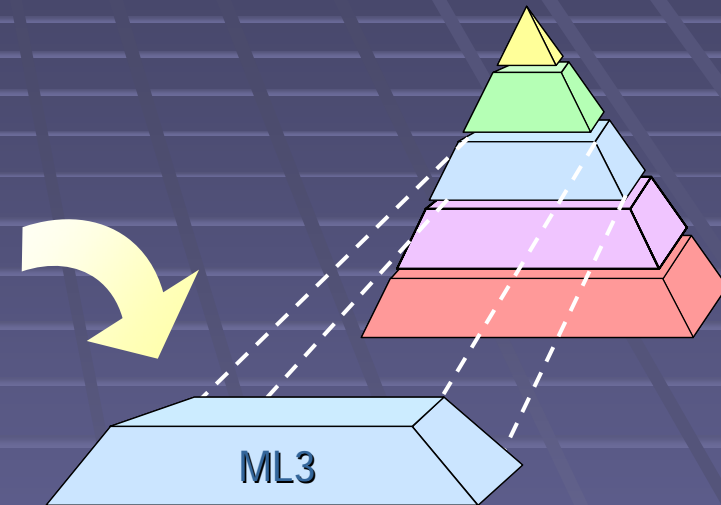


All Process Areas Assigned to Maturity Level 2 Must Achieve Capability Level 2 or Higher

Capability Levels

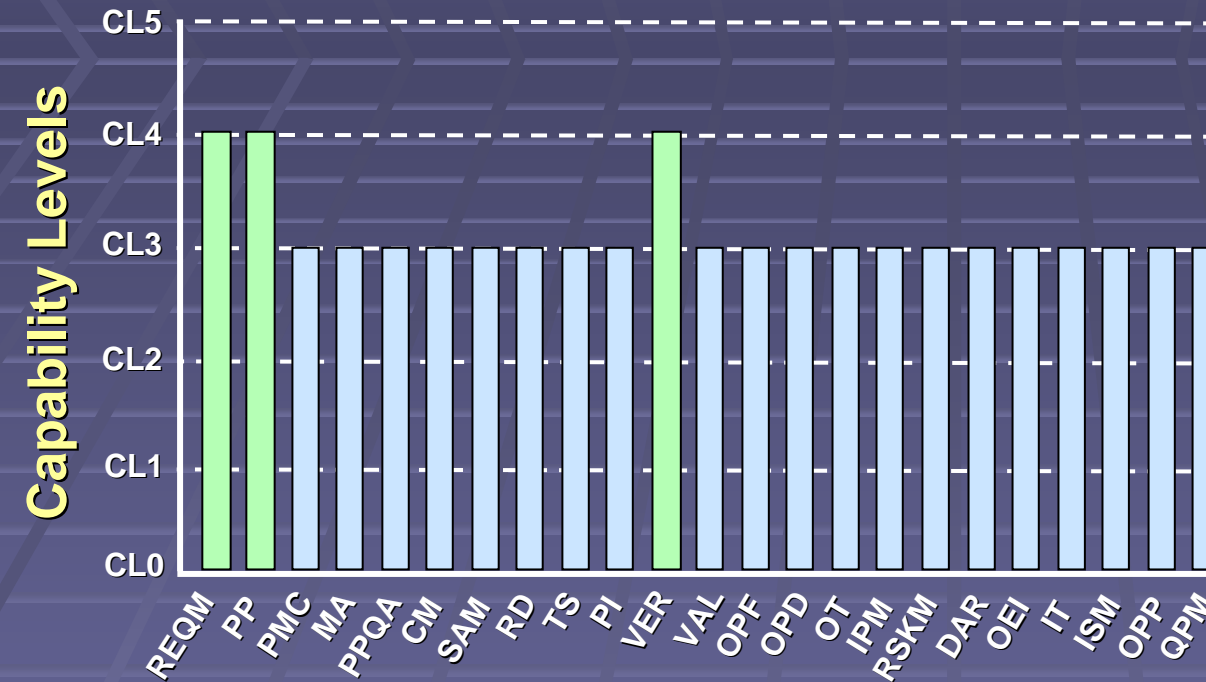


ML 2 & 3 Process Areas

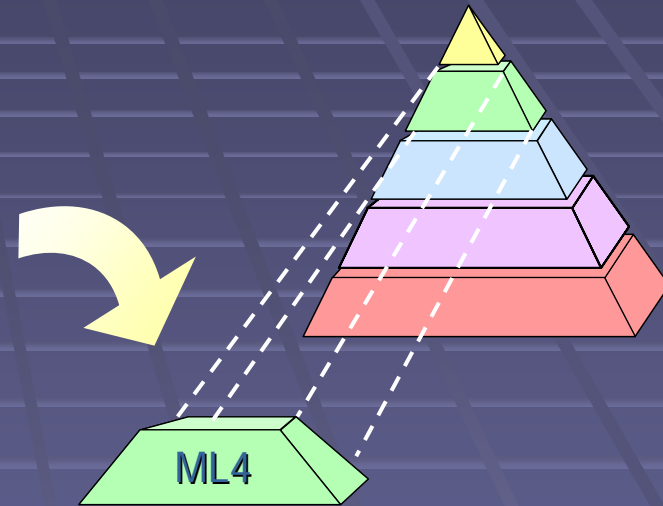


All Process Areas Assigned to Maturity Levels 2 and 3 Must Achieve Capability Level 3 or Higher

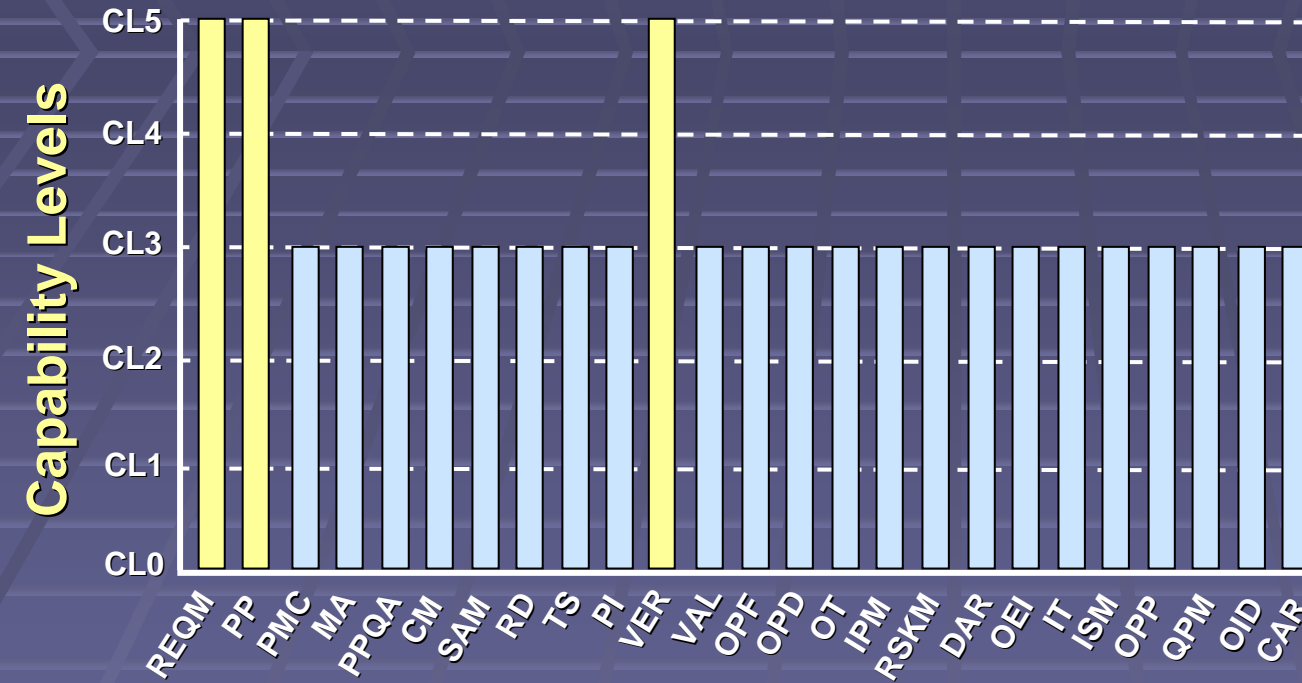
Equivalence Staging – Maturity Level 4



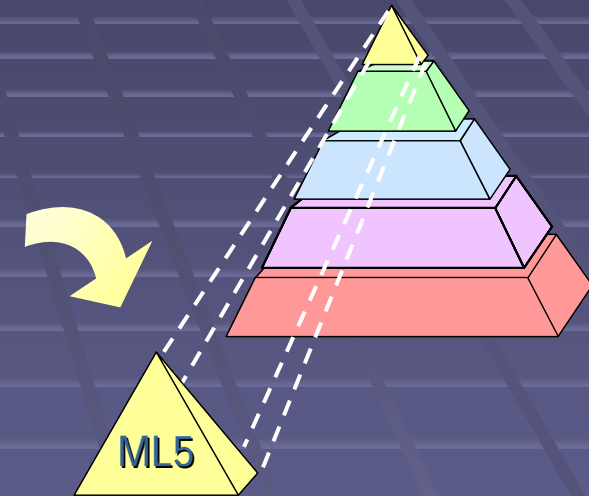
ML 2, 3 & 4 Process Areas



All Process Areas Assigned to Maturity Levels 2, 3 and 4 Must Achieve Capability Level 3 or Higher AND Some Must Achieve Capability Level 4



ML 2, 3, 4, 5 Process Areas



All Process Areas Must Achieve Capability Level 3 or Higher AND Some Must Achieve Capability Level 5

- ❖ The Staged and Continuous Representations Provide Essentially the Same Content But Shown in Different Ways
- ❖ Choose the Representation That Provides the Best Fit for Your Organization
 - Business Objectives
 - Culture
 - Legacy
- ❖ Mix and Match, As Necessary
 - Continuous Implementation, Staged Appraisal
 - Staged Implementation, Continuous Appraisal
 - Both Staged and Continuous Implementations for Different Parts of Your Organization

Tie Process Improvement to Your Business Goals