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Customer Success Is Our Mission

SCAMPI^{SM} A V1.3
MDD Usage Profile

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NDIA CMMI® Technology Conference and User Group

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MDD V1.3 Glossary Definitions

- **Basic unit** – A managed set of interrelated resources which delivers one or more products or services to a customer or end user and typically operates according to a plan (e.g., projects, work groups).

- **Sampling factor** – organizational or work context that reflects meaningful differences in the way work is performed across different basic units within the organizational unit (e.g., size, location, customer).

- **Subgroup** – Cluster of basic units that share common sampling factor alternatives and exhibit similar process implementations.

- **Support function** – An organizational group that provides products and/or services for a bounded set of activities needed by other portions of the organization (e.g., Configuration Management group, Quality Assurance group).

- **Organizational scope** - The collection of basic units and support functions that provides instantiations of practices used within, and representative of, an organizational unit.

Sampling Factors in Action

Determining Subgroups and Samples Example: BINDY Co.

1. Identify Sampling Factors
   - Location: Indianapolis, Boston
   - Type of Work: new, maintenance
   - Customer: DoD, commercial
2. Combine sample factors, sort basic units (BUs), determine min. sample
   - Minimum # of BUs per subgroup = (# BUs in subgroup × # subgroups) / total # BUs

BINDY Co.		Location	Type of Work	Customer	# of BUs in subgroup	# subgroups X # BUs in subgroup	...divided by total # BUs	Min. Number Sampled
		Boston	new	comm	0	0	0.00	0
	Subgroup 1	Boston	new	DoD	4	20	0.13	1
	Subgroup 2	Boston	maint	comm	49	245	1.64	2
		Boston	maint	DoD	0	0	0.00	0
	Subgroup 3	Indy	new	comm	5	25	0.17	1
	Subgroup 4	Indy	new	DoD	16	80	0.54	1
		Indy	maint	comm	0	0	0.00	0
	Subgroup 5	Indy	maint	DoD	75	375	2.52	3
Totals	5				149			8

#sampling factors => # subgroups => # BUs sampled

Outline

- Introduction
- CMMI V1.3 Appraisals
- Sampling Factors
- Subgroups
- Basic Units
- Support Functions
- Organizational Unit Size
- Data Relationships
- SCAMPI Infrastructure Implications
- Comparing MDD V1.2 and MDD V1.3 CMMI V1.3 Appraisals
- Coda

Introduction - Purpose

- Understand adoption and usage of MDD V1.3
- Provide guidance to future MDD V1.3 users

- Ensure MDD V1.3 is working and being used as intended
- Identify possible SCAMPI infrastructure implications based on usage within the community
  - MDD, SAS, PARS, ADS, Training Material

Introduction – Briefing Contents

This briefing includes:

- MDD V1.3 Adoption
- Sampling Factor Analysis
- Subgroup Analysis
- Basic Unit Analysis
- Support Function Analysis
- Organizational Unit Analysis
- Data Relationships
- SCAMPI Infrastructure Implications
- Comparing MDD V1.2 and MDD V1.3 CMMI V1.3 Appraisals

- Notes:
  - All data comes from the SEI Published Appraisal Results Site (PARS)
  - Data includes SCAMPI A appraisals posted to PARS by November 1, 2011

MDD V1.3 Adoption Data

CMMI V1.3 Appraisals

MDD V1.3 released →

Legend:
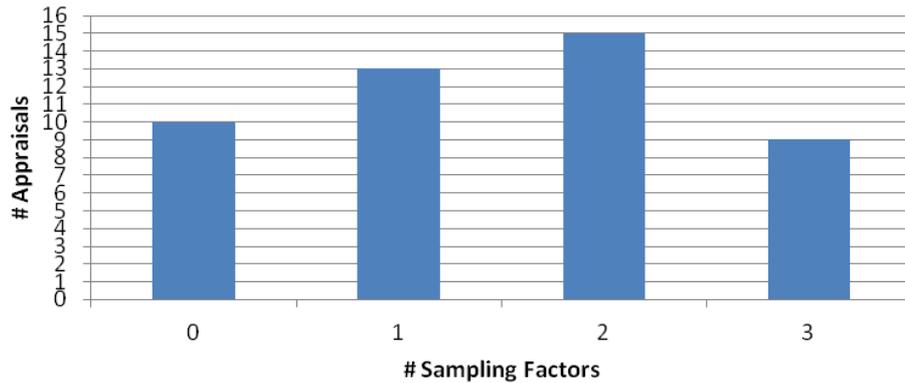- Total CMMI V1.3 MDD V1.3
- Total CMMI V1.3 MDD V1.2
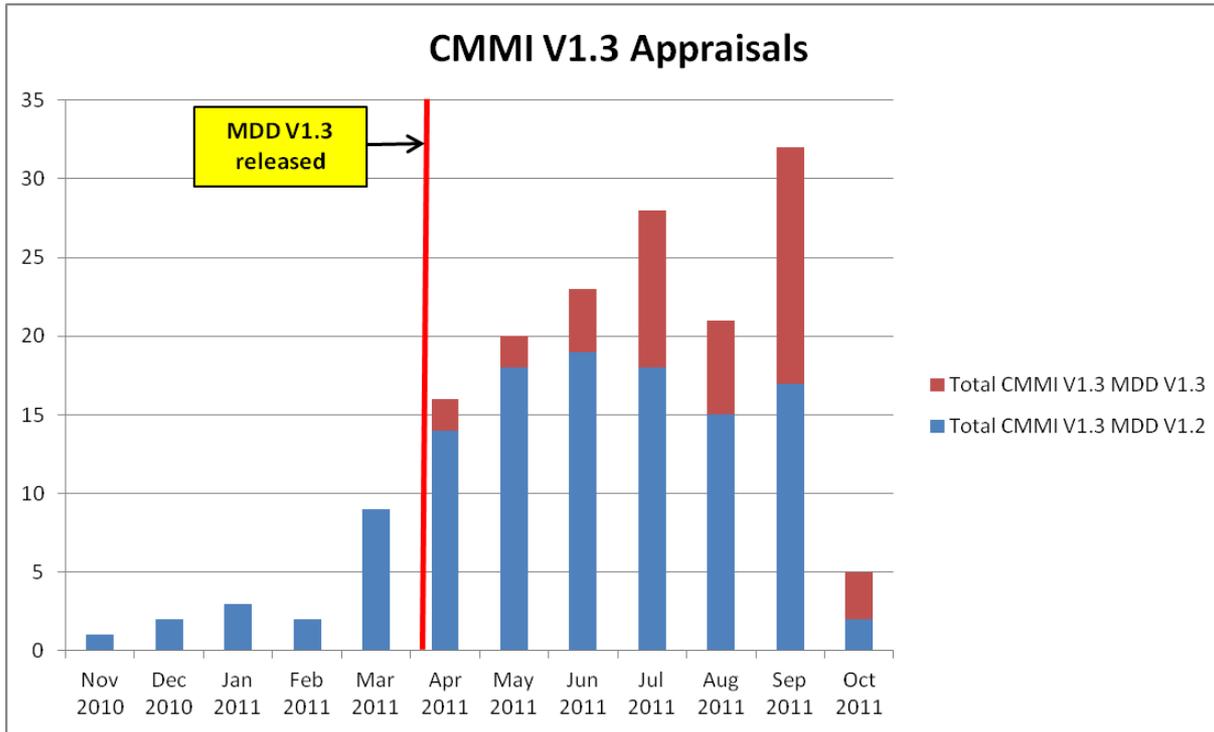
Notes:
1. 47 MDD V1.3 appraisals reported in PARS, 42 with CMMI V1.3 models (see graph/data).
2. 5 CMMI V1.2 MDD V1.3 appraisals were reported (not shown on this chart), 2 in 1 multi-model appraisal.
3. No P-CMM MDD V1.3 appraisals have been conducted.
4. 2 CMMI V1.3 MDD V1.3 multi-model appraisals were conducted.

	Nov 2010	Dec 2010	Jan 2011	Feb 2011	Mar 2011	Apr 2011	May 2011	Jun 2011	Jul 2011	Aug 2011	Sep 2011	Oct 2011	total		since MDD V1.3 release	
CMMI-DEV V1.3 MDD V1.2	0	1	3	2	7	12	15	15	17	12	14	2	100	73%	87	70%
CMMI-DEV V1.3 MDD V1.3	0	0	0	0	0	1	2	4	9	5	13	3	37	27%	37	30%
CMMI-SVC V1.3 MDD V1.2	1	1	0	0	1	2	3	4	1	3	3	0	19	79%	16	76%
CMMI-SVC V1.3 MDD V1.3	0	0	0	0	0	1	0	0	1	1	2	0	5	21%	5	24%
CMMI-ACQ V1.3 MDD V1.2	0	0	0	0	1	0	0	0	0	0	0	0	1	100%	0	
CMMI-ACQ V1.3 MDD V1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	0	
Total CMMI V1.3 MDD V1.2	1	2	3	2	9	14	18	19	18	15	17	2	120	74%	103	71%
Total CMMI V1.3 MDD V1.3	0	0	0	0	0	2	2	4	10	6	15	3	42	26%	42	29%

Sampling Factors

Sampling Factors in Appraisals
Ave. = 1.5
Med. = 2

 # Sampling Factor Values
Ave. = 2.2
Med. = 2

Legend: 2 3 4 5 6 7 8

2% 0% 2%
4%
4%
13%
75%

Sampling Factors

(Bar chart categories: Type of Work, Customer, Org Structure, Size, N/A, Contract Value, Project Governance Level, Lifecycle, Location, Ownership/Stakeholder, Support Function, Development Type, SQA type, "Other", Program Manager, Technology)
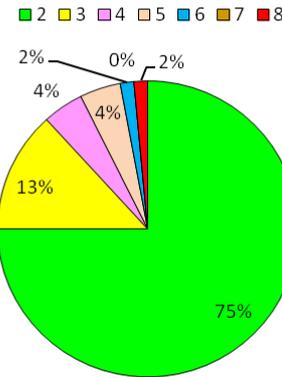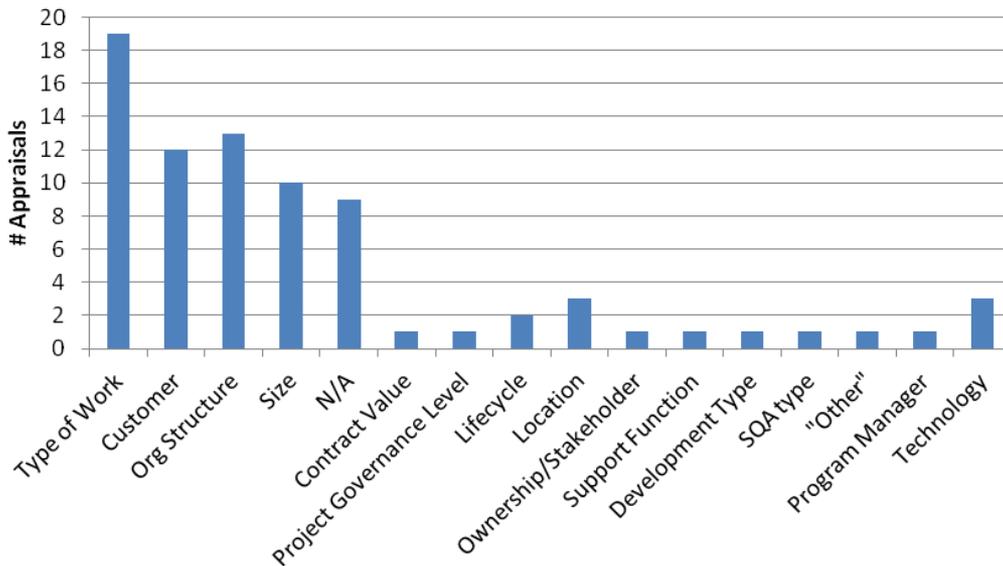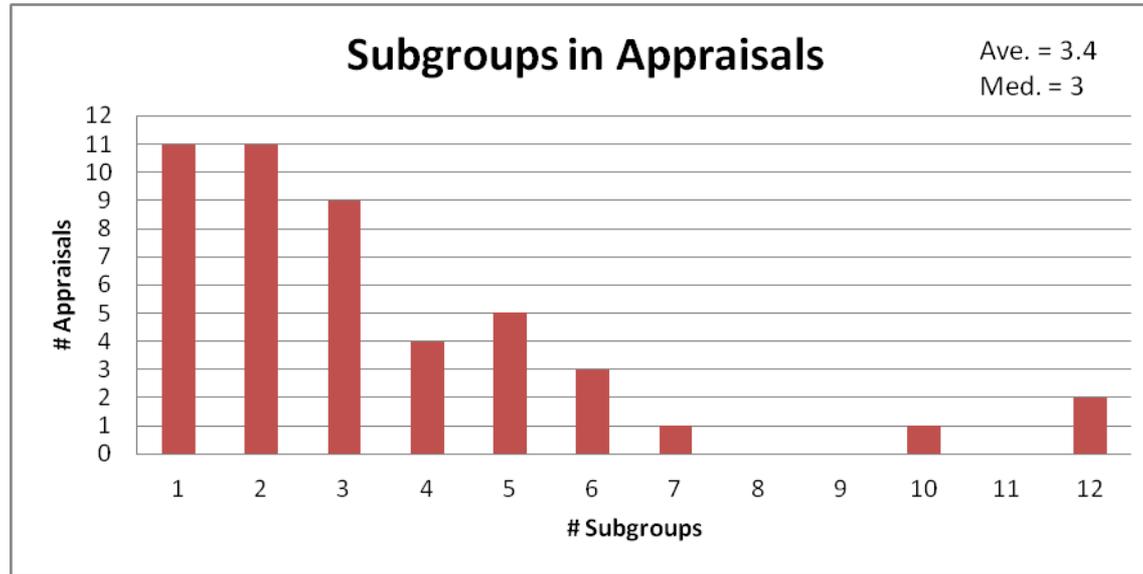
Notes:
1. No appraisals have > 3 sampling factors.
2. 8 of the 10 "zero-sampling factor" appraisals included 100% of OU basic units.
3. [Type of Work, Customer, Org Structure, Size] constitute 77% of sampling factor usage (not counting N/As).
4. "Location" (required to be considered) is not typically a sampling factor.
5. Sometimes "sampling factors" appear to be "forced" (e.g., "Customer" identified as a sampling factor, but description says "Though the OU has different customers, the work is performed the same way for all customers.") SEI Appraisal System problem.
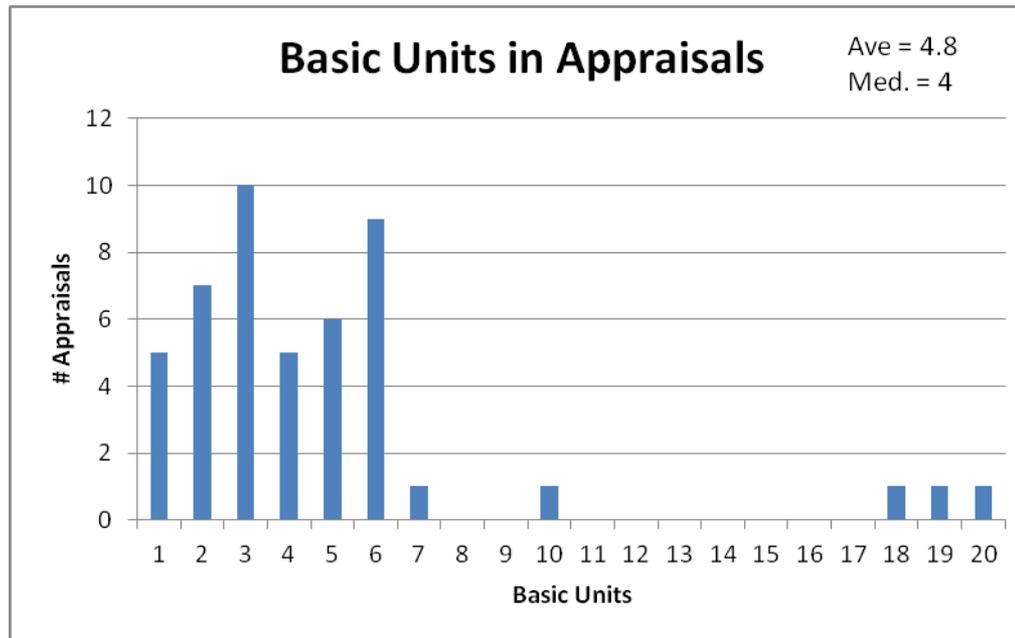
Subgroups

Notes:
1. If average #sampling factors = 2 and average #sampling factor values = 2, an average of 3-4 subgroups seems reasonable.
2. One appraisal had 2 sampling factors, each with 2 sampling factor values, but only 1 subgroup. Questionable data: "forced" sampling factors.
3. In 5 appraisals, the #basic units in the organizational scope is less than the #subgroups. Questionable data: #basic units should be ≥ #subgroups (MDD Data Coverage Rule 1 for Basic Units).
    • In 4 of the 5 appraisals, support functions (QA, HR, Training, EPG) were being called subgroups, and sometimes also called sampling factors and/or sampling factor values. Questionable data: MDD definition of subgroup is "Cluster of basic units that share common sampling factor alternatives…"
    • In 1 "zero-sampling factor appraisal", 100% of the OU was contained in the organizational scope, and was segmented into "subgroups" that don't align with MDD usage of the term subgroup. Questionable data: misuse of the term subgroup.

Basic Units

Basic Units in Appraisals

Ave = 4.8
Med. = 4

Notes:
1. If the average #subgroups = 3, then the average #basic units = 4-5 seems reasonable.
2. The "18 basic unit" example was a large organization (2000+), with 6 subgroups, some of which contained as many as 100 basic units).
3. The "19 basic unit" example was a small (< 100) organization whose appraisal also contained 5 support functions and 6 subgroups. 15 basic units had just 1 person each. 4 of the 5 support functions had just 2 people each.
4. The "20 basic unit example" was a large organization (2000+) that chose to broaden OU coverage beyond MDD V1.3 minimum requirements in order to include projects of strategic importance and to include projects from various locations even though location was not considered a sampling factor.
5. 47% of appraisals still have 3 or fewer basic units (an MDD V1.2 concern).

Support Functions

Support Functions in Appraisals

Ave = 2.9
Med. = 3
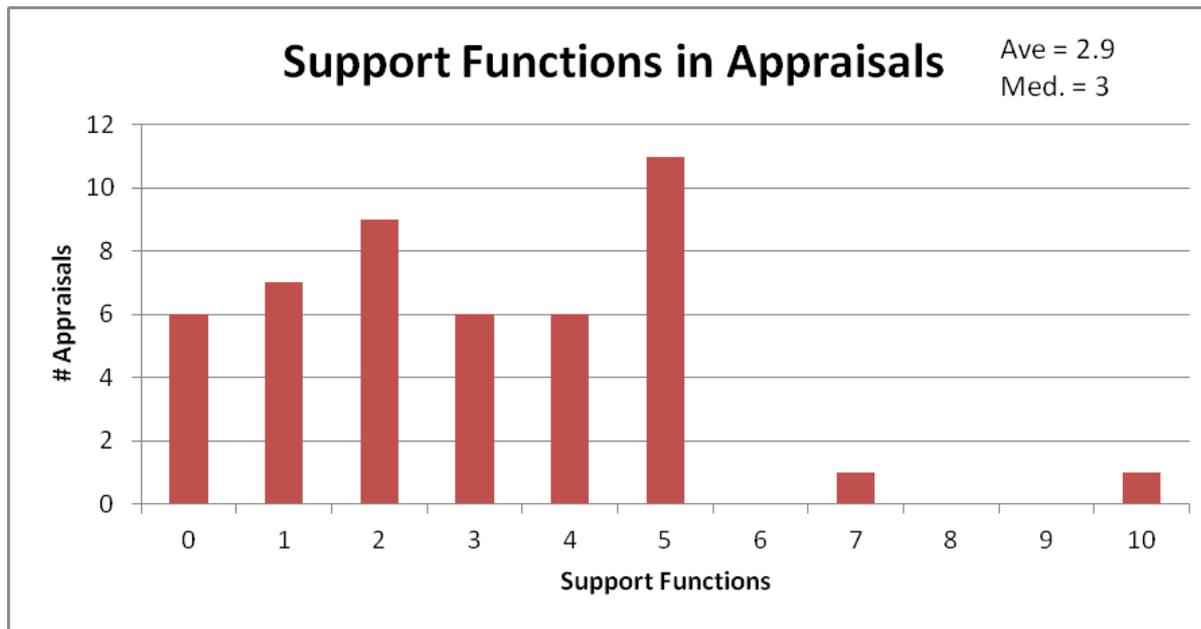
Notes:
1. Type of support function is not always entered into PARS (sensitive). 29 appraisals contained some identifying information about the support functions.
2. QA, CM, Training, and EPG are the most common support functions.
3. MA identified as a support function 3 times.
4. In some cases, support functions were being called subgroups, and sometimes also called sampling factors and/or sampling factor values. Questionable data.

Organizational Unit Size

Organizational Unit Size

1-100 - 65%
101-200 - 15%
201-2000+ - 20%

Pie chart values:
- < 25 — 13%
- 26 - 50 — 32%
- 51 - 75 — 13%
- 76 - 100 — 7%
- 101 - 200 — 15%
- 201 - 300 — 4%
- 301 - 500 — 6%
- 501 - 1000 — 2%
- 1001 - 2000 — 2%
- 2000+ — 6%
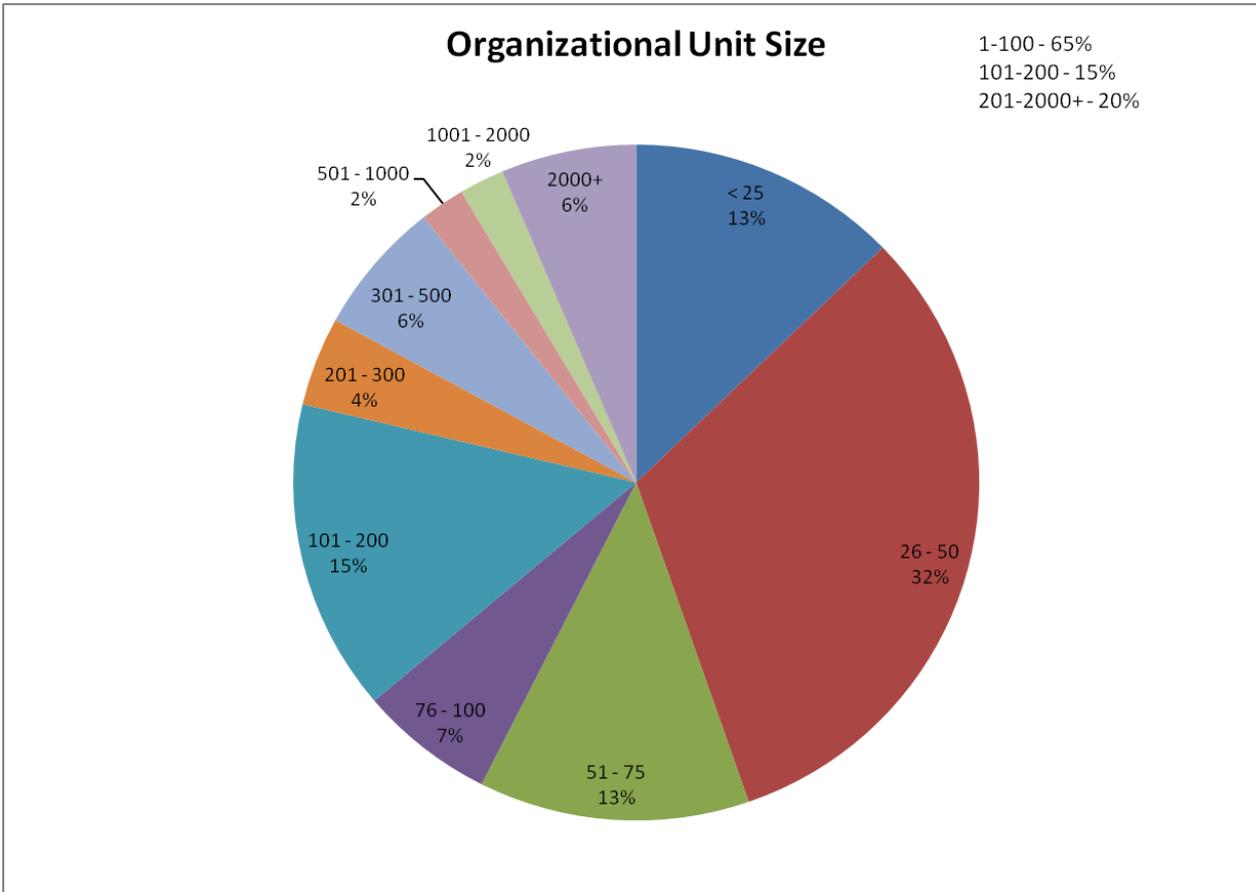
CMMI 3/2011 Maturity Profile	
1-100	61%
101-200	17%
201-2000+	22%

| OU Size	# Appraisals
< 25	6
26 - 50	15
51 - 75	6
76 - 100	3
101 - 200	7
201 - 300	2
301 - 500	3
501 - 1000	1
1001 - 2000	1
2000+	3
total	47

Notes:
1. MDD V1.3 OU Size Percentages are comparable to CMMI Maturity Profile data.
2. OU size is estimated based on basic unit and support function "number of people", and "% of people included" fields in PARS.

#Sampling Factors and #Basic Units = f(OU Size)?…too early to tell. Current data does not show a relationship.

OU Size	# Appraisals	# Sampling Factors in Appraisals															Basic Units in Appraisals														
< 25	6	0	1	0	1	0	0										2	1	2	3	1	1									
26 - 50	15	0	2	2	2	1	1	1	1	3	2	1	2	2	2	1	1	4	3	3	2	2	6	6	2	3	3	5	3	4	3
51 - 75	6	2	0	3	1	2	1										3	5	19	6	4	4									
76 - 100	3	2	0	2													3	1	7												
101 - 200	7	3	3	3	2	3	2	3									6	6	5	6	6	2	5								
201 - 300	2	2	1														4	5													
301 - 500	3	3	1	0													6	6	3												
501 - 1000	1	0															5														
1001 - 2000	1	1															10														
2000+	3	2	2	0													20	18	2												

Data Relationships (2 of 4)

#Basic Units = f(#Sampling Factors)?…too early to tell.

• #Basic Units appears to be rising as #Sampling Factors rises

• Nominally #Subgroups = f(#sampling factors, #sampling factor values) and #Basic Units = f(#Subgroups).

Basic Units vs. Sampling Factors

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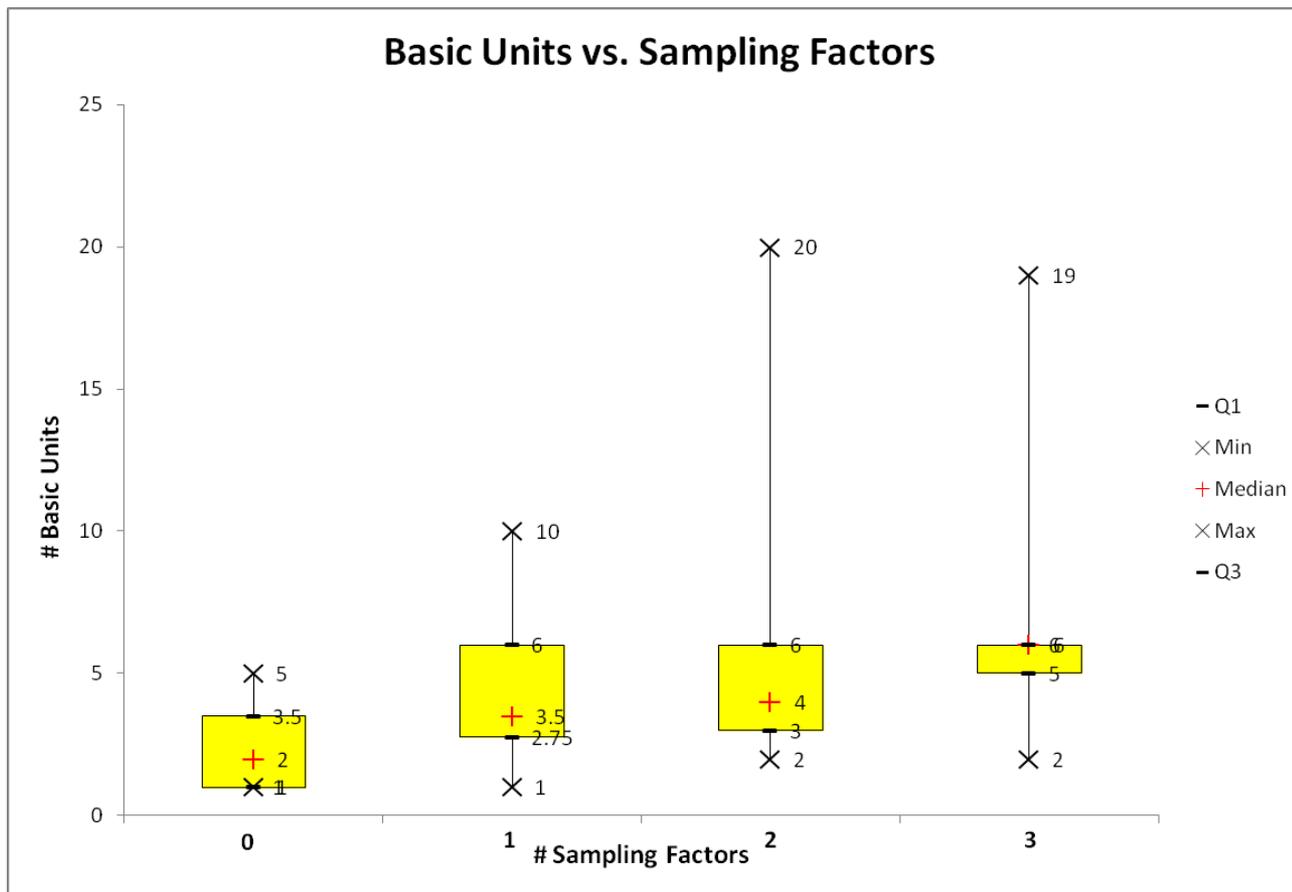
#Basic Units = f(#Subgroups)?

- Nominally #Subgroups = f(#sampling factors, #sampling factor values) and #Basic Units = f(#Subgroups)…

- Data in red are questionable

• In 5 appraisals, the #Basic Units in the organizational scope is smaller than the #Subgroups.

•Coverage Rule 1 for Basic Units: For each subgroup, both artifacts and affirmations shall be provided for at least one basic unit for every process area implemented by basic units in the subgroup.

•2 appraisals have 2 sampling factors but only 1 subgroup. Questionable data – forced sampling factor.

Sampling Factors	Subgroups	Basic Units	Average (BUs)	Median (BUs)
0	1	1	2.3	2
0	1	5		
0	1	2		
1	1	1		
0	1	2		
0	1	1		
2	1	5		
0	1	3		
0	1	2		
0	1	1		
2	1	2		
0	2	5	4.3	3
1	2	10		
1	2	2		
2	2	3		
1	2	6		
1	2	3		
1	2	3		
1	2	5		
1	2	4		
1	2	3		
2	2	3		
1	3	2	3.6	3
2	3	3		
2	3	4		
2	3	3		
2	3	3		
2	3	4		
2	3	3		
2	3	4		
3	3	6		
1	4	6		
3	4	5		
3	4	5		
2	4	4		
0	5	1	5	6
1	5	6		
1	5	6		
3	5	6		
3	5	6		
3	6	2		
2	6	18		
2	6	7		
2	7	6		
3	10	6		
2	12	20		
3	12	19		

#Basic Units = f(#Subgroups)

With questionable data removed, a reasonably strong relationship emerges

Scatter Chart (Subgroups vs Basic Units)

$y = 1.5256x + 0.2371$
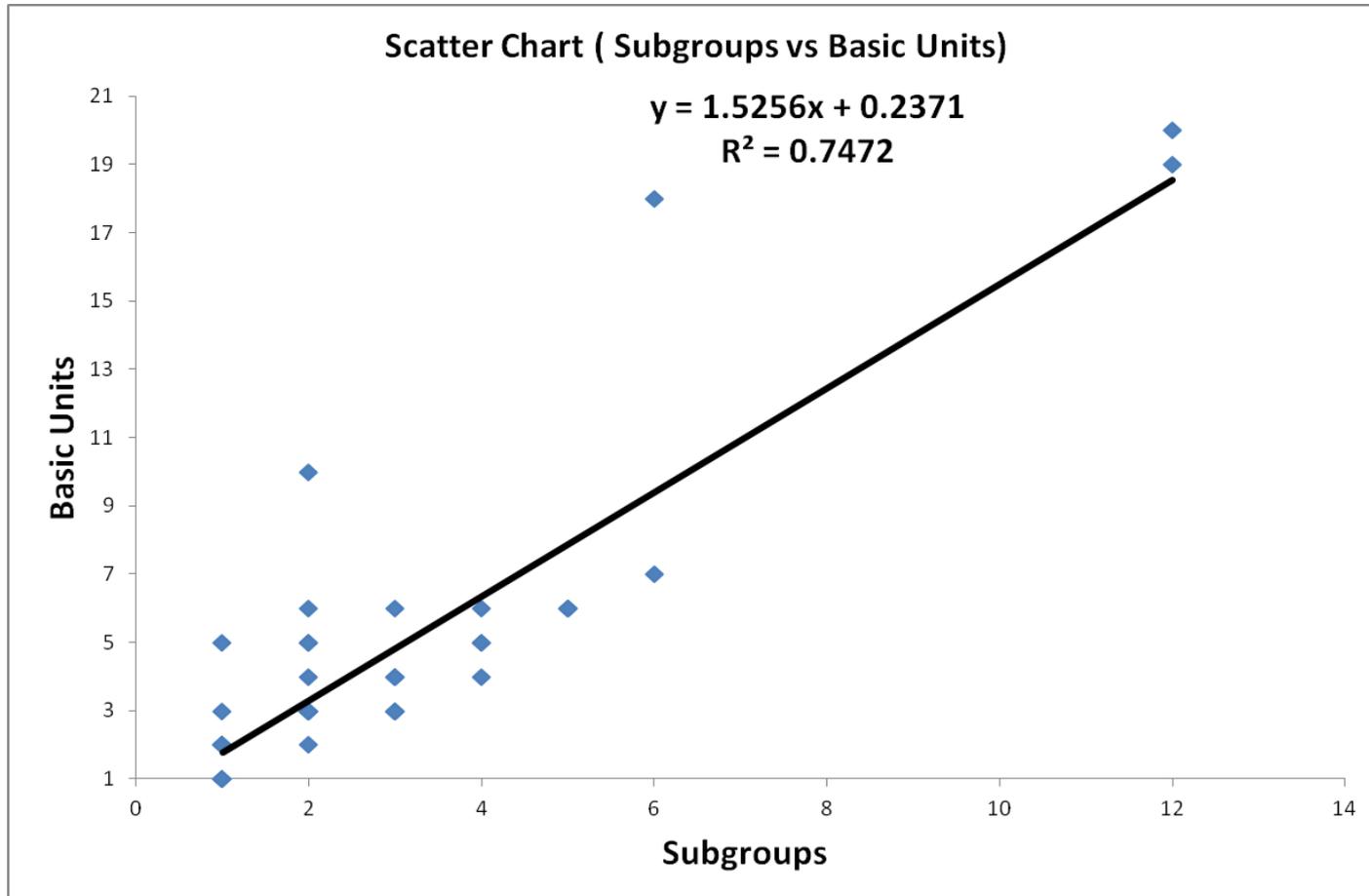
$R^2 = 0.7472$

Possible MDD changes

- If "location" continues to be a little-used sampling factor, consider removing it from list of mandatory sampling factors to be considered.

- The MDD does not address "zero-sampling factor" appraisals.
  - Using the MDD definition of subgroup ("Cluster of basic units that share common sampling factor alternatives…"), zero sampling factors implies #subgroups = 0…
  - …but if #subgroups = 0, there are no minimum basic unit sampling requirements in the MDD.
  - Most "zero-sampling factor" appraisals shows #subgroups = 1, but one case = 5 and another = 2.
  - Recommendation:
    - Amend the definition of "subgroups" to allow for cases where there are no meaningful differences in the entire OU process implementation (i.e., #sampling factors = 0).
    - Note that if #sampling factors=0, #subgroups=1 (i.e., the "subgroup" is the whole OU).

- Clarification appears to be needed in the MDD (or training material or a bulletin) on the usage of sampling factors, subgroups, basic units, and support functions
  - Support functions are not subgroups.
  - Sampling factors should not be "forced" to create subgroups.
  - The #basic units should be ≥ the #subgroups (per Coverage Rule 1 for Basic Units).
  - If #sampling factors = 0, #subgroups = 1.
  - If #sampling factors > 0, #subgroups ≥ 2 (because each sampling factor has at least 2 values).

- Need to keep watching key data relationships to ensure MDD is working as intended (Sampling Factors, Subgroups, Basic Units, OU Size…)

SAS/PARS/ADS

- Use recommended guidance for "zero-sampling factor" appraisals.
  - If #sampling factors=0, #subgroups=1 (i.e., the "subgroup" is the whole OU).
  - SAS Workaround
    - Set #subgroups = 1
    - Identify 1 sampling factor with 2 values (all basic units, no basic units)
- May need some cross-checking of data
  - Several data entries appear questionable:
    - One entry has 2 sampling factors, each with 2 sampling factor values, but only 1 subgroup.
    - One entry has 6 subgroups but only two basic units.
  - The #basic units should be ≥ the #subgroups (per Coverage Rule 1 for Basic Units).
  - If #sampling factors > 0, then
    - the #values for each sampling factor ≥ 2…
    - and #subgroups ≥ 2…
    - and #basic units ≥ 2.
    - For example, an OU identifies only 1 sampling factor, containing 2 values:
      - Customer (commercial, military)
      - Subgroup 1 = commercial, with at least one basic unit in the organizational scope
      - Subgroup 2 = military, with at least one basic unit in the organizational scope

- The ability to filter PARS data by "Appraisal Method" would facilitate analysis.

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CMMI V1.3 Appraisals
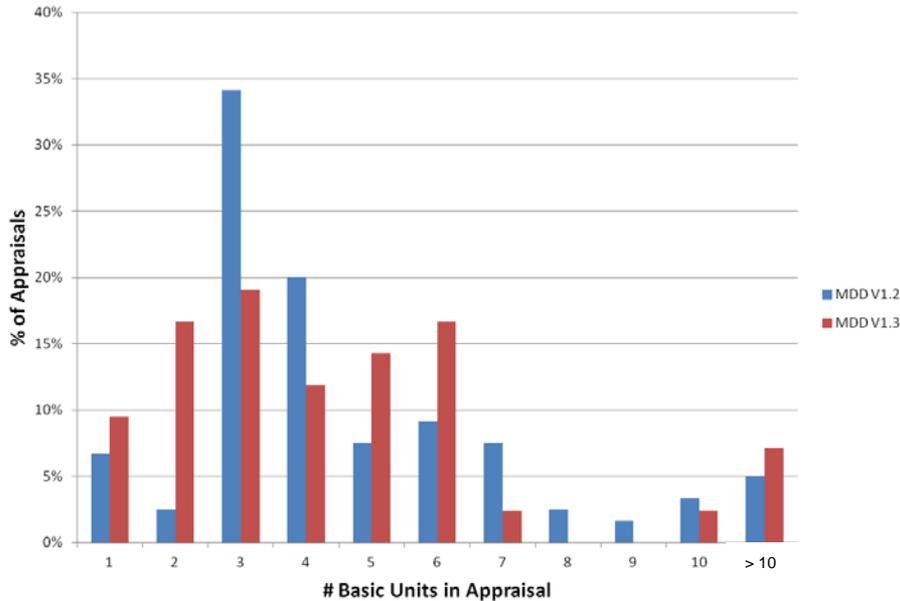
CMMI V1.3 Appraisals with ≤ 3 Basic Units
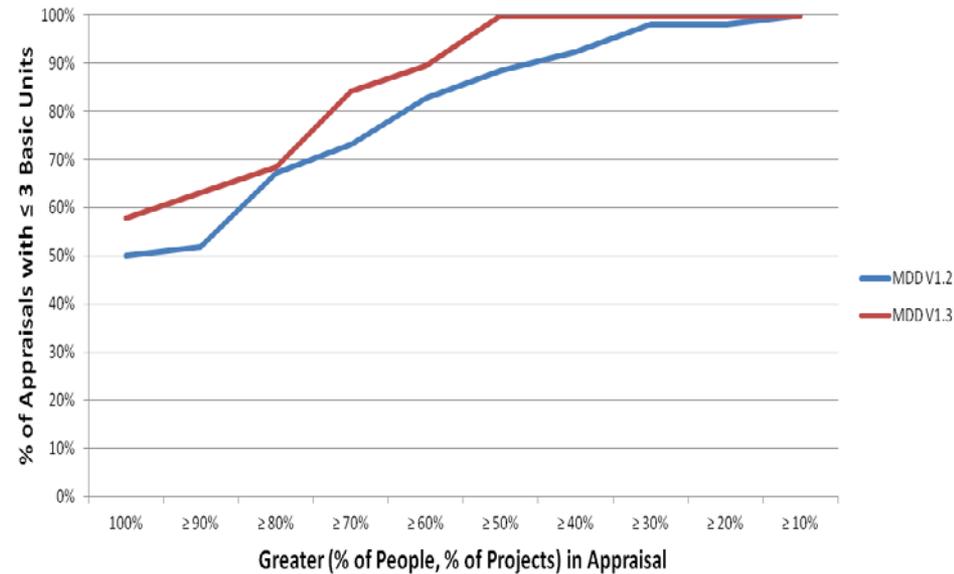
Notes:
1. Total data include 120 MDD V1.2 appraisals and 42 MDD V1.3 appraisals.
2. Distribution of Basic Units in MDD V1.3 CMMI V1.3 appraisals is more even than MDD V1.2, which spikes at 3 Basic Units.
3. Percentage of CMMI V1.3 appraisals with ≤ 3 Basic Units is virtually the same for MDD V1.3 (45%) and MDD V1.2 (43%).
4. CMMI V1.3 appraisals with ≤ 3 Basic Units sampled (52 MDD V1.2 data points, 19 MDD V1.3 data points) have comparable OU coverage percentage using MDD V1.2 or MDD V1.3 (difference is not statistically significant).

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|	# CMMI V1.3 Appraisals	# Basic Units (Ave.)	# Basic Units (Median)	% of OU Projects (Ave.)	% of OU Projects (Median)	% of OU People (Ave.)	% of OU People (Median)
MDD V1.2	120	5	4	60%	60%	63%	64%
MDD V1.3	42	5	4	65%	67%	67%	69%

Overall Observations

1. Organizational Scope of CMMI V1.3 MDD V1.2 and MDD V1.3 appraisals are very similar.
   - # Basic Units included in the organizational scope are comparable.
   - Differences in % of OU projects and people included in the appraisal are not statistically significant.

2. The use of sampling factors in MDD V1.3 appraisals provides more insight into how the basic unit sample set was determined.

3. The Published Appraisal Results site provides no information on objective evidence coverage.
   - Cost differences between MDD V1.2 and MDD V1.3 appraisals cannot be determined from this analysis alone.
   - Organizational scope does not appear to be a cost driver. Impact of MDD V1.3 data coverage rules would need to be examined.

Coda

Kudos to the "innovators" and "early adopters" who have used MDD V1.3, paving the way for the rest of the community!

Innovation Adoption Lifecycle
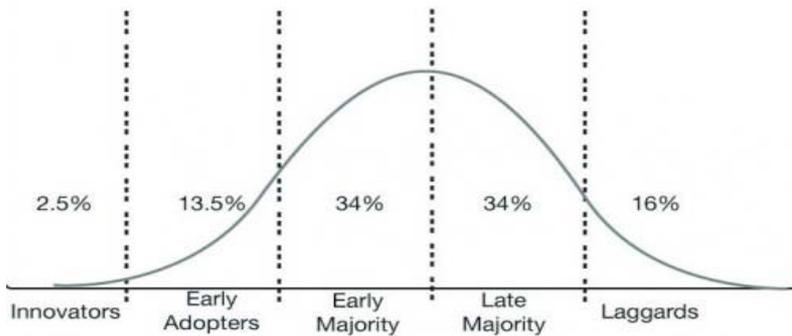
Adopter Category	Description
Innovators	Venturesome, interested in new ideas, risk takers
Early Adopters	More discrete in adoption choices than innovators. Realize judicious choice of adoption will help them maintain central communication position.
Early Majority	Slower in the adoption process, have contact with early adopters, and seldom hold positions of opinion leadership.
Late Majority	Will adopt an innovation after the average member of the society, skeptical about an innovation, in contact with others in late majority and early majority, very little opinion leadership.
Laggards	Last to adopt an innovation, have an aversion to change-agents, tend to be focused on "traditions", very little to no opinion leadership.

Source: Wikipedia description of Everett Roger's *Diffusion of Innovations.*

Questions

Contact Information

- For future questions the presenter contact information is:

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Presenter Biography

- Michael Campo is a Principal Engineering Fellow at Raytheon Company, with 33 years experience that includes roles as a software developer, software/system integrator, manager, software project manager, and process group leader. As process group leader for Raytheon Integrated Defense Systems, Mike developed and deployed processes that led to achievement of CMMI Maturity Level 3 in 2003, Maturity Level 4 in 2005, and Maturity Level 5 in 2008.

- Mike's present position is IDS Process Technical Director. He is a certified CMMI Instructor.   Mike is a member of the CMMI V1.3 Core Model Team, the CMMI V1.3 Training Team, the CMMI Configuration Control Board, and the NDIA CMMI Working Group.