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Customer Success Is Our Mission

How Many Sampling Factors Does It Take…?

(Organizational Scoping of SCAMPI^{SM} A V1.3 Appraisals)

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Introduction

The tutorial reviews the SCAMPI A Method Definition Document (MDD) V1.3 concepts of appraisal scoping.

The primary focus of this tutorial is on “Determining Organizational Scope”.

- MDD V1.3 Activity 1.1.4 Determine Appraisal Scope
- MDD V1.3 Appendix F Scoping and Sampling in SCAMPI A Appraisals

We will also review the MDD V1.3 “coverage rules” used to determine artifact/affirmation needs for basic units and support functions sampled in a SCAMPI A appraisal.

We will review data and examples from the SEI Published Appraisal Results Site (PARS) demonstrating how MDD V1.3 scoping is being applied in the community.

Learning Objectives

Upon Completion of This Course, the Student Will Be Able to:

- Use the MDD V1.3 appraisal scoping rules to *effectively* determine the appraisal scope for there own organization or one they are appraising.

Your Expectations?

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Agenda

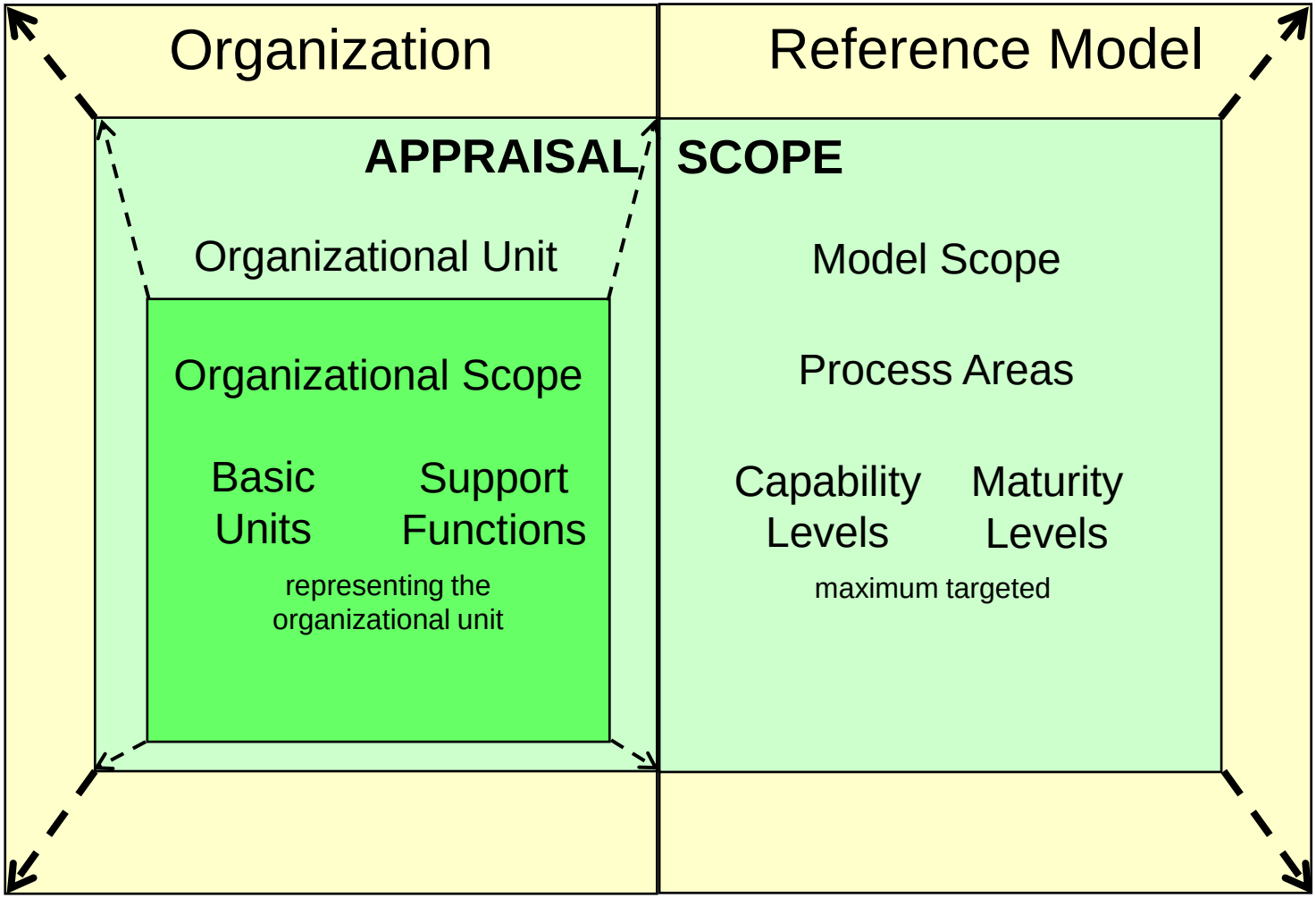
- Appraisal Scoping Definitions 1
- History of Organizational Scoping
- Part I : Reviewing the SCAMPI A V1.3 Organizational Scoping Method
  - Appraisal Scoping Definitions 2
  - Identifying Sampling Factors
  - Determining Subgroups and Basic Units
  - Support Functions
- Part II : Common Mistakes Seen in Organizational Scoping
  - Guidance
  - Examples
  - Exercises
- Part III
  - Objective Evidence & Coverage Requirements
- Summary

Appraisal Scoping Definitions 1

- **Appraisal scope** – The definition of the boundaries of the appraisal encompassing the organizational limits and the model limits within which the processes to be investigated operate. The appraisal scope includes the reference model scope, organizational unit, and organizational scope.
- **(Reference) Model scope*** – the set of reference model process areas that are investigated within the organizational unit in an appraisal, and, for CMMI models, the representation chosen as well as the associated maximum capability or maturity level targeted.
- **Organizational unit –** That part of an organization that is the subject of an appraisal and to which the appraisal result will be generalized. An organizational unit deploys one or more processes that have a coherent process context and operates within a coherent set of business objectives. An organizational unit is typically part of a larger organization, although in a small organization, the organizational unit may be the whole organization.
- **Organizational scope** - The collection of basic units and support functions that provides instantiations of practices used within, and representative of, an organizational unit.

* - Model scope is not defined in the MDD V1.3 glossary, but is described in 1.1.4 and ARC V1.3

Appraisal Scope



Appraisal Scope = Model Scope & Organizational Unit & Organizational Scope

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History of Organizational Scoping

MDD V1.1 (1.1.3 Determine Appraisal Scope - 3 pages)

- Model scope must include at least 1 Process Area
- "Typically" at least 2 instances (i.e., *instantiations*) of processes being investigated are available as sources of evidence
- For processes enacted at the organizational level, (e.g. Organizational Training), multiple instances are not required
- Implementation Guidance: the size and number of instantiations investigated should be selected to form a valid sample of the organizational unit to which the results will be attributed

	CM	MA	PMC	PP	PPQA	REQM	SAM	DAR	IMP	OPD	OPF	OT	PI	RD	RSKM	TS	VAL	VER
Project A	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X
Project B	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X
Organization										X	X	X						

History of Organizational Scoping

MDD V1.2 (1.1.3 Determine Appraisal Scope - 5 pages)

- Parameters & Limits expanded to include more evidence that the organizational scope was representative of the organizational unit
  - Organizational unit size (# people and # projects) must be documented as well as the percentage of each (% people, % projects) included in the organizational scope
  - Critical factors (e.g., application domains, location, project types) that influence implementation of practices in projects and functions must be identified.
  - Sample projects and support groups selected to form the organizational scope (i.e., focus and non-focus projects) must represent all critical factors identified for the organizational unit
    - Focus projects must provide objective evidence for every PA within the model scope applicable to those projects
    - Non-focus projects must provide objective evidence for one or more PAs within the model scope applicable to those projects
    - Support functions must provide objective evidence for practices within the model scope that address organizational infrastructure or functions

History of Organizational Scoping

MDD V1.2 (continued)

- The organizational scope must include at least 1 focus project and, if the OU includes more than 3 projects, must include enough focus and non-focus projects to provide 3 instances of each practice in each project-related PA in the model scope

	CM	MA	PMC	PP	PPQA	REQM	SAM	DAR	IMP	OPD	OPF	OT	PI	RD	RSKM	TS	VAL	VER
Focus Project A (critical factor 1)	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X
Non-focus Project B (critical factor 1)	X	X			X		X	X									X	X
Non-focus Project C (critical factor 1)	X	X			X		X						X		X		X	X
Non-focus Project D (critical factor 2)			X	X		X		X	X					X		X		
Non-focus Project E (critical factor 2)			X	X		X			X				X	X	X	X		
Organization										X	X	X						

Desired results

History of Organizational Scoping

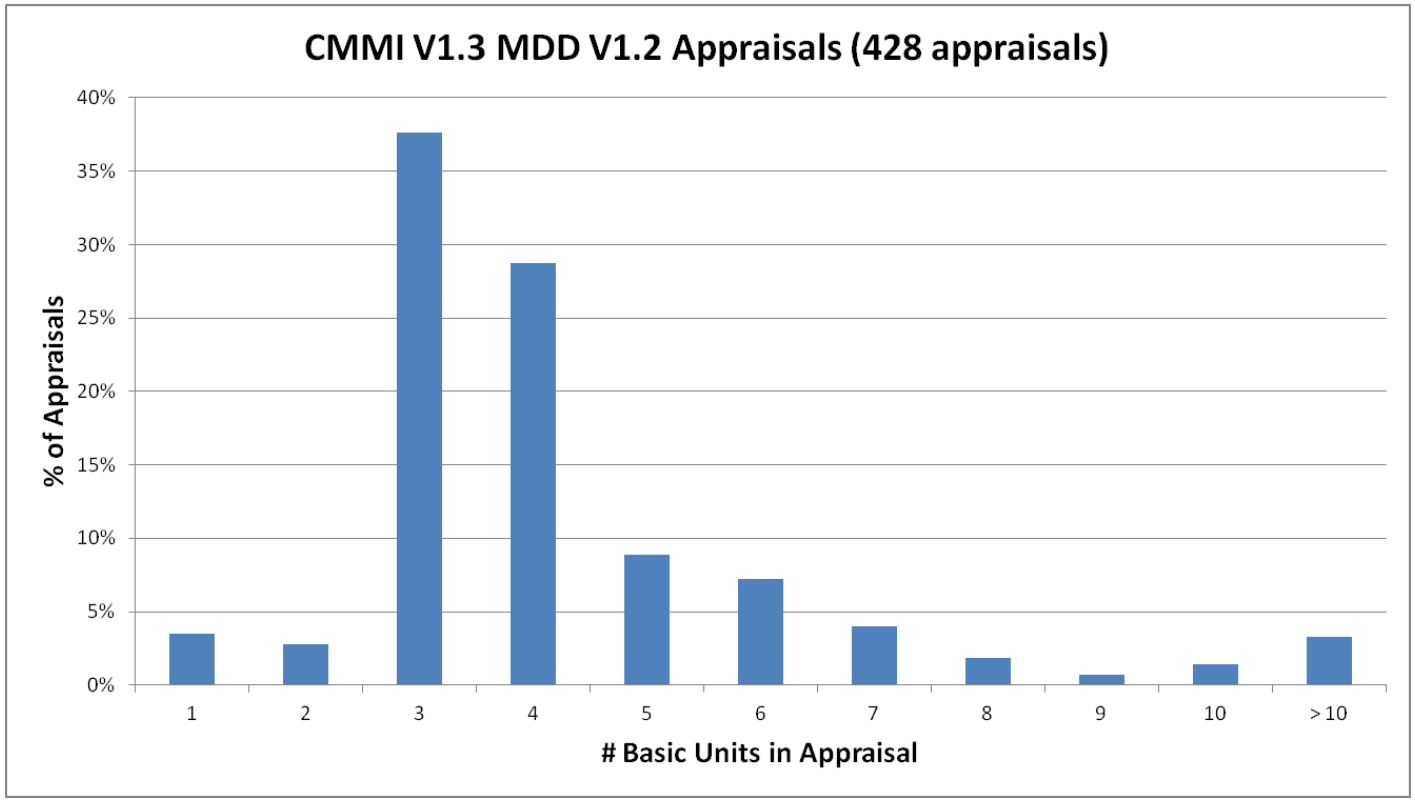
MDD V1.2 (continued)

	CM	MA	PMC	PP	PPQA	REQM	SAM	DAR	IMP	OPD	OPF	OT	PI	RD	RSKM	TS	VAL	VER
Focus Project A (critical factor 1)	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X
Focus Project B (critical factor 1)	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X
Focus Project C (critical factor 2)	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X
Organization										X	X	X						

All too often results

History of Organizational Scoping

MDD V1.2 (continued)



Distribution of Basic Units in MDD V1.2 CMMI V1.3 appraisals spikes at 3 projects. Small percentage of appraisals with < 3 projects.

Data from SEI Published Appraisal Results Site (PARS)

History of Organizational Scoping

MDD V1.3 (1.1.4 Determine Appraisal Scope - 8 pages)

- Replaced the terms “focus project” and “non-focus project” with “basic unit”.
  - “Project” is not always an appropriate term for CMMI-SVC users .
- Replaced the notion of “critical factors” with “sampling factors” and “subgroups”.
- “3-instantiation rule” replaced by sampling algorithm, subgroups, and data coverage rules.
  - Coverage Rules for Process Areas, Basic Units and Support Functions are used to determine objective evidence needs from basic units and support functions.
  - Coverage Rules replace previous oral affirmation rules (“1 row/1 column” or “50%”).

Focus of this tutorial

Comparing MDD V1.2 and MDD V1.3 CMMI V1.3 Appraisals

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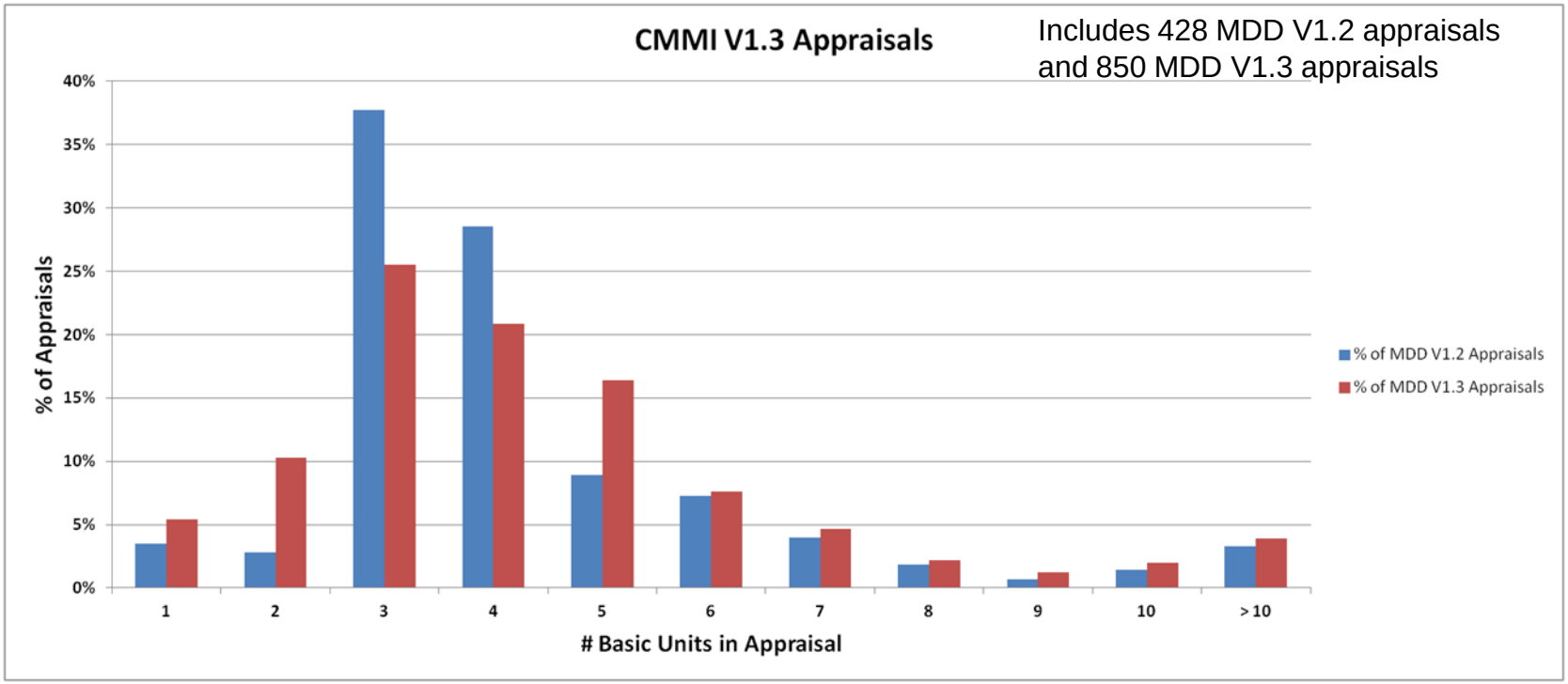

- MDD V1.2 spikes at 3 basic units, MDD V1.3 more normal
- MDD V1.2 Average = 4.4, Median = 4 73% 4 basic units or less
- MDD V1.3 Average = 4.2, Median = 4, 70% 4 basic units or less
- No statistically significant difference between mean or standard deviation in methods

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Appraisal Scoping Definitions 2

- **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).

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Identifying Sampling Factors

Sampling factor	organizational or work context that reflects meaningful differences in the way work is performed across different basic units within the organizational unit (OU)

MDD: The following sampling factors must be evaluated to determine the organizational scope of the appraisal: location, customer, size, org structure, type of work

- May not be relevant sample factors in some OUs
- Other sampling factors may be relevant (e.g., lifecycle model)

– For each sampling factor, sampling factor values (or alternatives) must be identified (e.g., lifecycle model: waterfall, incremental, Agile)

– The appraisal team leader and the sponsor must agree to the sampling factors and document the results of the identification and analysis of sampling in the appraisal records.

– Careful consideration of what impacts the way work is performed in an OU must be done to determine sampling factors

- Consider how basic units in the organization tailor the standard process

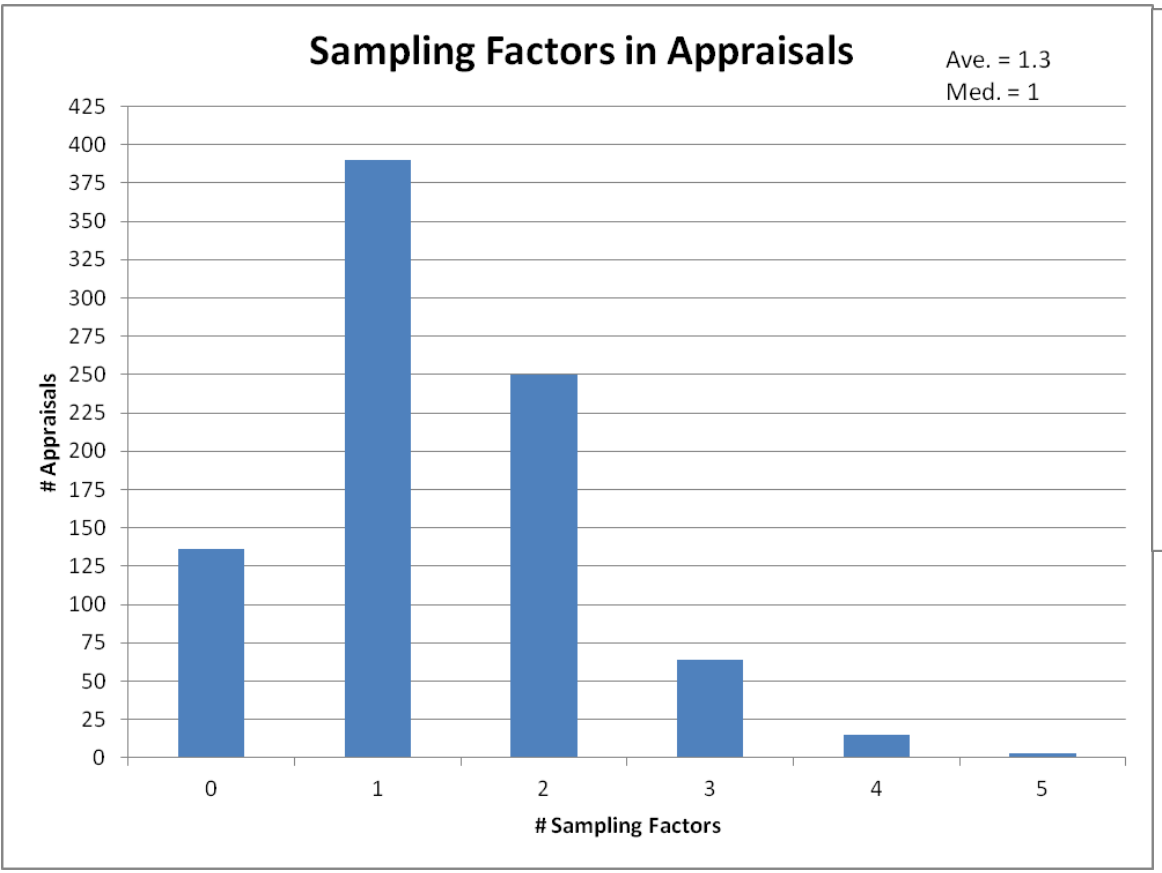
Sampling factors are drivers of OU process diversity.

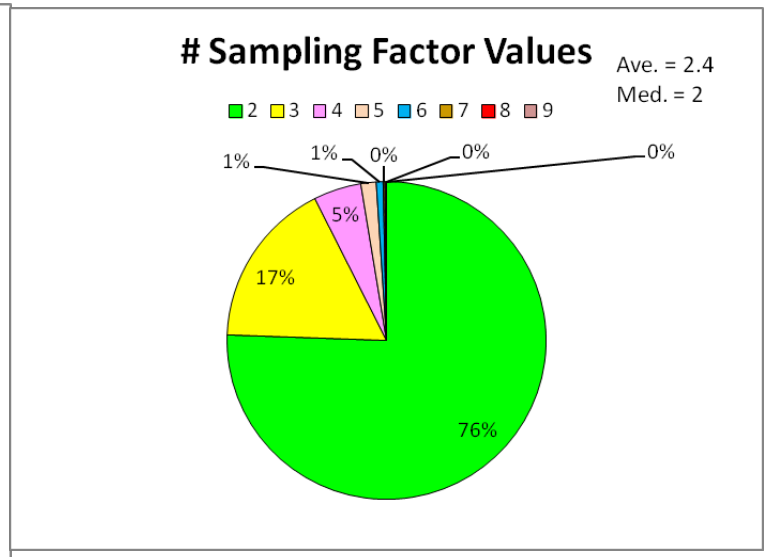
Identifying Sampling Factors

Fictional Organization Name: BINDY Company

- Organizational Unit: Bindy Co. Systems and Software Development
  - Bindy Co. also provides services support for its products, but this is not included in the appraisal.
- Sampling factors:
  - Location: Indianapolis, Boston (Bindy Co. has 2 locations, with processes historically implemented differently.)
  - Customer: DoD, commercial (Customers have different process expectations.)
  - Size: (Not Relevant. No impact on processes.)
  - Org Structure: (Not Relevant. No impact on processes.)
  - Type of Work: new development, maintenance (Different processes followed for new development and maintenance/enhancement projects.)
- Metrics:
  - 3 sampling factors, each with 2 sampling factor values
  - 8 possible sampling factor value combinations

Identifying Sampling Factors

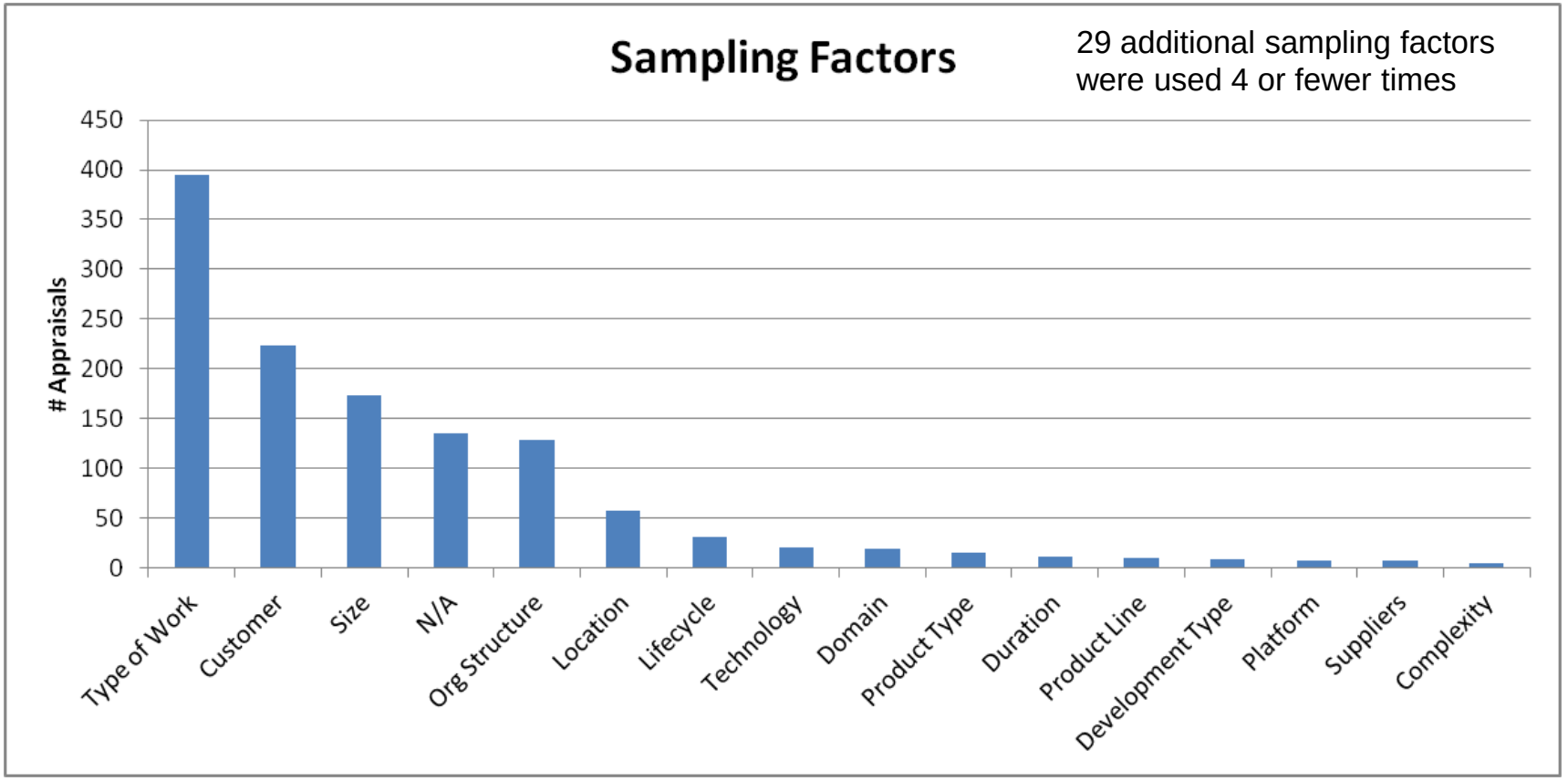




- 76% of sampling factors have 2 values (e.g., Type of Work – development, maintenance)

- 90% of appraisals have 2 or fewer sampling factors.
- Note: There is no statistically significant relationship between OU size and # sampling factors (or OU Size and # Subgroups or OU Size and # Basic Units)

Identifying Sampling Factors



- [Type of Work, Customer, Org Structure, Size] constitute 79% of sampling factor usage (not counting N/As which are zero sampling factor appraisals).
- "Type of Work" is the biggest driver of process diversity in appraised organizations.

Sampling Factors Issues *Page 1 of 2*

Usage Issues:

- Organizational characteristics are identified as sampling factors even though there may be no process implementation impact
  - Example: Locations identified as sampling factor without any indications of process differentiation based on location

- Sometimes excessive sampling factor and/or sampling factor values are identified (and not used).
  - One appraisal had 96 possible sampling factor value combinations!
  - Some appraisals had more possible sampling factor value combinations than people in the organizational units

- Sampling factors (and/or sampling factor values) are identified but not used in organizational scoping
  - Past or future sampling factors/values that are not currently relevant to the organizational unit being appraised should not be included
    - Example: An OU identifies type of work as a sampling factor with 2 values: new, maintenance. Although the OU standard process still contains unique processes for maintenance type work, no maintenance work is currently being performed at the OU, and no basic units/support functions are providing objective evidence of maintenance processes being implemented

Sampling Factors Issues *Page 2 of 2*

Sampling Factor Usage Issues:

- Redundant sampling factors are identified
  - E.g., 2 sampling factors: location (Chicago, Dallas), type of work (new, maintenance)
  - If all new work is done in Dallas, and all maintenance in Chicago, one sampling factor may be redundant.

- Support functions identified as sampling factors and/or sampling factor values.
  - Example: “Support Functions” is identified as a “sampling factor” with 3 values (CM, QA, process improvement)
  - 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).
  - 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).

SEI Appraisal System (SAS) problem:

- Although “zero sampling factors” is a valid real world condition, SAS forces users to identify at least one sampling factor.
- Workaround:
  - Set #subgroups = 1
  - Identify 1 sampling factor with 2 values (all basic units, no basic units)

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Determining Subgroups & Basic Unit Samples

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

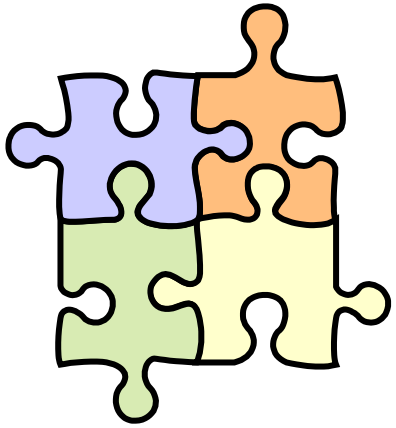
Determining subgroups and basic unit samples is a 4-step process:

- Step 1: Determine possible subgroups by analyzing all possible sampling factor value combinations.
- Step 2: Allocate all the basic units in the OU to the appropriate subgroup.
- Step 3: Determine the number of representative sample basic units from each subgroup to be included in the organizational scope.
- Step 4: Identify the individual basic units in the sample.

Determining Subgroups & Basic Unit Samples

Step 1: The number of possible subgroups is determined by analyzing all combinations of sampling factor values.

- The result is a set of subgroups that represents the potentially unique process implementations under which work is performed across the organizational unit (OU).
  - Note: some possible sampling factor value combinations may not be implemented in the OU.
- The subgroups represent the process diversification in an OU, and are used as a basis for sampling basic units in the appraisal



Subgroups depict the breadth of process diversity in the OU.

Determining Subgroups & Basic Unit Samples

Determining Subgroups Example: Bindy Co.

Sampling Factors

- Location: Indianapolis, Boston
- Type of Work: new, maintenance
- Customer: DoD, commercial

BINDY Co.	Possible subgroups	Location	Type of Work	Customer
	1	Boston	new	comm
	2	Boston	new	DoD
	3	Boston	maint	comm
	4	Boston	maint	DoD
	5	Indy	new	comm
	6	Indy	new	DoD
	7	Indy	maint	comm
	8	Indy	maint	DoD
Totals	8			

Bindy Co. has 8 possible subgroups.

Determining Subgroups & Basic Unit Samples

Step 2: Allocate all the basic units in the OU to the appropriate subgroup

Allocating basic units to subgroups Example: Bindy Co.

BINDY Co.		Location	Type of Work	Customer	# of BUs in subgroup
		Boston	new	comm	0
	Subgroup 1	Boston	new	DoD	4
	Subgroup 2	Boston	maint	comm	49
		Boston	maint	DoD	0
	Subgroup 3	Indy	new	comm	5
	Subgroup 4	Indy	new	DoD	16
		Indy	maint	comm	0
	Subgroup 5	Indy	maint	DoD	75
Totals	5				149

Bindy Co. basic units fall into 5 subgroups.

Determining Subgroups and Basic Unit Samples

Step 3: Establish a representative sample for the OU by selecting basic units from each of the subgroups according to the following formula:

$$\text{Minimum number of basic units to be selected from a given subgroup} = \frac{\text{Number of subgroups} \times \text{Number basic units in the given subgroup}}{\text{Total number of basic units}}$$

- If the computed value is less than 1, the required number of basic units shall be 1.
- Fractional values greater than 1 shall be subject to standard rounding rules.
  - (i.e., 1.5.1 becomes 2, and 1.49 becomes 1)

Determining Subgroups and Basic Unit Samples

Example: Bindy Co.

- Minimum # of basic units per subgroup = (# basic units in subgroup × #subgroups) / total # basic units

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

Bindy Co. must provide evidence from 8 basic units representative of the 5 subgroups.
(Note: The OU can choose to provide more.)

Determining Subgroups & Basic Unit Samples

Step 4: Identify the individual basic units in the sample.

Consider:

- Where basic units are in lifecycle
  - Basic units need to be in a lifecycle stage that supports the process areas for which they will be providing evidence
  - E.g., late lifecycle basic units needed for VER and VAL process areas
- Programmatic considerations
  - Program milestones (e.g., will the basic unit be in customer reviews during the appraisal)
  - Contractual requirements
  - Security issues (e.g., classified basic units)
- Use the Decision and Analysis process area

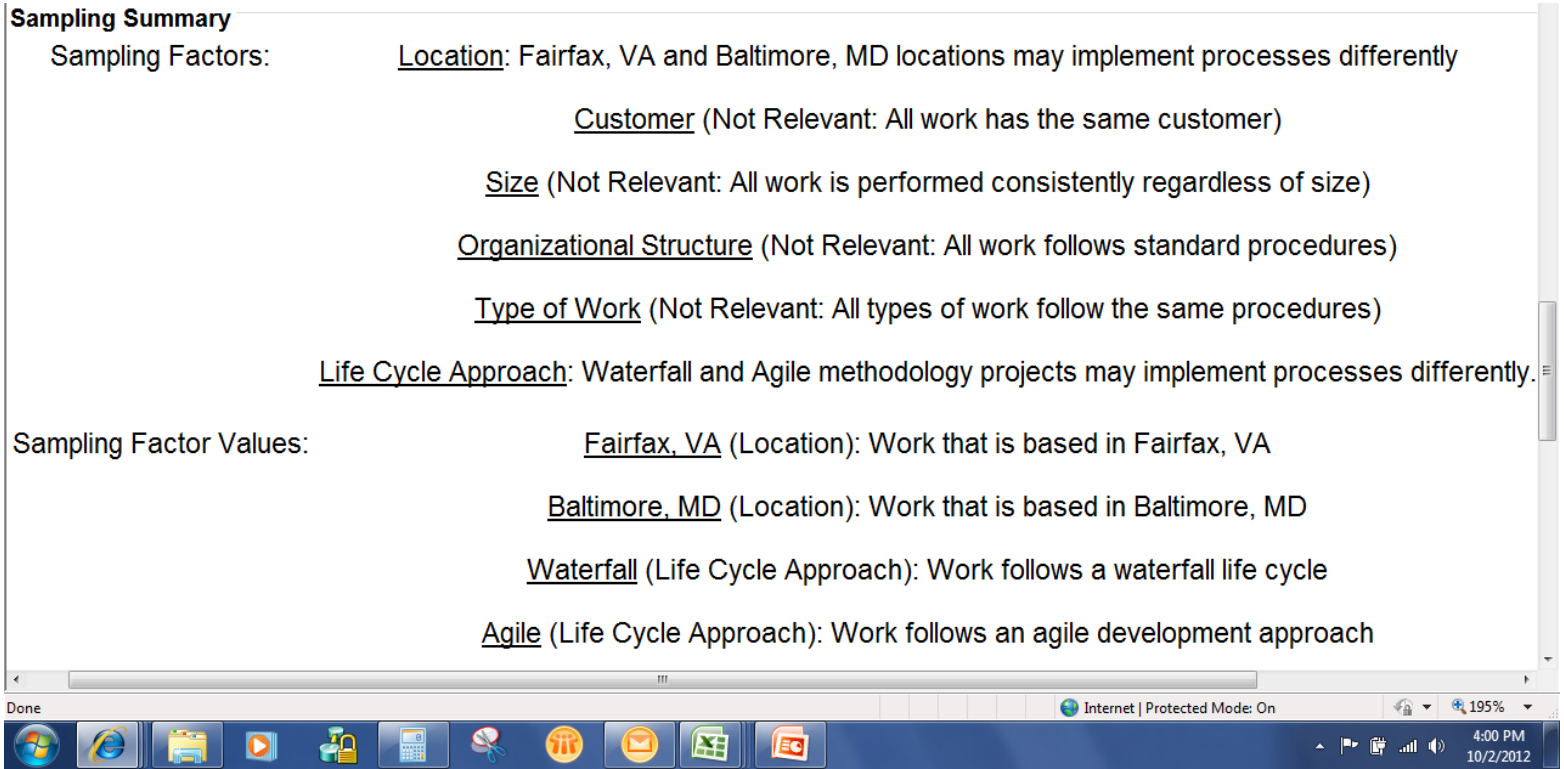
Subgrouping process helps the OU in selecting basic units to be part of the organizational scope .

Identifying Sampling Factors

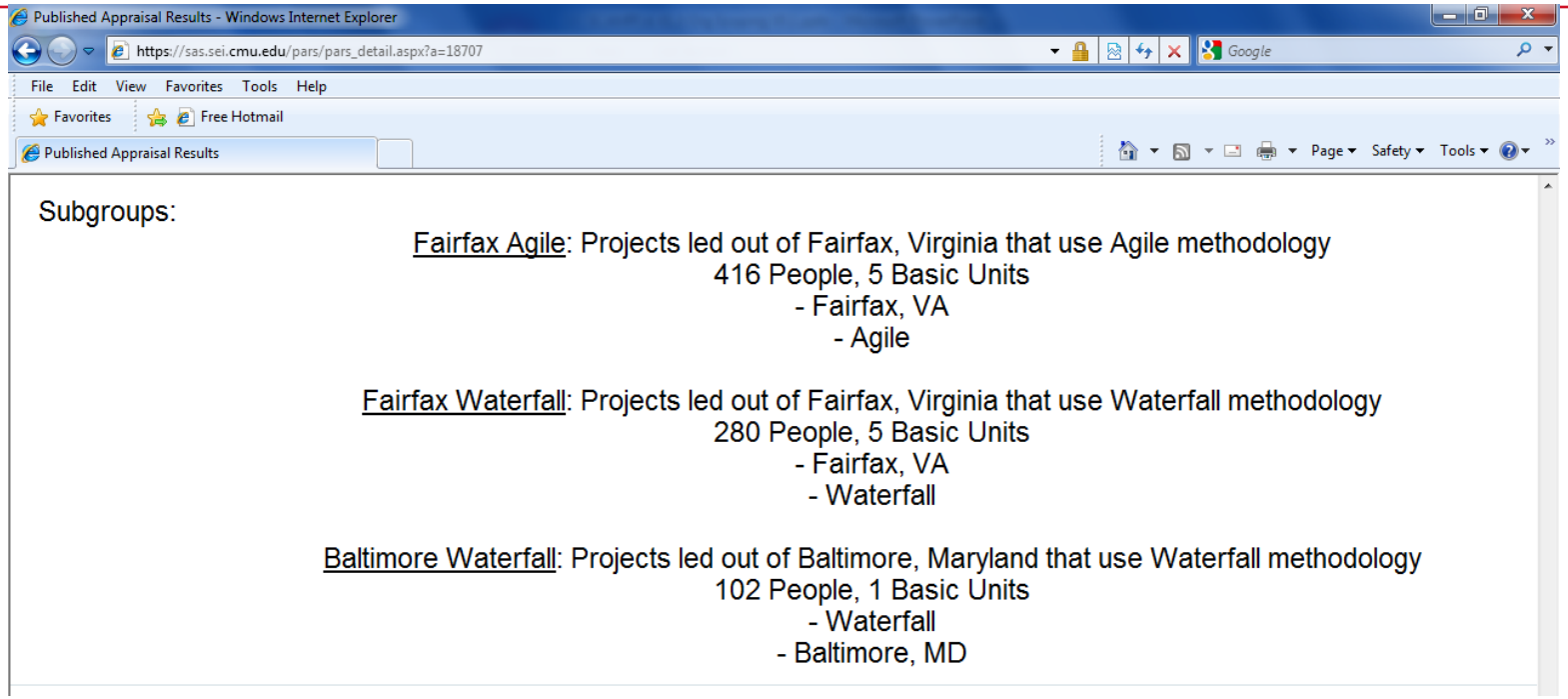
Example from Published Appraisal Results Site (PARS)

Organizational Unit identified 2 sampling factors with (some) rationale.

Each sampling factor has 2 sampling factor values.



Determining Subgroups & Basic Unit Samples



Example from PARS

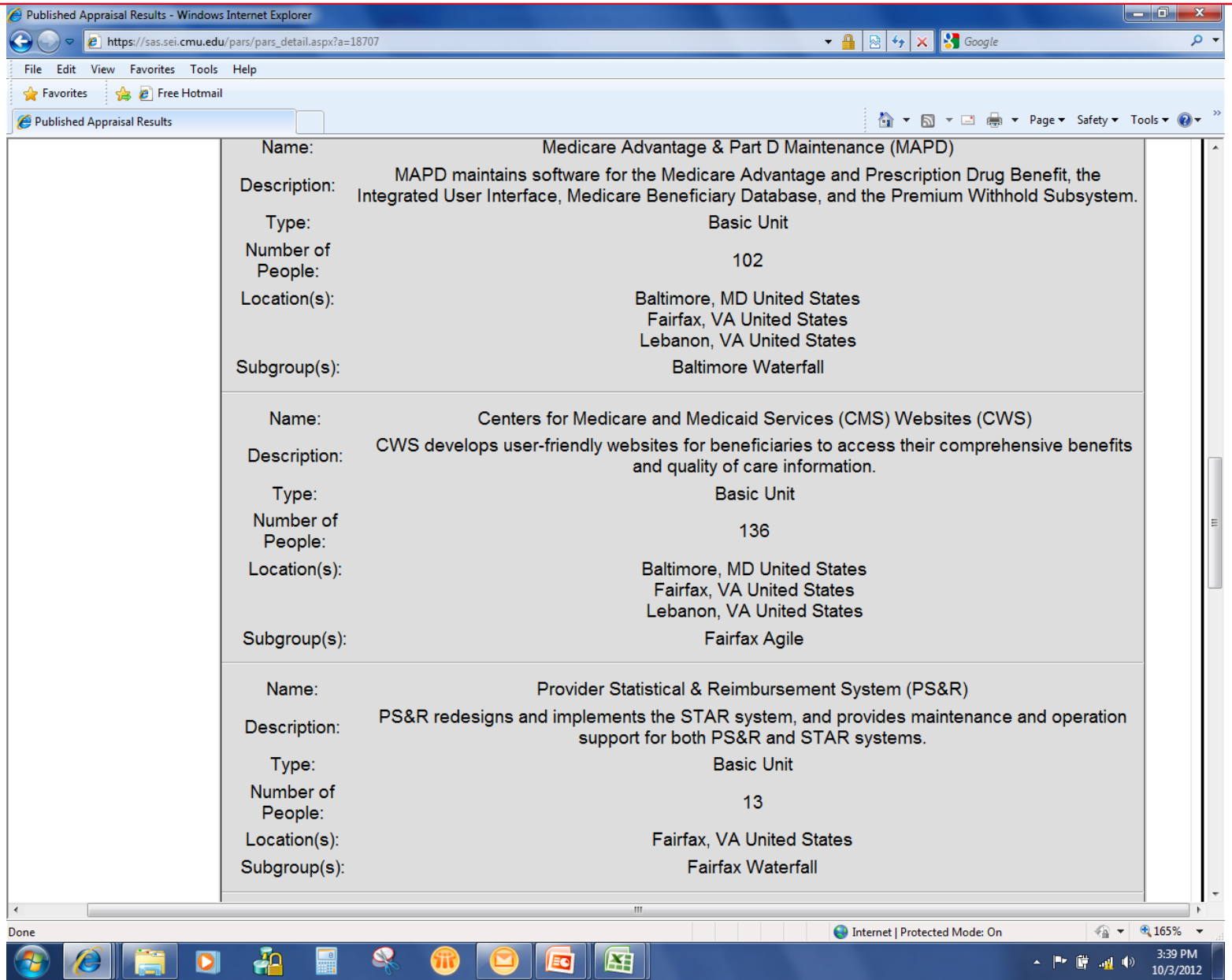
Organizational Unit identified 3 subgroups.

No basic units in Baltimore used the Agile methodology

Organizational scope included 4 basic units and 2 support functions.

- 2 basic units from Fairfax Waterfall
- 1 basic unit each from Fairfax Agile and Baltimore Waterfall

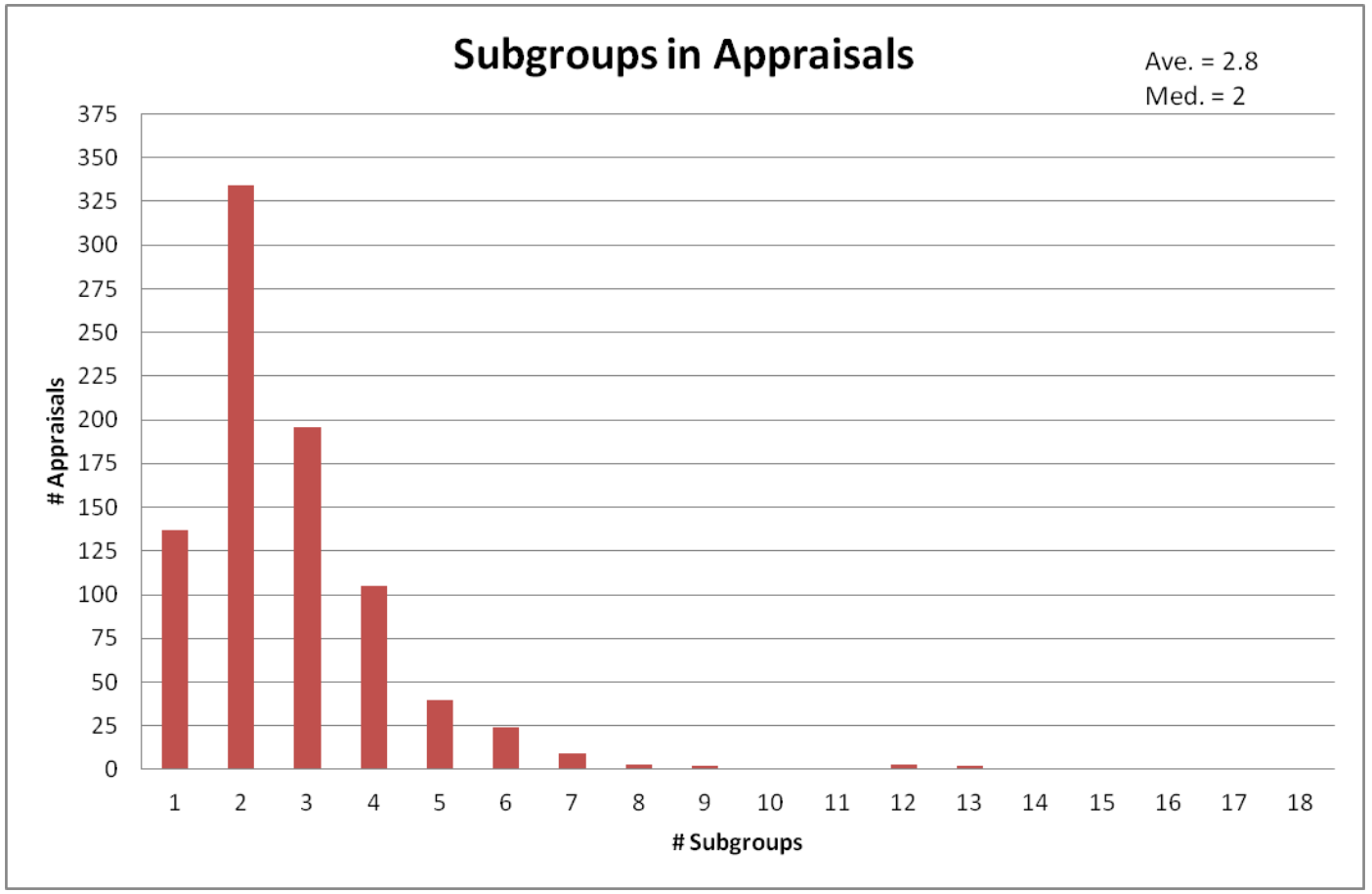
Determining Subgroups & Basic Unit Samples



Name:	Medicare Advantage & Part D Maintenance (MAPD)
Description:	MAPD maintains software for the Medicare Advantage and Prescription Drug Benefit, the Integrated User Interface, Medicare Beneficiary Database, and the Premium Withhold Subsystem.
Type:	Basic Unit
Number of People:	102
Location(s):	Baltimore, MD United States Fairfax, VA United States Lebanon, VA United States
Subgroup(s):	Baltimore Waterfall
Name:	Centers for Medicare and Medicaid Services (CMS) Websites (CWS)
Description:	CWS develops user-friendly websites for beneficiaries to access their comprehensive benefits and quality of care information.
Type:	Basic Unit
Number of People:	136
Location(s):	Baltimore, MD United States Fairfax, VA United States Lebanon, VA United States
Subgroup(s):	Fairfax Agile
Name:	Provider Statistical & Reimbursement System (PS&R)
Description:	PS&R redesigns and implements the STAR system, and provides maintenance and operation support for both PS&R and STAR systems.
Type:	Basic Unit
Number of People:	13
Location(s):	Fairfax, VA United States
Subgroup(s):	Fairfax Waterfall

Example from PARS

Determining Subgroups & Basic Unit Samples



- 78% of appraisals have 3 or fewer subgroups.
- Median of 2 subgroups aligns with median #sampling factors = 1 and median #sampling factor values = 2.

Subgroup Issues

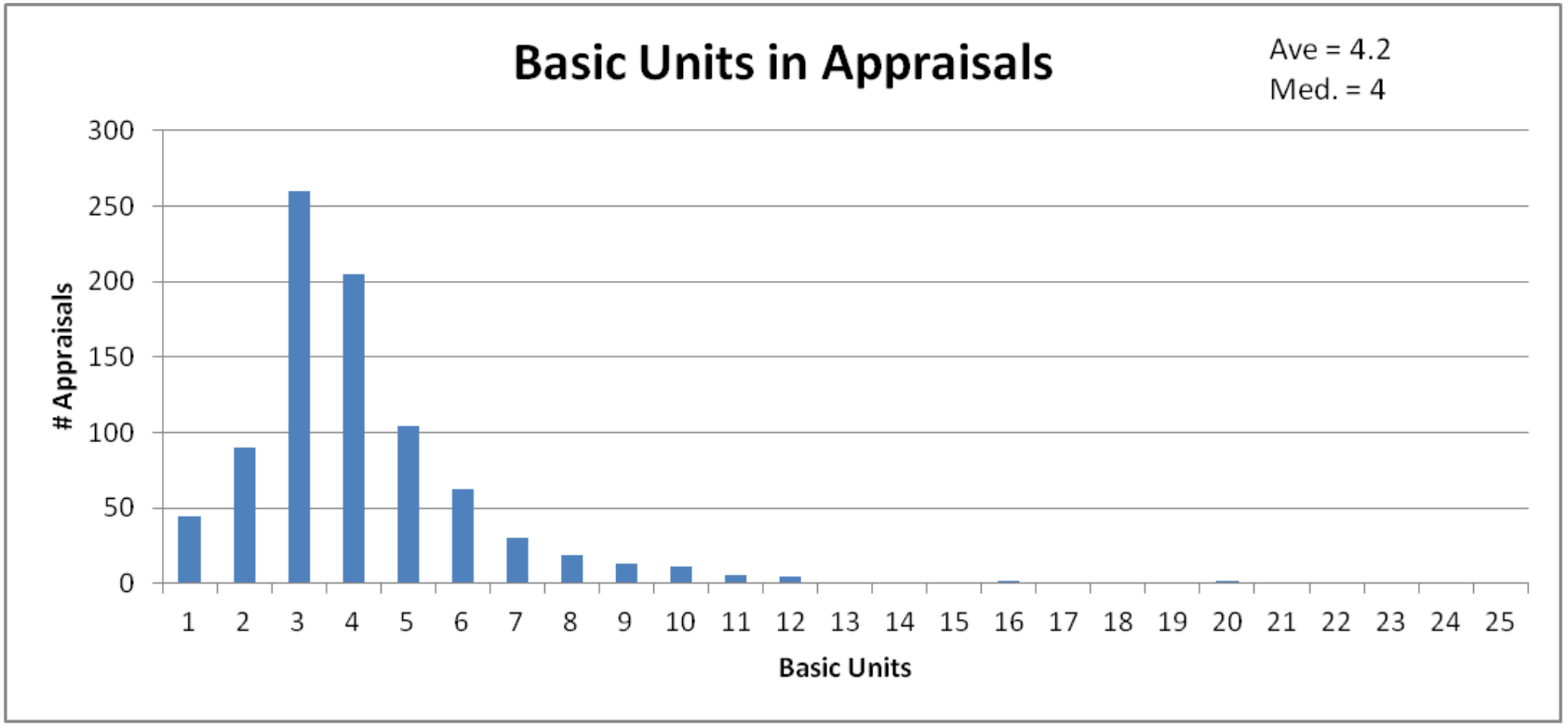
Usage Issues:

- In some cases, the number of sampling factors and sampling factor values identified does not always align with the number of subgroups. Examples:
  - 4 appraisals had 1 sampling factors with 2 sampling factor values but 3 subgroups
  - 1 appraisal had 2 sampling factors, each with 2 values, but 6 subgroups
  - 1 appraisal had 1 sampling factor with 2 values but 18 subgroups and 25 basic units!
- In some appraisals, support functions were being called subgroups.
  - MDD definition of subgroup: "*a cluster of basic units* that share common sampling factor alternatives and exhibit similar process implementations"

Guidance:

- The number of subgroups ≥ the number of sampling factors.
  - Zero sampling factors implies one subgroup (the entire OU)
  - One sampling factor implies at least 2 subgroups
- The number of subgroups ≤ the number of possible sampling factors value combinations
- Support functions are not subgroups and should not be designated as such.
- Different subgroups should not have the same sampling factor value combination.

Determining Subgroups & Basic Unit Samples



- 70% of appraisals have 4 or fewer basic units
- Aligns with 78% of appraisals having 3 or fewer subgroups

Basic Unit Issues

Usage Issues:

- In 12 appraisals, the number of basic units sampled was less than the number of subgroups.
  - MDD Coverage Rule 1 for Basic Units states that “For each subgroup, artifacts and affirmations shall be provided for at least one basic unit for each process area implemented by basic units within the subgroup.”
- In 11 appraisals, not all of the subgroups were represented by basic units in the organizational scope.

Guidance:

- The number of basic units ≥ the number of subgroups
  - See MDD Coverage Rule 1 for Basic Units

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Support Functions

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).

Support functions provide products/services and support for basic units and possibly other support functions.

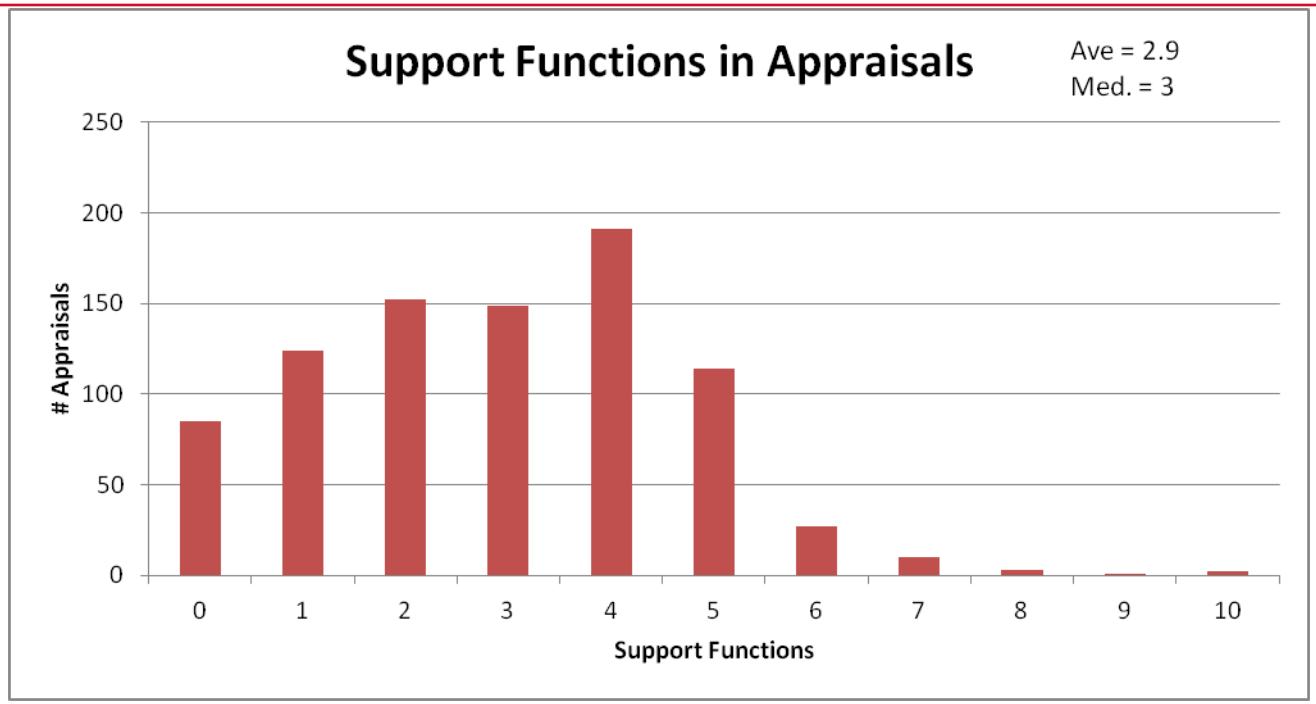
- A configuration management group may provide CM services for a process group that provides process products/services for basic units in the OU.

The structure of the organizational unit usually determines the number and types of support functions in the OU.

- An OU could contain 2 quality assurance groups that provide services to different parts of the OU.
- Some quality assurance groups are combined with process groups as one support function.

Support functions can provide objective evidence (artifacts and affirmations) for multiple basic units in an appraisal.

Support Functions



Notes:

1. QA, CM, Training, Testing, EPG, and supplier-related groups (e.g., Contracts, Procurement, etc.) are the most commonly identified support functions in CMMI appraisals
2. Other common support functions include MA, Management groups.
3. Some support functions have multiple roles (e.g., a process group that also does training).

Support Function Issues

Usage Issues:

- In some cases, support functions were being called subgroups, and sometimes also called sampling factors and/or sampling factor values.
  - MDD definition of a 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).
  - MDD definition of subgroup: "*a cluster of basic units* that share common sampling factor alternatives and exhibit similar process implementations"
  - MDD definition of sampling factors: "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).

Guidance:

- Support functions are not subgroups or sampling factors or sampling factor values, and should not be designated as such.

Agenda

- Appraisal Scoping Definitions 1
- History of Organizational Scoping
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Guidance Summary *Page 1 of 2*

Error Code	Error Description	#	Example	Guidance
A	SAS does not allow “zero sampling factor” appraisals.	136	Many appraisals have no sampling factors (valid).	Use SAS Workaround until SAS is fixed. Be clear in SAS.
B	#subgroups < #sampling factors	14	2 sampling factors, 1 subgroup	#subgroups ≥ #sampling factors
C	Bad numerical combinations of sampling factors, sampling factor values, and subgroups	10	1 sampling factor with 2 values but 3 subgroups	#subgroups ≤ #possible sampling factor value combinations
D	#basic units < #subgroups	12	10 subgroups, 6 basic units	#basic units ≥ #subgroups (See MDD Coverage Rule 1 for Basic Units)
E	Not all subgroups are represented by basic units in the org. scope	11	List of basic units that excludes a subgroup	See MDD Coverage Rule 1 for Basic Units.
F	Redundant sampling factors	50	2 sampling factors identified, each with the same values. 2 sampling factors representing equivalent conditions.	Don’t “force” sampling factors.
G	Support functions being called sampling factors or sampling factor values or subgroups or basic units	23	A sampling factor called “support functions” with values: CM , QA, Training, MA	See MDD definitions of support function, subgroup, sampling factor, basic unit. Often pairs with error code D.

Guidance Summary *Page 2 of 2*

Error Code	Error Description	#	Example	Guidance
H	Gratuitous sampling factors (Sampling factors identified but not used)	4	“Customer” identified as sampling factor but not used in any subgroups.	Use sampling factors to create subgroups.
I	Gratuitous sampling factor values (Sampling factor values identified but not used)	24	Sampling factor Size (small, med, large) identified but small not used in any subgroups.	Past or future sampling factor values that are not currently relevant to the OU should not be included. (Processes related to the unused values are not being appraised.)
J	Multiple subgroups with the same sampling factor value combination.	2	2 sampling factors, 1 subgroup	Subgroups are unique combinations of sampling factor values.

Example 1 *Page 1 of 4*

Organization Name	Green Grass Software
Organizational Unit	SW Development Department
Appraisal Sponsor Name	Helen Troy
Lead Appraiser Name	Homer Plate
SEI Partner Name	Happy Process, Inc.
Organizational Unit Description	SW Development organization
Organizational Sample Size	
% of people included	50
% of projects included	100
Organizational Scope Descriptio	SW Development Group, QA Group
Appraisal Description	
Appraisal End Date	May 8, 2012
Appraisal Expiration Date	May 8, 2015
Appraisal Method Used	SEI SCAMPI V1.3 A
Model Information	CMMI-DEV v1.3

Example 1 *Page 2 of 4*

Sampling Summary	
Sampling Factors	Location - Not relevant. All work done in Somecity.
	Customer - Three customers: Government, Commercial, Academic
	Size - Not relevant. All projects are similar in size.
	Org Structure - Not relevant. All work done by one department.
	Type of Work - Two types: new development, maintenance
Sampling Factor Values	Government Customer (Customer) - provides SW work
	Commercial Customer (Customer) - provides SW work
	Academic Customer (Customer) - provides SW work
	New Development (Type of Work) - majority of work by SW Dept.
	Maintenance (Type of Work) - very minor and negligible compared to amount of new work
Subgroups	
SG1	Government work, new development
	8 people, 6 basic units
	- Government
	- New Development
SG2	Commercial work, new development
	8 people, 6 basic units
	- Commercial
	- New Development
SG3	Government work, new development
	9 people, 6 basic units
	- Government
	- New Development

Questions to ask:

1. Are # subgroups ≥ # sampling factors?
2. Are # subgroups ≤ # possible sampling factor combinations?
3. Are all sampling factors represented in subgroups?
4. Are all sampling factor values represented?
5. Are the subgroups unique groupings of sampling factor values?
6. Do the subgroups include support functions?
7. Do the subgroups indicate redundant sampling factors?

Example 1 *Page 3 of 4*

Sampling Summary	
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	9 people, 6 basic units
	- Government
	- New Development

Two sampling factor values (Academic Customer, Maintenance) were not included in any subgroup.

Subgroup 1 and Subgroup 3 are duplicates.

If Maintenance is not included in the scope of the appraisal, Type of Work is not a sampling factor. Should have only been 1 sampling factor (customer) and 2 subgroups.

Maintenance Work and Academic Customer should have been excluded in the OU description. They were not included in the organizational scope or appraised.

Example 1 *Page 4 of 4*

Basic Units /Support Functions	
Name	**AAAA**
Description	**Please contact lead appraiser for more information**
Type	**Basic Unit**
Number of People:	**8**
Location	**Somecity, Somecountry**
Subgroup(s)	**SG1**
Name	**BBBB**
Description	**Please contact lead appraiser for more information**
Type	**Basic Unit**
Number of People:	**9**
Location	**Somecity, Somecountry**
Subgroup(s)	**SG2**
Name	**CCCC**
Description	**Please contact lead appraiser for more information**
Type	**Basic Unit**
Number of People:	**9**
Location	**Somecity, Somecountry**
Subgroup(s)	**SG3**

Questions to ask:

1. Are all subgroups represented by basic units?
2. Are at least the minimum required # basic units for each subgroup included?

Minimum # of basic units per subgroup = (# basic units in subgroup × #subgroups) / total # basic units

SG1 Min. = (6 * 3) / 18 = 1
SG2 Min. = (6 * 3) / 18 = 1
SG3 Min. = (6 * 3) / 18 = 1

Example 2 *Page 1 of 2*

OU (size 89) has 4 sampling factors, 5 subgroups and 5 basic units

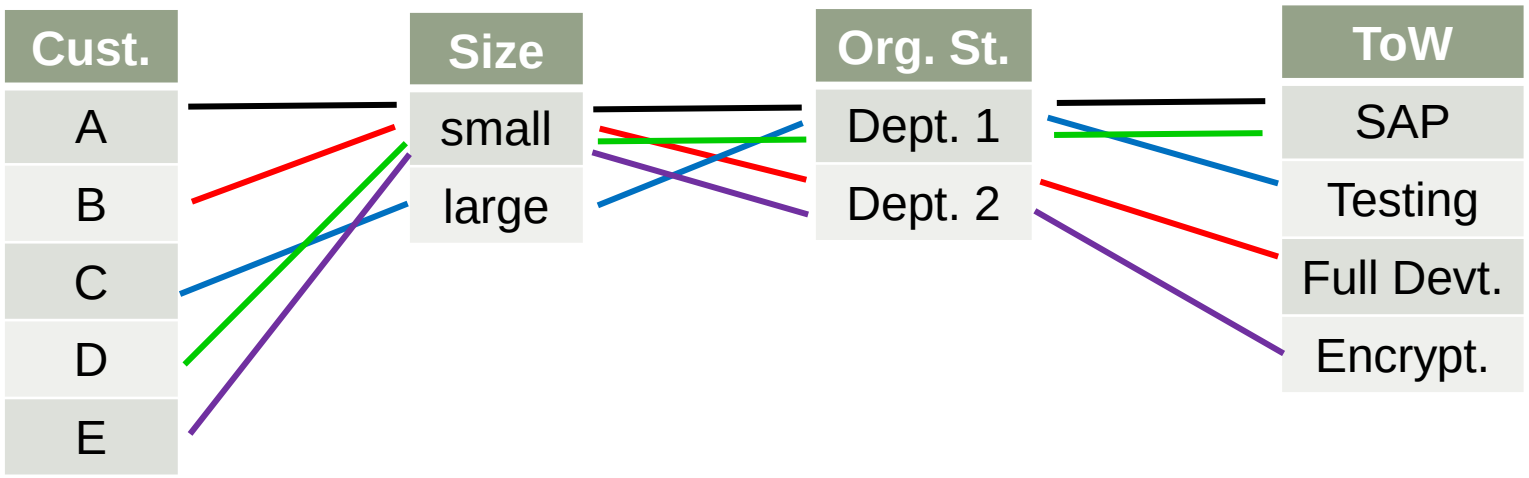
- Customer: A, B, C, D, E
- Size: small, large
- Org Structure: Dept. 1, Dept. 2
- Type of Work: SAP, Testing, Full Devt., Encryption

How many possible sampling factor combinations?

Sampling Factor	Subgroup 1	Subgroup 2	Subgroup 3	Subgroup 4	Subgroup 5
Customer	A	B	C	D	E
Size	Small	Small	Large	Small	Small
Org Structure	Dept. 1	Dept. 2	Dept. 1	Dept. 1	Dept. 2
ToW	SAP	Full Devt.	Testing	SAP	Encryption

Find the potentially redundant sampling factors…..

Example 2 *Page 2 of 2*



Sampling Factor	Subgroup 1	Subgroup 2	Subgroup 3	Subgroup 4	Subgroup 5
Customer	A	B	C	D	E
Size	Small	Small	Large	Small	Small
Org Structure	Dept. 1	Dept. 2	Dept. 1	Dept. 1	Dept. 2
ToW	SAP	Full Devt.	Testing	SAP	Encryption

Customer & ToW are potentially redundant sampling factors

Student Exercises

Raytheon

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Objective Evidence & Data Coverage Rules

- MDD V1.2
  - Required a direct artifact and indirect artifact/affirmation for each model practice in a process area from each project or support function providing evidence for that process area
    - Oral affirmations for model goals must satisfy 1-row/1-column or 50% rule requirements

	1-row, 1-column rule			
SG 1	Project A	Project B	Project C	Project D
SP 1.1	X			
SP 1.2			X	
SP 1.3		X		
SP 1.4				X

	50% rule			
SG 1	Project A	Project B	Project C	Project D
SP 1.1	X	X	X	X
SP 1.2	X	X	X	X
SP 1.3				
SP 1.4				

Objective Evidence & Data Coverage Rules

- MDD V1.3
  - Objective evidence is either artifact or affirmation
    - Eliminated the concept of “direct” and “indirect” artifacts
  - Added Coverage Rules for Process Areas, Basic Units, and Support Functions
    - Coverage Rules denote minimum basic units and support function objective evidence requirements for process areas in the model scope of the appraisal
    - Although the Coverage Rules are listed separately for Process Areas, Basic Units, and support Functions, they form an integrated set of objective evidence requirements.

No more direct vs. indirect evidence quarreling!

Objective Evidence & Data Coverage Rules

- Coverage Rules for Process Areas (PA)
  1. Objective evidence provided for a PA must address all practices that are part of the PA. Each basic unit or support function sampled must address all practices in the PAs for which they supply data.
  2. Design of process in the OU may lead to PAs implemented by one of the following:
     - An individual basic unit within a subgroup
     - A single support function that serves the entire OU
     - A set of support functions that each serve different parts of the OU
     - Some hybrid of the above where the groupings of basic units in subgroups would be too limiting (It would make sense to "collapse the subgroups together" because of the level of PA standard implementation.)

     For basic units, the implementation of a PA in a standardized manner may reduce the data collection needs.

Coverage Rule 2 for Process Areas is also known as "the override rule".

Objective Evidence & Data Coverage Rules

- Coverage Rules for Basic Units
  1. For each subgroup, both artifacts and affirmations shall be provided for at least one basic unit for every PA implemented by basic units within that subgroup *("pseudo-focus program")*.
  2. For at least 50% of the sampled basic units in each subgroup, both artifacts and affirmations shall be provided for at least one PA implemented by basic units within that subgroup.
  3. For all sampled basic units in each subgroup, either artifacts or affirmations shall be provided for at least one PA implemented by basic units within that subgroup.

These rules constitute PA coverage for basic units within each subgroup.

If appropriate, the PA *"override rule"* can apply across subgroups.

Objective Evidence & Data Coverage Rules

- Coverage Rules for Support Functions
  1. Both artifacts and affirmations shall be provided for each support function for all PAs relating to work performed by that support function.
     - *E.g., a CM group would provide evidence for the CM PA.*
  2. The artifacts and affirmations provided by support functions shall demonstrate the work performed for basic units for at least one sampled basic unit in each subgroup. This applies for each PA relating to work performed by that support function.
  3. In cases where multiple support functions exist within the OU, all instances of the support functions shall be included in the appraisal scope.
     - *E.g., If multiple CM groups exist in the OU, all must provide evidence.*

These rules constitute PA coverage for support functions.

Objective Evidence & Data Coverage Rules

- Determining Process Area Coverage: BINDY Co
  - BINDY Co. is being appraised for CMMI-DEV maturity level 2
  - Sampling factors:
    - Location: Indianapolis, Boston
    - Type of Work: new, maintenance
    - Customer: DoD, commercial
  - Quality support function is done at the org level for all basic units
  - CM support function is done at the org level for all basic units
  - Basic units in Boston and Indianapolis follow separate standard measurement and analysis processes
  - Basic Units in Boston use a standard process for project planning. Plans are built from a common template, have same look/feel, standard contents, standard set of signatories, etc.

Objective Evidence & Data Coverage Rules

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

BINDY Co.		CM		MA		PPQA		PMC		PP		REQM		SAM	
		Art	Aff	Art	Aff	Art	Aff	Art	Aff	Art	Aff	Art	Aff	Art	Aff
Subgroup 1	Basic Unit A	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subgroup 2	Basic Unit B							X	X			X	X	X	X
	Basic Unit C								X						
Subgroup 3	Basic Unit D							X	X	X	X	X	X	X	X
Subgroup 4	Basic Unit E							X	X	X	X	X	X	X	X
Subgroup 5	Basic Unit F			X	X			X	X	X	X	X	X	X	X
	Basic Unit G									X	X				
	Basic Unit H												X		
	Total	1	1	2	2	1	1	5	6	5	5	5	6	5	5

Summary

- What we have covered…
  - Important definitions of terms used in organizational scoping
    - Appraisal scope, model scope, organizational unit, basic unit, sampling factor, subgroup, support function
  - Evolution of organizational scoping for CMMI appraisals
  - MDD V1.3 organizational scoping process
  - Results of MDD V1.3 organizational scoping in the CMMI community
  - MDD V1.3 data coverage rules
    - Process areas, basic units, support functions

- Note: the MDD is not just for lead appraisers.
  - Organizational staff involved in planning appraisals should also know the MDD
  - Appraisal team members should also know the MDD

Summary

- As always…
  - Professional judgment and due diligence required
  - Satisfy the requirements of the MDD and meet the needs of the organizational unit being appraised

Be reasonable – avoid extremes.

Questions

Thank you and congratulations!

Acronyms

ADS	Appraisal Disclosure Statement
CM	Configuration Management
MDD	Method Definition Document
OU	Organizational Unit
PA	Process Area
PARS	Published Appraisal Result Site
QA	Quality Assurance
SAS	SEI Appraisal System
SCAMPI	Standard CMMI appraisal Method for Process Improvement

Presenter Biography

- Michael Campo is a Principal Engineering Fellow at Raytheon Company, with 34 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 was a member of the CMMI V1.3 Core Model Team, the CMMI V1.3 Training Team, and the CMMI Configuration Control Board. He is a member of the National Defense Industrial Association (NDIA) CMMI Working Group.

Contact Information

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Backup slides

Objective Evidence (1.1.4 and 2.2.1)

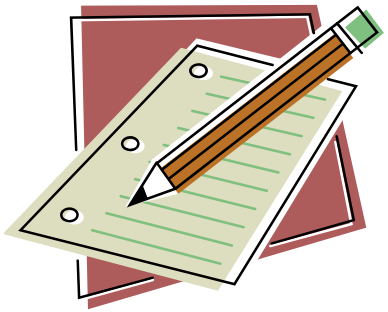
- *Artifacts*
  - Artifacts – a tangible form of objective evidence indicative of work being performed that represents either the primary output of a model practice or a consequence of implementing a model practice.
  - Examples of artifacts
    - Policies, meeting minutes, plans, test procedures
    - Demonstration or walkthrough of a tool by the person who uses the tool (e.g., requirements traceability tool demonstration)

Objective Evidence (1.1.4 and 2.2.1)

- *Affirmations*
  - Affirmation – oral or written statement confirming or supporting implementation (or lack of implementation) of a model practice, provided by implementers of the practice, provided via an interactive forum in which the appraisal team has control over the interaction.
  - Examples of oral affirmations
    - Interview responses, presentations, tool demonstrations
  - Examples of written affirmations
    - Email, written statements provided to the team, presentation/demonstration material (that are not outputs of a process)

Objective Evidence (1.1.4 and 2.2.1)

- Artifacts used as objective evidence must have been created or revised prior to the start of the Conduct Appraisal phase.
  - Artifacts created or revised as part of regularly planned activities (e.g., weekly meeting minutes, plan revisions, or releases) may be requested by the appraisal team – but cannot serve as the only evidence of implementation for a practice under consideration.
  - In no case would an artifact created after the start of the appraisal be accepted as the only artifact demonstrating the implementation of a practice.



Added for clarification