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Capability Target Profiles for Real Organizations

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Why Process Improvement?

- Process Improvement will benefit all organizations. (True or False?)
- If true then …
- … Maturity Levels are good for all organizations (True or False?)

"All models are wrong, but some are useful"

George E. P. Box, Norman R. Draper (1987). Empirical Model-Building and Response Surfaces, p. 424, Wiley

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Model Representations

Staged Representation	Continuous Representation
Sequence of improvements; each level builds on the one before it	Freedom to select improvement based on business needs
Maturity of a group of process areas	Increased visibility into process area capability
Generic practices are institutionalized groups	Generic practices are applied per process area
Comparisons are made via maturity level	Comparisons across organizations are made via a process area profile
Proven ROI	Untested/unverified

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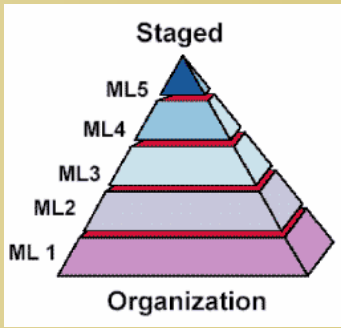
Measurement of Behavior - 1

- Under the CMMI's Staged representation, organizational behavior is characterized against a Maturity Level (ML) based on groups of specific Process Areas (PAs)
  - Initial (ML-1); Managed (ML-2); Defined (ML-3); Quantitatively Managed (ML-4); or Optimizing (ML-5).



- Each preceding level is the foundation for the next: i.e., you can't be ML-3 if you are not meeting the requirements of ML-2

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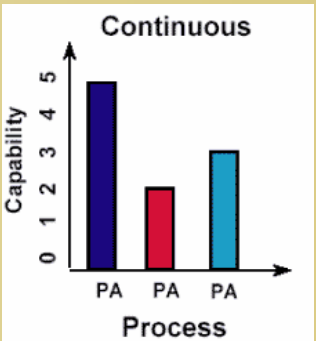
Measurement of Behavior - 2

- Under the CMMI's Continuous representation, organizational behavior is characterized against each PA as a Capability Level (CL)
  - Incomplete (CL-0); Performed (CL-1); Managed (CL-2); Defined (CL-3); Quantitatively Managed (CL-4); or Optimizing (CL-5).



- There are 6^{24} (or 4.7×10^{18}) possible capability level profiles (not all of which are useful ☺)

Real Process Improvement is not a "One Size Fits All" proposition

- What are the typical drivers for wanting a Maturity Level Rating?
  - RFP requires Level-X
  - Organization needs to use all the PAs of the CMMI
  - Unaware that its not the "only game in town"
    - Or … "I don't know how to do the 'Capability Level' thing"
- Do I need to do CMMI at all?

Recent issues with Maturity Levels

- "… when the DoD started requiring CMMI maturity levels for contracts, some groups found that it was easier to produce artifacts than to change engineering behavior."

Watts S. Humphrey, SEI, Crosstalk (Aug 2008)

- Suppliers execute at lower maturity levels than they have achieved in a formal appraisal
- CMMI-driven processes and practices are not consistently applied at the project level after contract award

Mark D. Schaeffer, Defense AT&L, July-Aug 2007

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Analysis of Appraisals

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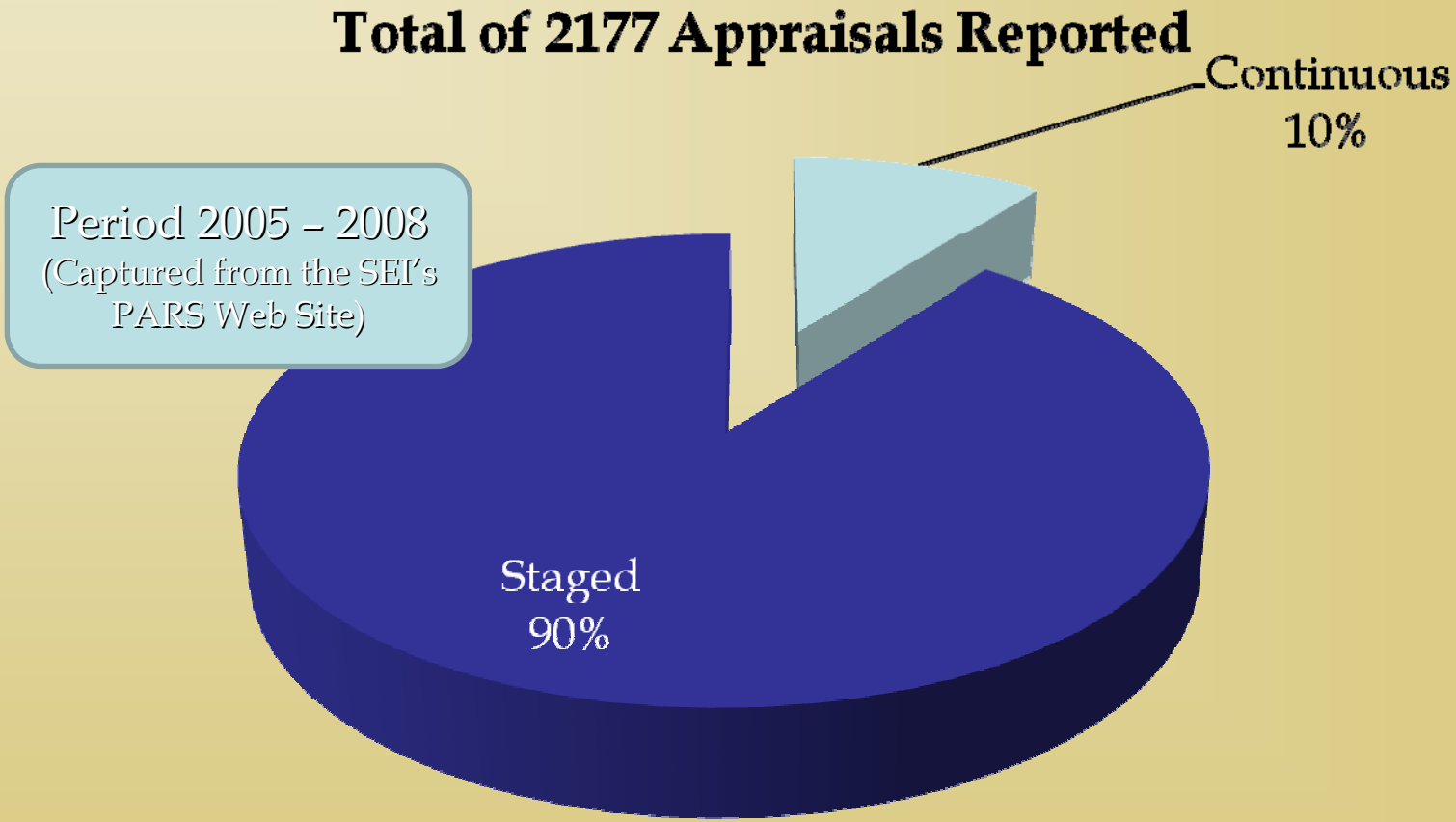
Types of Appraisals Reported



Period 2005 – 2008
(Captured from the SEI's PARS Web Site)

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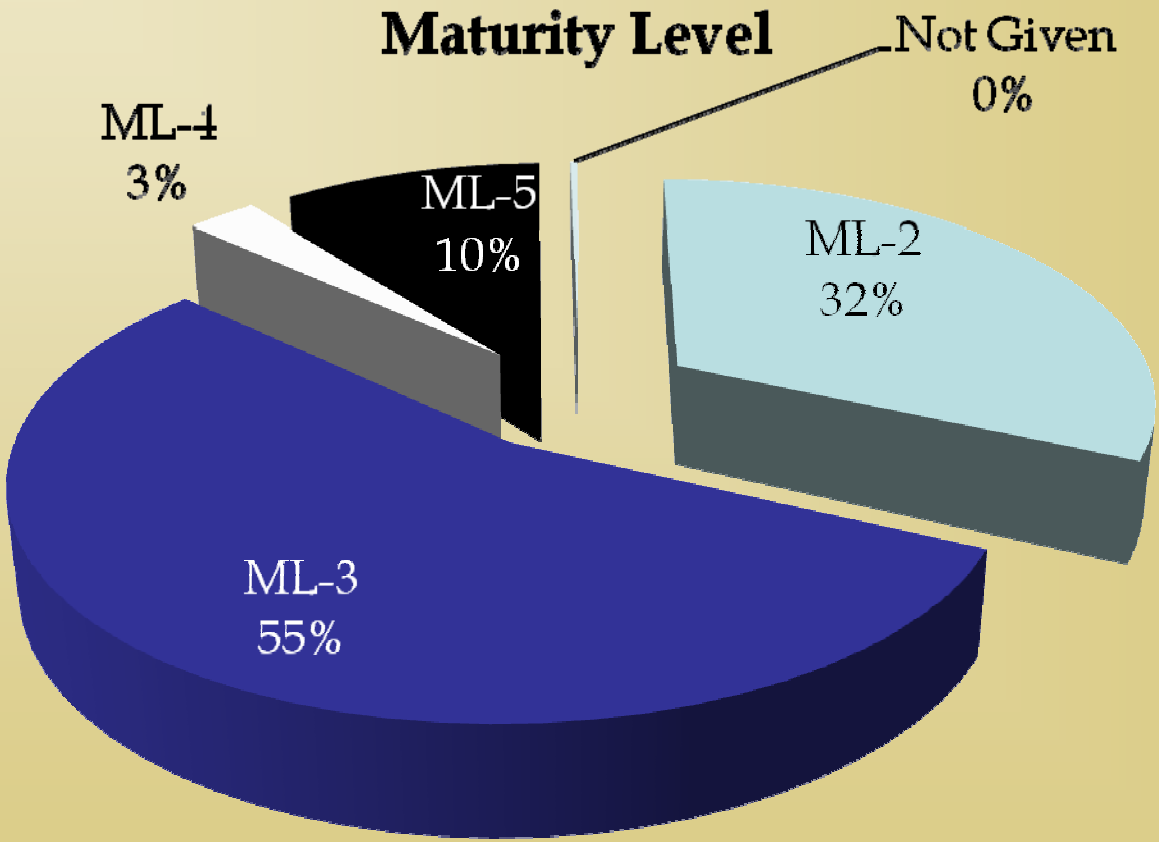
Staged Appraisals



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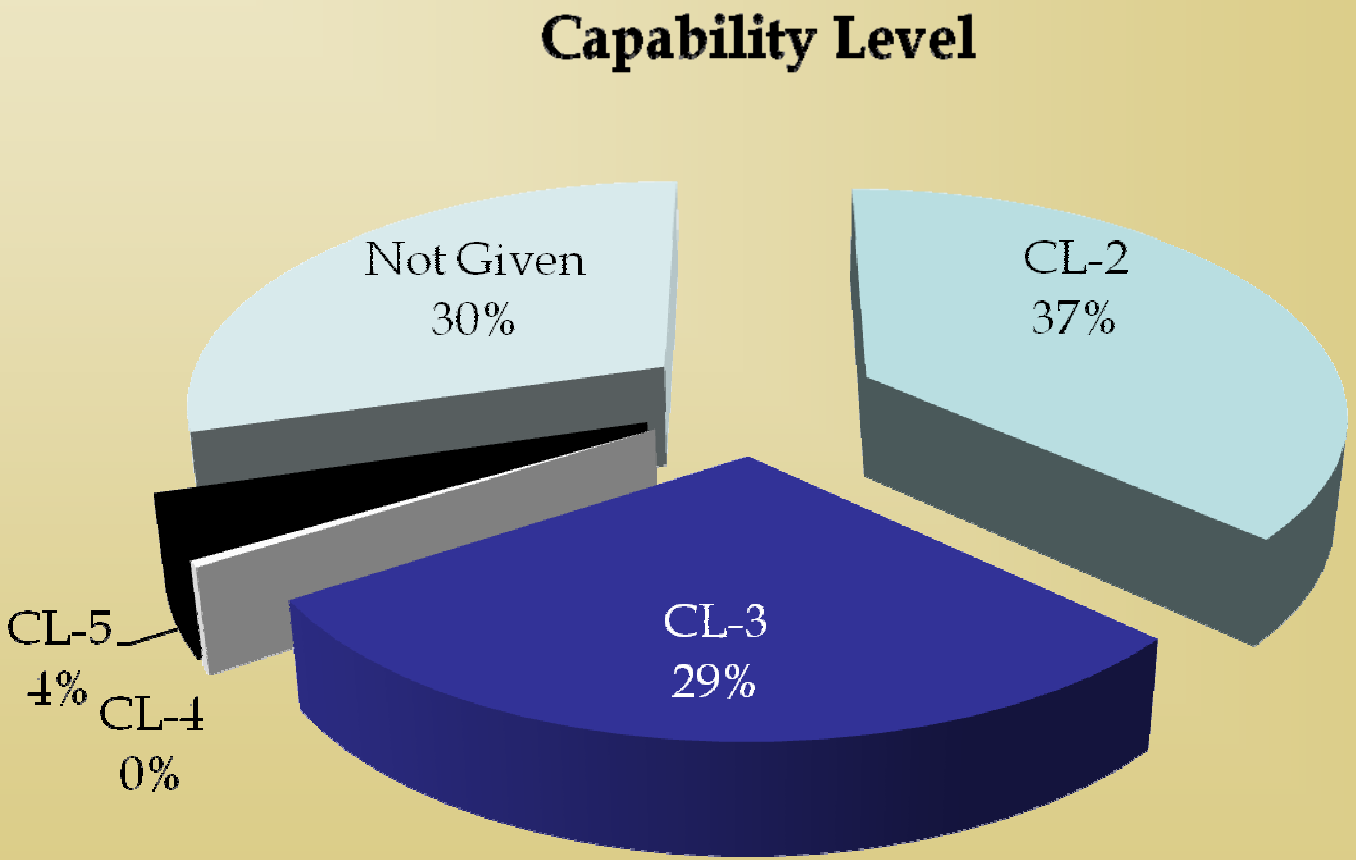
Continuous Appraisals



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Mapping of Profiles

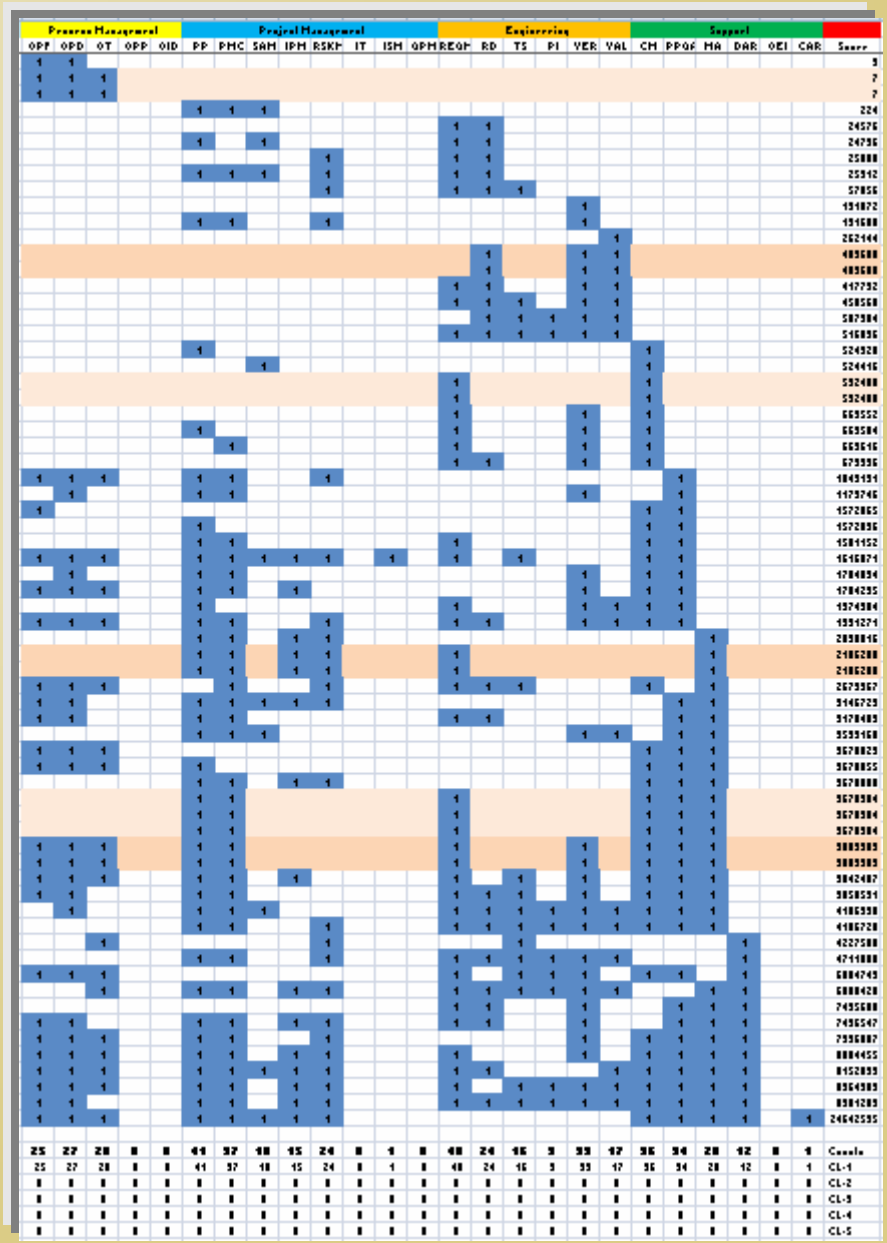
Analysis of 67 Continuous Appraisals without equivalent staging (ML not given).

- 15 - SW
- 6 - SW/SE
- 1 - SE
- 1 - HW
- 44 - No info given

Each appraisal was scored to facilitate identifying the duplicate patterns

Only a few identical patterns occurred

Many "nearly identical" patterns were identified



Some Identical Patterns

Pattern	Occurrences
OPD, OPF, OT	2
RD, VER, VAL	2
REQM, CM	2
PP, PMC, IPM, RSKM, REQM, MA	2
PP, PMC, REQM, CM, PPQA, MA	3
– Above plus OPD, OPF, OT, VER	2

Additional "Nearly Identical" Patterns

- PP/PMC pairs
  - PMC occurred with PP 35 out of 42 times
    - PP by itself: 6 times; PMC by itself: 2 times
- MA
  - Almost always occurred in conjunction with PPQA and CM
  - In only 2 cases did it appear without PP or PMC
- OPD/OPF/OT
  - 18 times together; 6 times without OT; 6 times as single PA

Some "Interesting" Patterns - 1

- One had OPD, OPF, OT, most of the Management PAs, most of the Support PAs (including CAR) but none of the engineering PAs.
  - Org Type: Software process improvement
- One comprised of OT, RSKM, TS and DAR
  - Org Type: Ground SIGINT
- One was CL-5 in PP, PMC, RSKM, and VER
- One had CL-4 in PP, PMC, VER and VAL along with other CL-3 PAs

Some "Interesting" Patterns - 2

- REQM/RD pairs - 21 times
  - RD only – 3 times
  - REQM only – 19 times
- One (SE/SW) had all the Engineering PAs (rated CL-3) but REQM listed as Not Applicable!
- PP/PMC/REQM/RD combination (with or without other PAs) – 15 times

What are we seeing?

- Are these patterns happenstance, or are they intentional?
- Why did organizations pick these selections?
  - Was there some *criteria or rationale* for the selection of PAs?
  - Did some specific *process improvement need* provide the focus for selecting the PAs?
  - Was it the *type of business* that drove the decision?
- In other words: Does there exist a set of useful combinations that can be matched to specific organization types?

The Continuous Representation and Capability Target Profiles

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The Capability Levels

5 Optimizing	Focus on continuous improvement
4 Quantitatively Managed	Process measured and controlled
3 Defined	Process characterized for the organization and is proactive
2 Managed	Process characterized for instances and is often reactive
1 Performed	Process is performed but unpredictable, poorly controlled and reactive
0 Incomplete	Process either not performed or key steps missing

Why Continuous?

- Tailors easily to an organization's current state
- Offers a greater degree of granularity in organizational performance measurement
- Allows resources to be concentrated on those PAs that are important to business goals
- Focuses on improvements that have the highest payoff for the organization
  … and …
- *Equivalent Staging can give you a Maturity Rating!*

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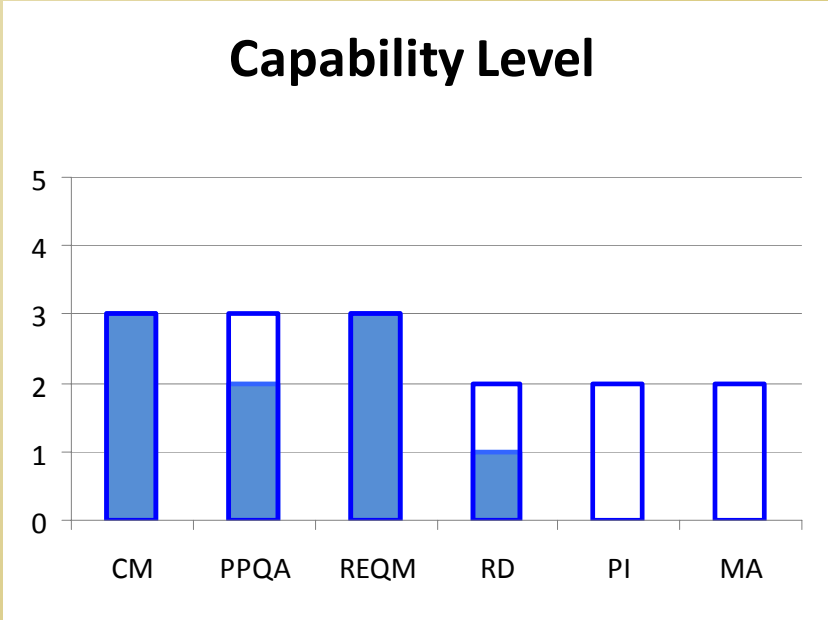
Capability Level Profile

- A ***Capability Target Profile*** is a list of PAs and the *desired* target level for each.
  (identified on the bar chart by the unshaded bars).
- A ***Capability Level Profile*** is a list of target PAs and the corresponding level *achieved* for each
  (identified on the chart by the shaded portion of the bars).



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Example "Real" Organization Profiles

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Organization A

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR
			2	2			2	2						2	2	2	

- Employed between 1000-2000 people spread across multiple US states and foreign countries.
- Target capability profile was ML 2 but SAM was excluded.
- There were concerns about the RSKM and REQM PAs
- Some emphasis on PPQA and CM
- Business model was entirely internally
- No Gov't work

Organization B

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

- Mixture of government and private contracts
- Government contracts were interested in maintaining ML 3
- Commercial work was focused on maintaining ML 5
  - Fixed price contract
  - Emphasis on SPC of their peer review process to predict the number of defects in deployed software
    - Since defect repair was fixed price holding down the number of defects was extremely important!

Organization C

Process Management			Project Management					Engineering							Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL		CM	PPQA	MA	DAR
							3	3	3									

- Utility company
  - Wholly owned corporation of the local residents
  - Approximately 100 developers/integrators
  - Lots of COTS integration work
  - Some software development
- No real established profile but they were most interested in risk management, requirements management and requirements development.

Organization D

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR
3	3		3	3				3	3	3				3	3		

- Software development organization within Federal government
- Four small projects
  - Web-based application development
  - Project size 4 – 6 persons average
- Initially achieved CL-2 in OPF, OPD

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Organization E

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR
			2	2				2						2	2	2	

- Employed between 1000-2000 people spread across multiple US states and foreign countries.
- Target capability profile was ML 2 but SAM was excluded.
- There were concerns about the RSKM and REQM PAs
- Some emphasis on PPQA and CM
- Business model was entirely internal
- No Government work

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Organization F

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR
3		3	2					2								2	

- Management and Technical Services Company Incorporated in 1992
  - Information Technology
  - Engineering and Scientific Analysis
  - Systems Engineering/Project Management
- Employer of about 280 personnel (2003)
- Customer base includes:
  - NASA, Army, Air Force

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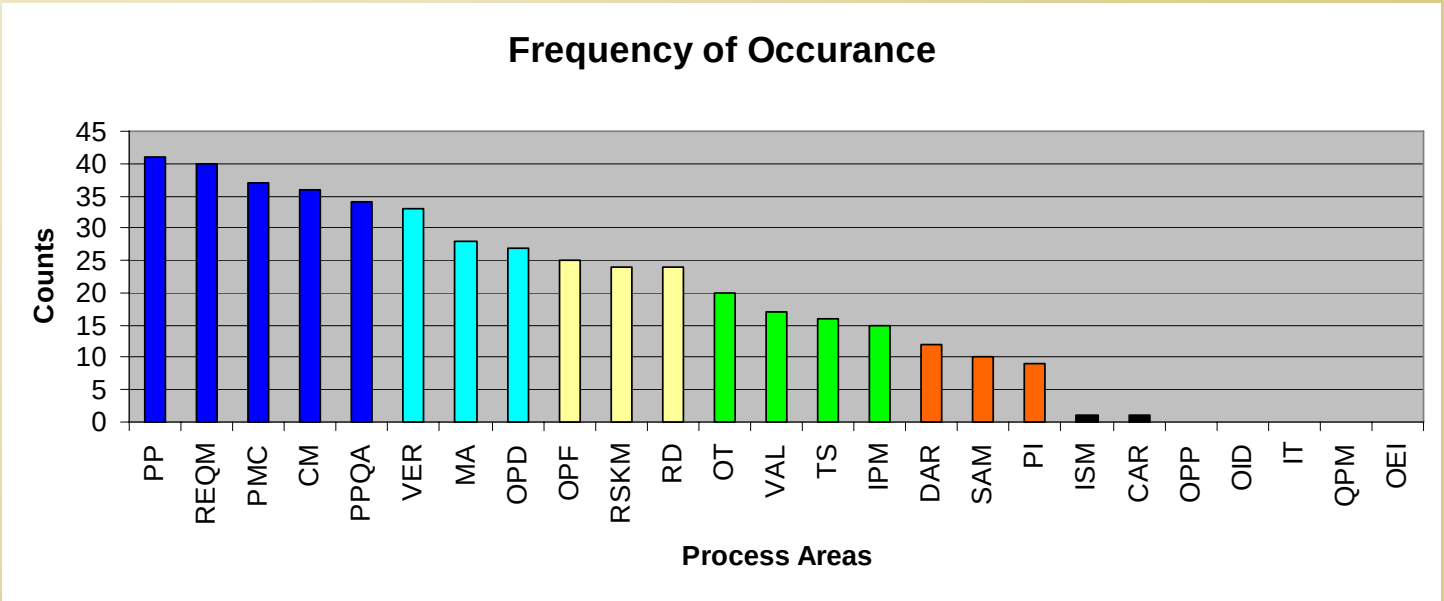
PA Occurrence in Continuous Appraisals



- Examining the sample of Continuous appraisals conducted we find the following frequency of PAs
- Some interesting findings:
  - PI is last
  - SAM, IPM and VAL are low on the list
  - The high scorers are not surprising

Proposed Target Profiles

- Determine the stages of capability
- Example:

– Stage 1:	PP, PMC, REQM, CM		Level 2
– Stage 2:	+	MA, PPQA	
– Stage 3:	+	RD, TS, IPM, VER	Level 3
– Stage 4:	+	OPF, OPD	
– Stage 5:	+	OT, PI, RSKM, VAL, DAR	

- Improvement is achieved by moving to the next stage

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Program Management

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR

- Suitable for PMO groups

Engineering

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR

- Initial profile applicable for SW only with minimal integration activities

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Small Software Engineering

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR

- Alternate profile establishes a defined process for the selected PAs

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Consulting/Improvement Organization

Process Management			Project Management					Engineering						Support			
OPF	OPD	OT	PP	PMC	SAM	IPM	RSKM	REQM	RD	TS	PI	VER	VAL	CM	PPQA	MA	DAR

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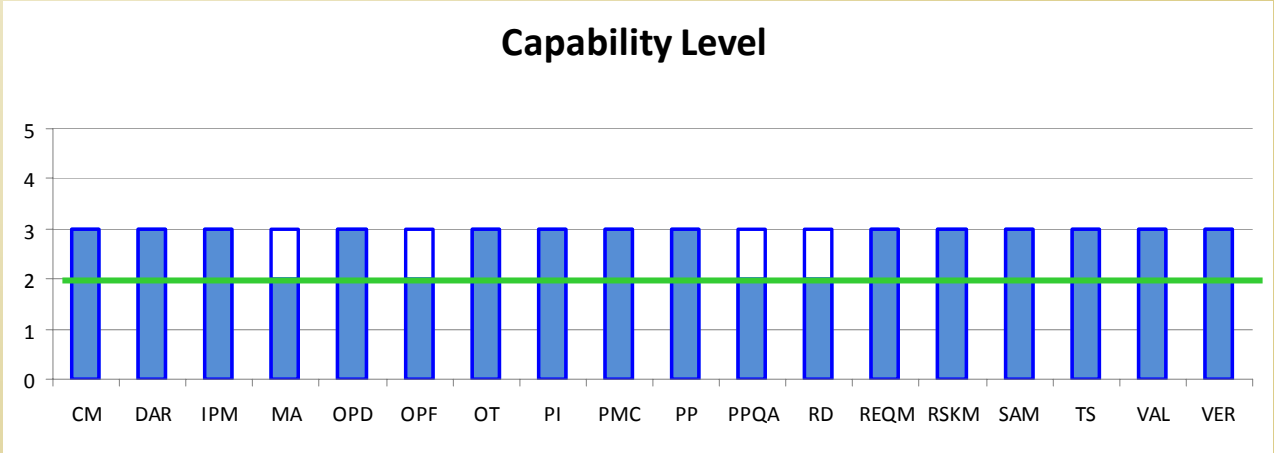
Equivalent Staging - 1



- Organizations can still claim a Maturity Level by using *Equivalent Staging*
  - To achieve ML-2, you must achieve CL-2 (or higher) in all ML-2 PAs.
  - To achieve ML3, you must achieve CL-3 (or higher) in all ML-2 and ML-3 PAs.

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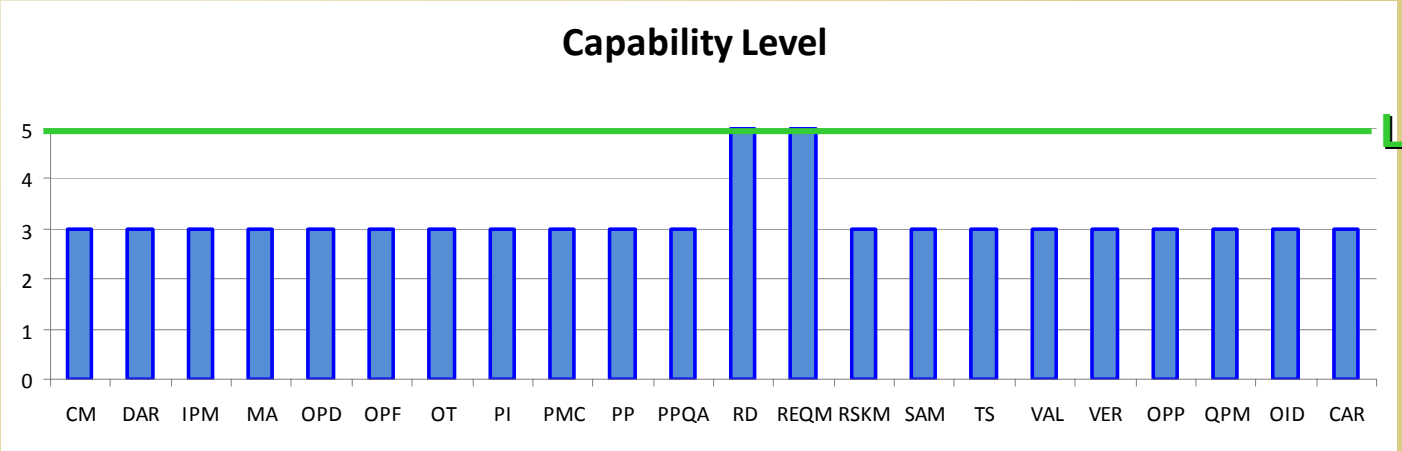
Equivalent Staging - 2



- To achieve ML-4, you must achieve CL-3 (or higher) in all ML-2 PAs.
- To achieve ML3, you must achieve CL-3 (or higher) in all ML-2 and ML-3 PAs.

The Downside of a PA-only approach to Process Improvement*

- Multiple processes are developed that are not linked, integrated, or connected in any way
- Excessive documentation is created
- The institutional aspects of process improvement is overlooked
- Processes and process assets will mimic the language of the CMMI

*West, M., Real Process Improvement using the CMMI, 2004

Key requirements for effectively using the Continuous Representation

- Organization must understand the links between their business goals and the CMMI
- There needs to be a thorough understanding of the process area relationships in the CMMI:
  - PA to PA relationships
  - GPs and the PAs
- An understanding that some GPs may be much less effective if the driving process area is not implemented

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So, what's in your wallet … ?

- What target capability profile makes sense for your type of work?
- Future discussions:
  - Common groups of Target Profiles associated with specific business types
  - Database of Profile effectiveness
  - Other collaboration venues?