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Pittsburgh, PA 15213-3890

CMMI®

Interpreting Measurement and Analysis in CMMI®

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Workshop Format & Agenda

One half day (3.5 hours)

Introductions (10 minutes)

Review of measurement & analysis in CMMI (20 minutes)

- The Measurement and Analysis Process Area
- Other PA's and Generic Practices

Roundtable discussion (45 minutes)

- Problems in interpreting CMMI intent
- Improvements over source models

Breakout into small groups (1.5 hours + 15 minute break)

- Propose guidance on proper interpretation
- Summarize improvements over source models

Reconvene (30 minutes)

- Present findings – decide on next steps & action items

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Introductions -1

First: A show of hands…

How would you best describe your familiarity with CMMI?

- Never heard of it
- Heard of it
- Use it occasionally
- Use it regularly

What if any CMMI training have you received?

- Introduction to CMMI – Staged
- Introduction to CMMI – Continuous
- Intermediate CMMI
- CMMI instructor training
- SCAMPI[SM] lead appraiser training
- SCAMPI team training

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Introductions -2

Has your organization made a decision about adopting CMMI?

- Decision not made yet
- Adoption in progress
- Well institutionalized throughout the organization
- Chosen not to adopt CMMI

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Measurement:
A Review & Few Reminders

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Measurement:
What's Needed … And Too Often Missing

Explicit and focused guidance

- Not a strong point of earlier approaches to software process improvement
  - Well, it *was* always there … but in the fine print
  - Well-integrated focus on measurement is noticeably lacking

An *early* focus

- Especially in a field where measurement isn't widely or well understood
- Do it right in the first place … or expect rework

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What Else Typically Is Missing?

Collaboration & coordination

- So the right stuff gets measured …
- And we end up with useful, actionable guidance to inform business and technical decisions

Measurement expertise alone certainly won't always address the right business and technical issues

- That requires good business perspective & deep knowledge of application domain & technology
- *Yet* … a collaborative approach to measurement may itself help clarify the business objectives and information needs it is asked to address

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Measurement and Analysis in CMMI

Early emphasis introduced at Maturity Level 2

- Measurement and Analysis describes good measurement practice

But it's *not* just the new Process Area

- Maturing measurement processes at higher levels of organizational maturity
- Maturing measurement capability wherever it's applied

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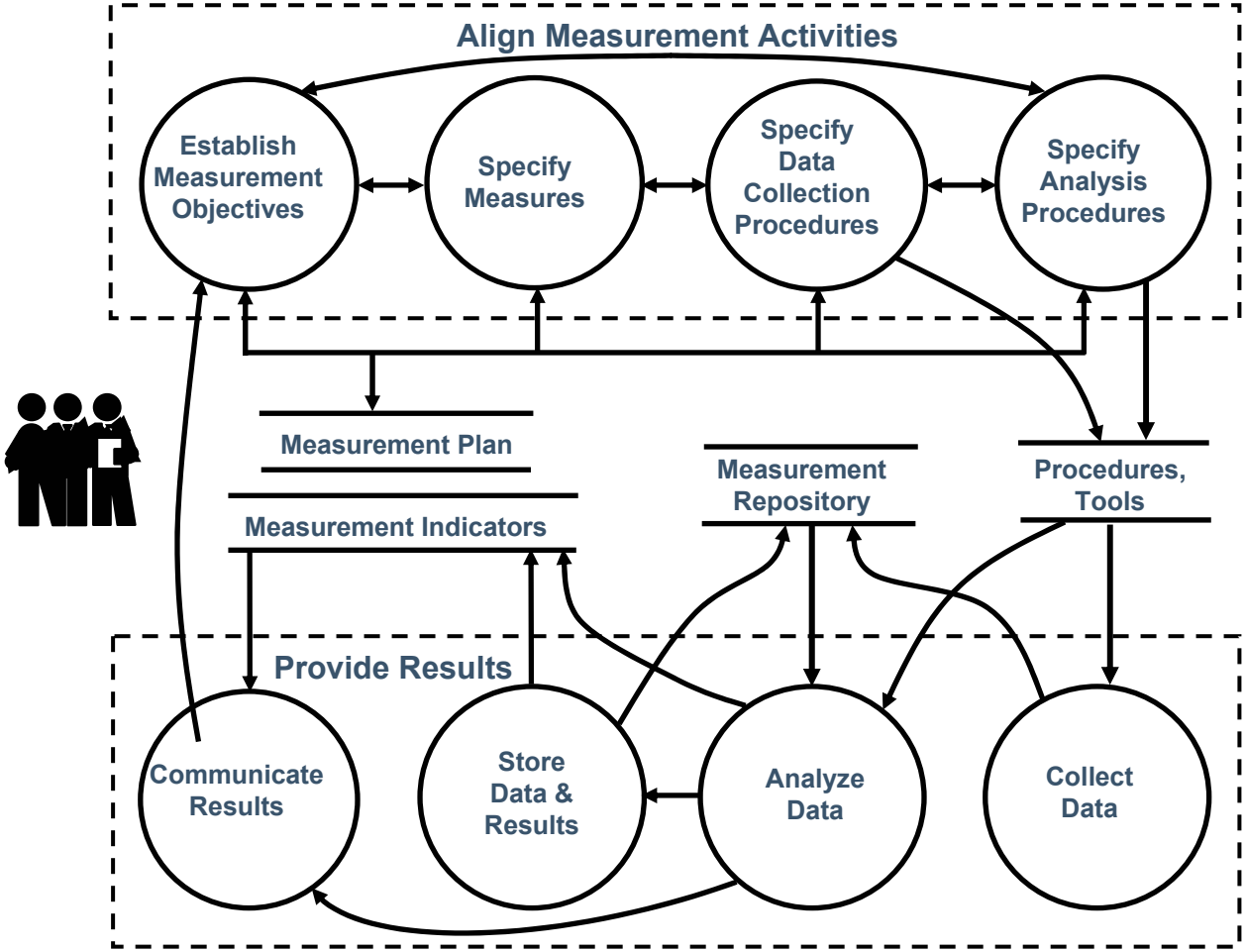
The Level 2 Process Area



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Measurement Related Generic Practices

Practice	Focus
2.8 Monitor and control the process	Monitor and control the process against the plan for performing the process and take appropriate corrective action
3.2 Collect improvement information	Collect work products, measures, measurement results, and improvement information derived from planning and performing the process to support the future use and improvement of the organization's processes and process assets
4.1 Establish quality objectives	Establish and maintain quantitative objectives for the process about quality and process performance based on customer needs and business objectives
4.2 Stabilize sub-process performance	Stabilize the performance of one or more subprocesses to determine the ability of the process to achieve the established quantitative quality and process performance objectives
5.1 Ensure continuous process improvement	Ensure continuous improvement of the process in fulfilling the relevant business objectives of the organization
5.2 Correct common cause of problems	Identify and correct the root causes of defects and other problems in the process

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Other Process Areas with Heavy Measurement Content

Organizational Process Definition

Organizational Process Performance

Quantitative Process Management

Causal Analysis & Resolution

Organizational Innovation Deployment

Any process area that references Measurement and Analysis

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By the Way

Where in the organization should responsibility for implementing measurement and analysis reside?

- Need there be an organization-wide measurement program?

The Measurement and Analysis PA is neutral:
It depends on organizational culture and context

- Exemplary projects often lead the way
- Responsibilities – and databases – can be distributed based on problem domains and technologies
- The best solution may be no separate program at all

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This Workshop

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Interpreting CMMI

What's right?

What's wrong?

What's confusing?

What's missing?

. . .

What's needed?

- Interpretive guidance
- Model revision

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Interpretive Guidance: Scope

The scope has been limited to the CMMI model initially

- Training and appraisal will be considered as issues warrant

Already created a CMMI for Software model that only contains software amplifications

CMMI-SW model used as the basis for this effort

We will look primarily at:

- process areas
- goals
- practices

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Potential Working Groups

Measurement and Analysis: The good, the bad, and the ugly…

Other heavily measurement oriented process areas

Other process areas, especially “new” to CMMI

Applying the measurement oriented generic practices to the other process areas

Applying all of the generic practices to the measurement oriented process areas

Consistent interpretation across appraisals

Global Issues: Adoption and transition to CMMI

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Roundtable Discussion

Okay, what are the issues?

What problems have you had interpreting CMMI model intent?

How have you resolved them?

- In process improvement efforts
- In appraisals
- What are you willing to share?

What improvements have you seen compared to the source models?

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Breakout into Small Groups

Want to collect issues as quickly and concisely as possible.

Want to have everyone participate.

We know we may not be able to cover all the process areas, but we will collect information in all areas of interest.

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Global Issues

Concepts

Terminology

Representations

Adoption
- size of models
- cost
- environment
- migration from SW-CMM

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Generic Goals and Practices

Particularly useful model content

Confusing use of words or phrases that need to be clarified

Concerns about changes from models that you have used before (e.g., emphasis or de-emphasis of former model components)

Inappropriate level of detail (i.e., too much or not enough)

Difficult to apply to certain Process Areas

Difficulty understanding relationships with related content elsewhere in the model (e.g., among the generic practices or with specific practices in the process areas)

Other issues or concerns

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Process Areas

Particularly useful model content

Confusing use of words or phrases that need to be clarified

Concerns about changes from models that you have used before (e.g., emphasis or de-emphasis of former model components)

Inappropriate redundancy or inconsistency with related content elsewhere in the model

Inappropriate level of detail (i.e., too much or not enough)

Difficult to apply or not applicable to this organization

The need for alternative practices to satisfy model content

Other issues or concerns

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Roles in the Working Groups

Facilitator and Presenter – lead discussion and capture issues on the flipchart (assigned)

Recorder – provide detailed notes of the discussion, preferably on-line (volunteer)

Timekeeper – keep track of the time so that you can achieve your objectives for covering the model content (volunteer)

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Session Outcomes

There will be 3 primary outcomes from working groups:

1. issues captured on flipcharts
2. detailed notes from recorder
3. presentation to overall group

Each working group only has 5 minutes at the end of the session to present to the overall group. Therefore, summarize your discussion into the “top 5” points.

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Time to Break into Working Groups

Pick the group which interests you most.

If group is too big, we may divide it.

If no one picks a group, that is ok.

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Work Group Presentations

Reminder…

Only have 5 minutes to present

Hold questions until the end of the workshop

Summarize the most important issues and discussions

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Back-up Slides

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Maturing Measurement Capability

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Early Focus Typically On …

Clarifying sometimes implicit business needs & translating them into measurable objectives

Building basic skills resources, & experience for the future

Often starting with the use of simple charts and graphs

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As Capability Matures …

Demand increases for more sophisticated quantitative analyses, e.g.,

- Statistical process control (SPC), structural modelling, other multivariate statistical methods

Analytic sophistication increases, e.g.,

- Finer grained measures of defects & product quality are coupled explicitly with process performance

Routine reliance on quantitative management enhances process discipline

Systematic programs of defect prevention and improved process performance often lead to increased predictability of productivity and schedule

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There's Still Room for Improvement

Quantitative Process Management still emphasizes statistical process control (SPC)

- That's a good thing after all!
- But there's a lot more out there too

Non SPC techniques <u>are</u> used

- Six Sigma
- Orthogonal Defect Classification
- Regression
- ANOVA

Yet higher maturity organizations often don't have a particularly broad analytic tool kit

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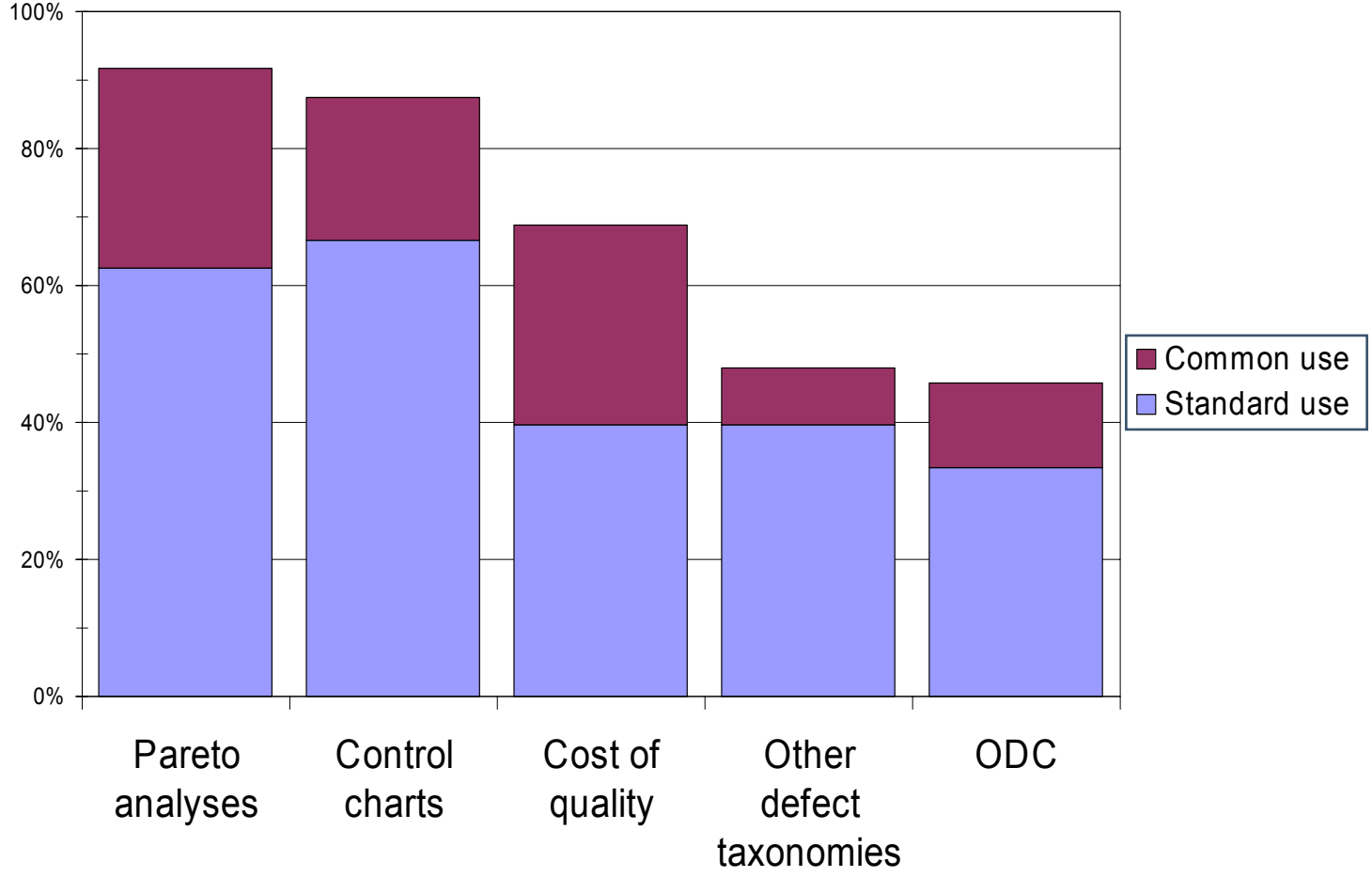
High Maturity Use of Analytics –1



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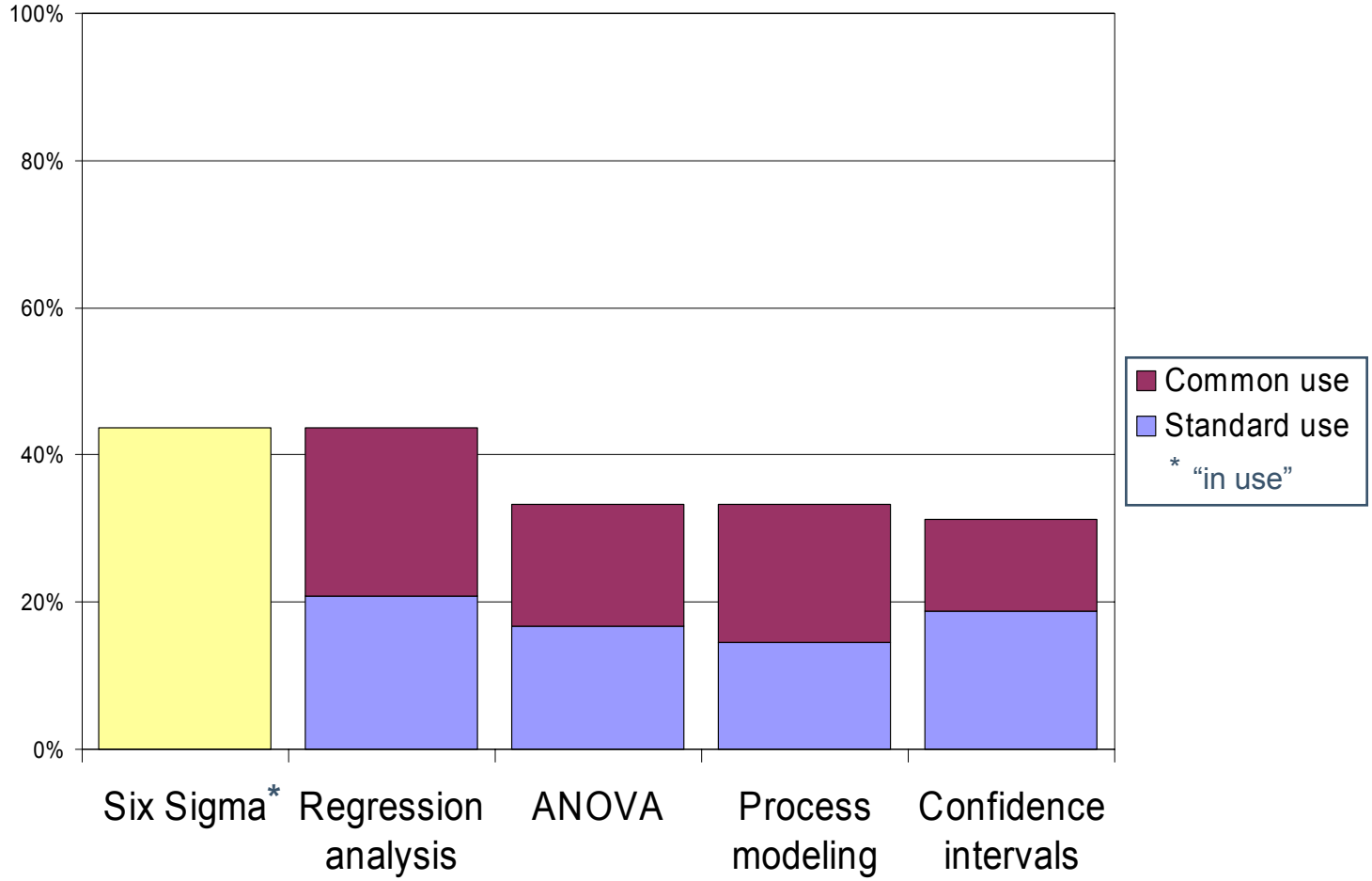
High Maturity Use of Analytics –2



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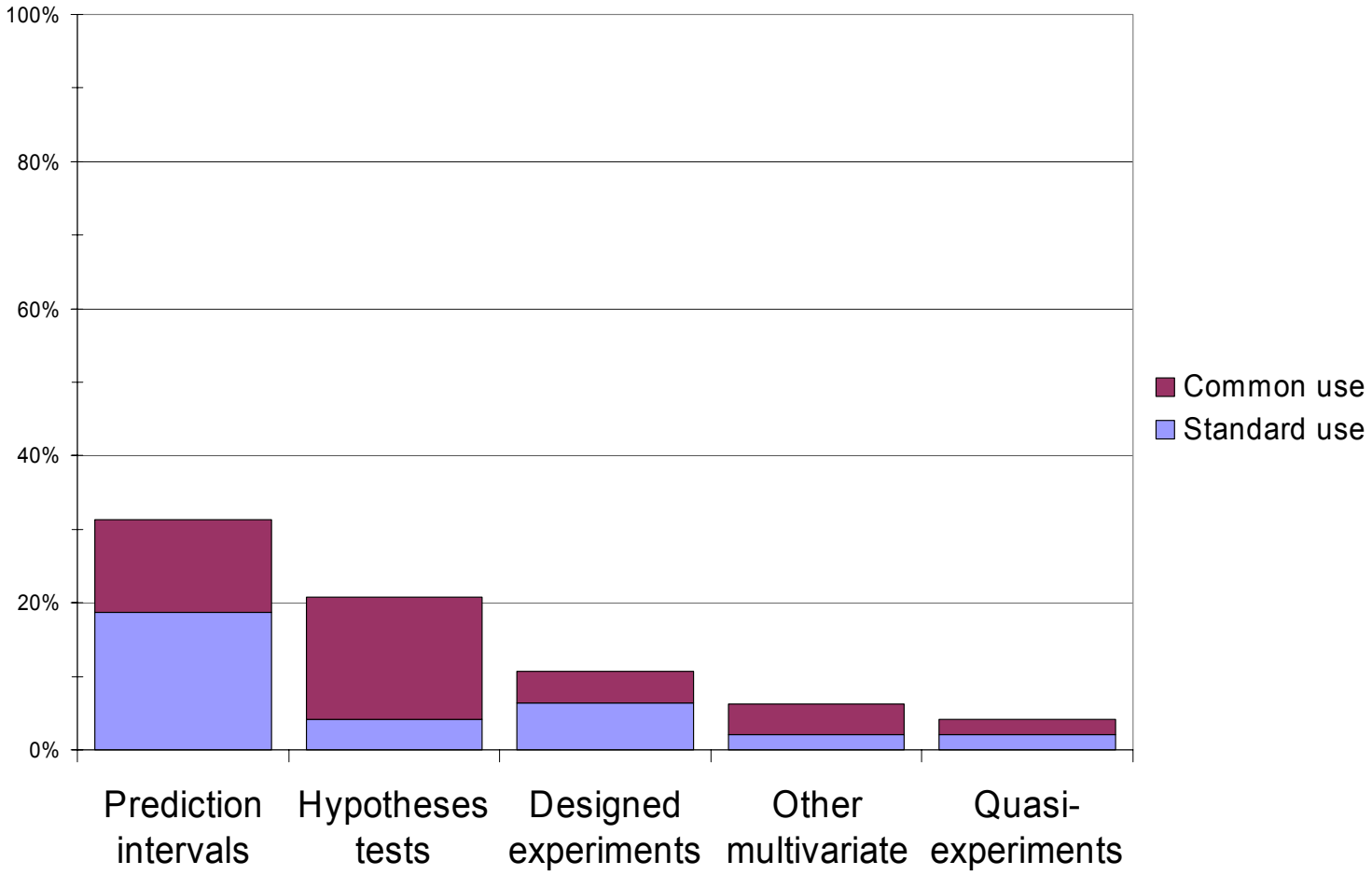
High Maturity Use of Analytics –3



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CMMI: A Little Refresher

Two Representations

Organizational Maturity

Process Capability

Process Areas

Common Features

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One Model, Two Representations

Appendixes

Maturity Level 5
OID, CAR

Maturity Level 4
OPP, QPM

Maturity Level 3
REQD, TS, PI, VER, VAL, OPF, OPD, OT, IPM, RSKM, DAR

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

Overview
- Introduction
- Structure of the Model
- Model Terminology
- Maturity Levels, Common Features, and Generic Practices
- Understanding the Model
- Using the Model

CMMI-SE/SW Staged

Appendixes

Support
CM, PPQA, MA, CAR, DAR

Engineering
REQM, REQD, TS, PI, VER, VAL

Project Management
PP, PMC, SAM IPM, RSKM, QPM

Process Management
OPF, OPD, OT, OPP, OID

Overview
- Introduction
- Structure of the Model
- Model Terminology
- Capability Levels and Generic Model Components
- Understanding the Model
- Using the Model

CMMI-SE/SW Continuous

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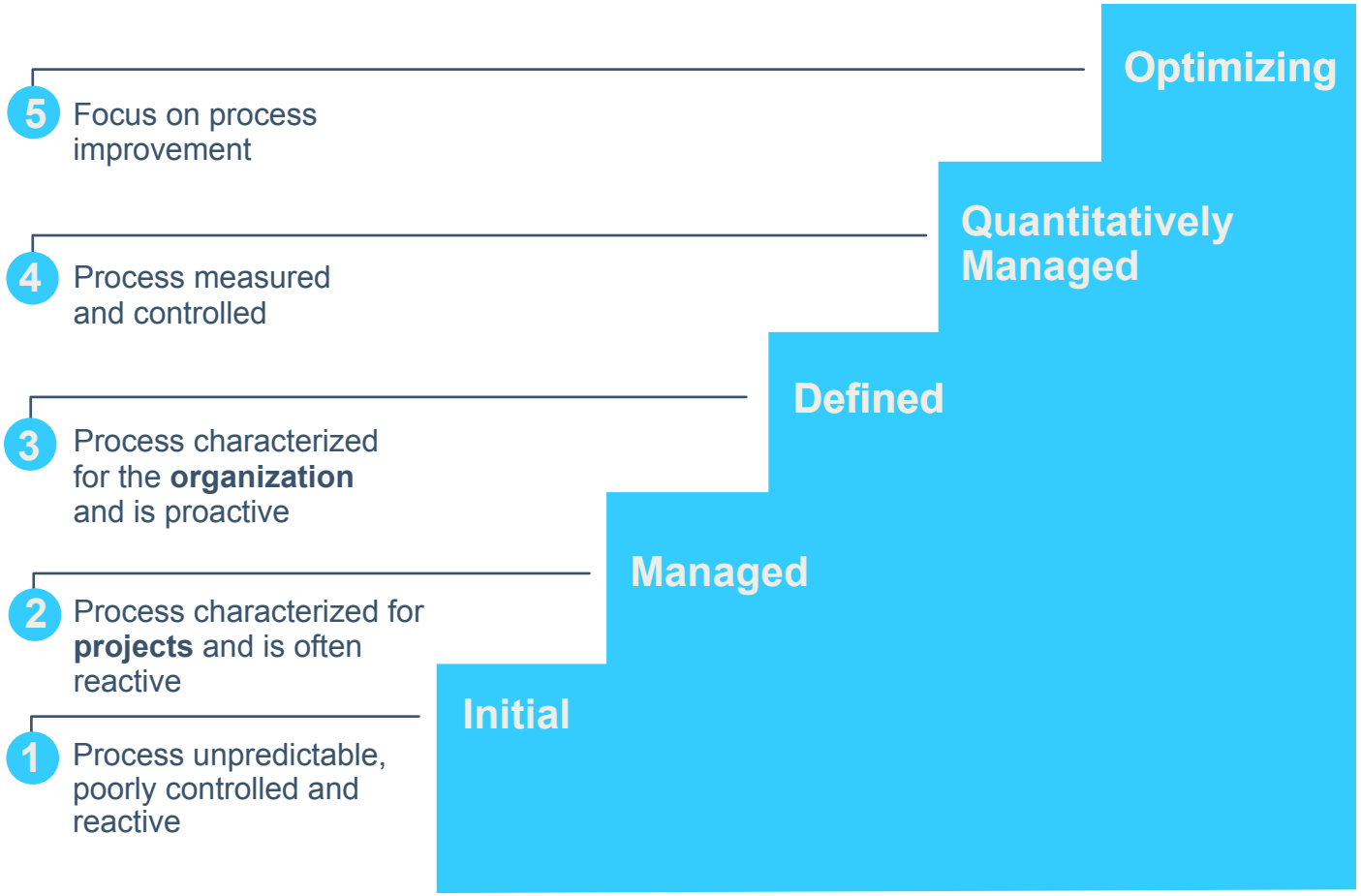
The Maturity Levels



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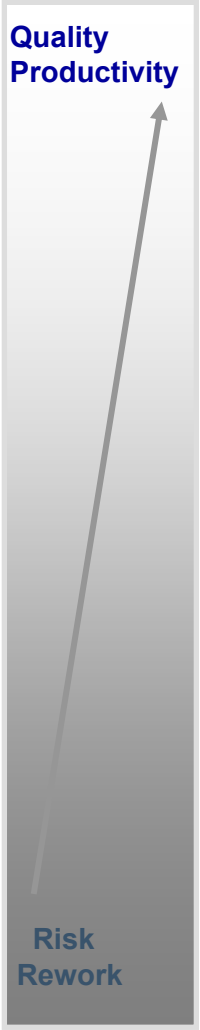
CMMI®

Level	Focus	Process Areas
5 Optimizing	*Continuous Process Improvement*	Organizational Innovation and Deployment Causal Analysis and Resolution
4 Quantitatively Managed	*Quantitative Management*	Organizational Process Performance Quantitative Project Management
3 Defined	*Process Standardization*	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Decision Analysis and Resolution
2 Managed	*Basic Project Management*	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Initial		



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Category	Process Areas
Process Management	Organizational Process Focus Organizational Process Definition Organizational Training Organizational Process Performance Organizational Innovation and Deployment
Project Management	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management Risk Management Quantitative Project Management
Engineering	Requirements Management Requirements Development Technical Solution Product Integration Verification Validation
Support	Configuration Management Process and Product Quality Assurance Measurement and Analysis Causal Analysis and Resolution Decision Analysis and Resolution

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Process Capability Levels

5 Optimizing

4 Quantitatively Managed

3 Defined

2 Managed

1 Performed

0 Incomplete

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More on CMMI: Adoption & Transition

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CMMI Transition Status – 5-31-03[1]

Training

- Introduction to CMMI—8053 trained
- Intermediate CMMI—579 trained
- Introduction to CMMI Instructors—161 trained
- SCAMPI Lead Appraisers[SM]—241 trained

Authorized

- Introduction to CMMI V1.1 Instructors—131
- SCAMPI V1.1 Lead Appraisers—197

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CMMI Transition Status – 5-31-03$_2$

- Transition partnering
  - Introduction to CMMI
    - 55 have signed
      - 25 are commercial offerors only
      - 17 are internal-use only
      - 13 are both
    - 3 in signature process
    - 1 in continuing review
    - 2 in government-use only process

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CMMI Transition Status – 5-31-03[3]

SCAMPI Appraiser Services

- 108 have signed
  - 56 commercial offerors only
  - 12 are internal-use only
  - 39 are both
  - 1 government-use only
- 5 in signature process
- 13 in continuing review
- 6 in government-use only process

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CMMI V1.1 Appraisals - 13 June 2003

The following was specially prepared for:

- European SEPG, 16 June 2003
- Software Process Engineering Symposium in Japan, 3 July 2003

The following slides report only on appraisal data received in which a V1.1 model and SCAMPI V1.1 were used.

- V1.1 model and SCAMPI method have been available for use since since early/mid 2002.

The analysis was conducted 11-13 June 2003.

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SCAMPI℠ Version 1.1 Appraisals*

87	Appraisals
81	Organizations
46	Participating companies
12	Countries
57%	Non-U.S. organizations

Analysis conducted 13 June 2003

*Per data in PAIS database covering the period late May 2002 – early June 2003.

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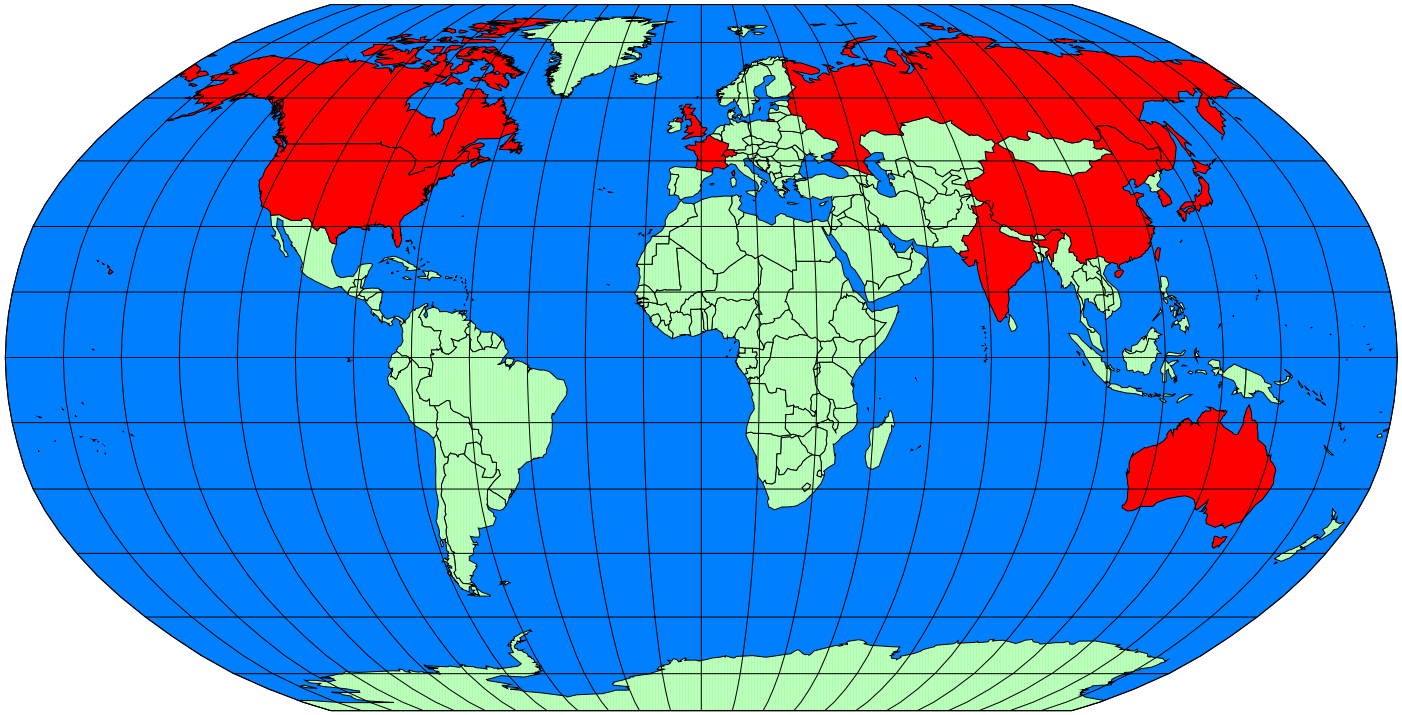
CMMI Appraisals Around the World



Australia
Canada
China
France
India
Japan
Russia
South Korea
Switzerland
Taiwan
United Kingdom
United States

Analysis conducted 13 June 2003

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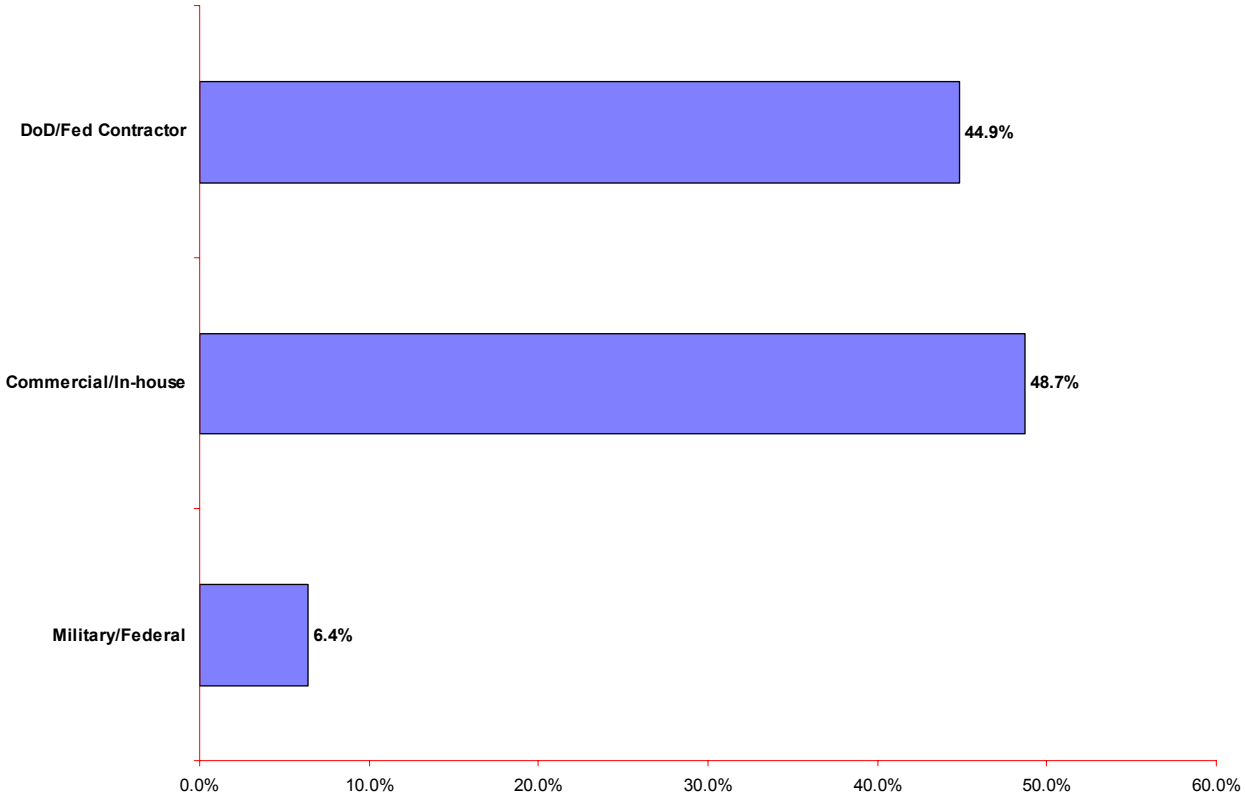
Reporting Organization Types



Analysis conducted 13 June 2003

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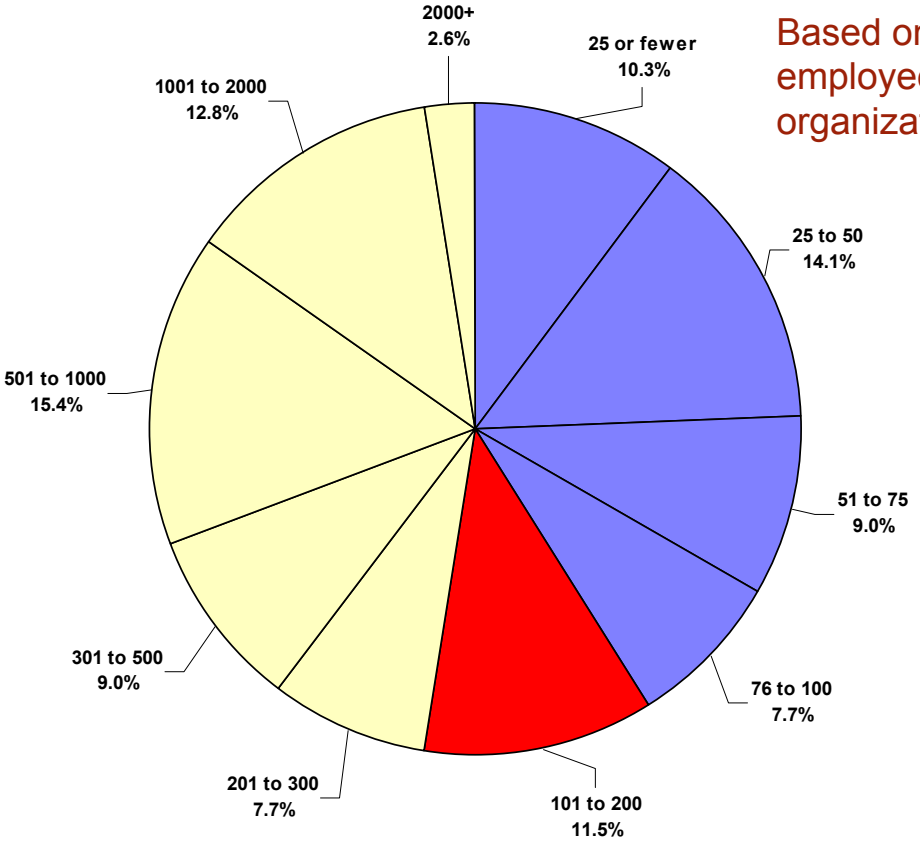
Organization Size



Based on the total number of employees within the area of the organization that was appraised

Analysis conducted 13 June 2003

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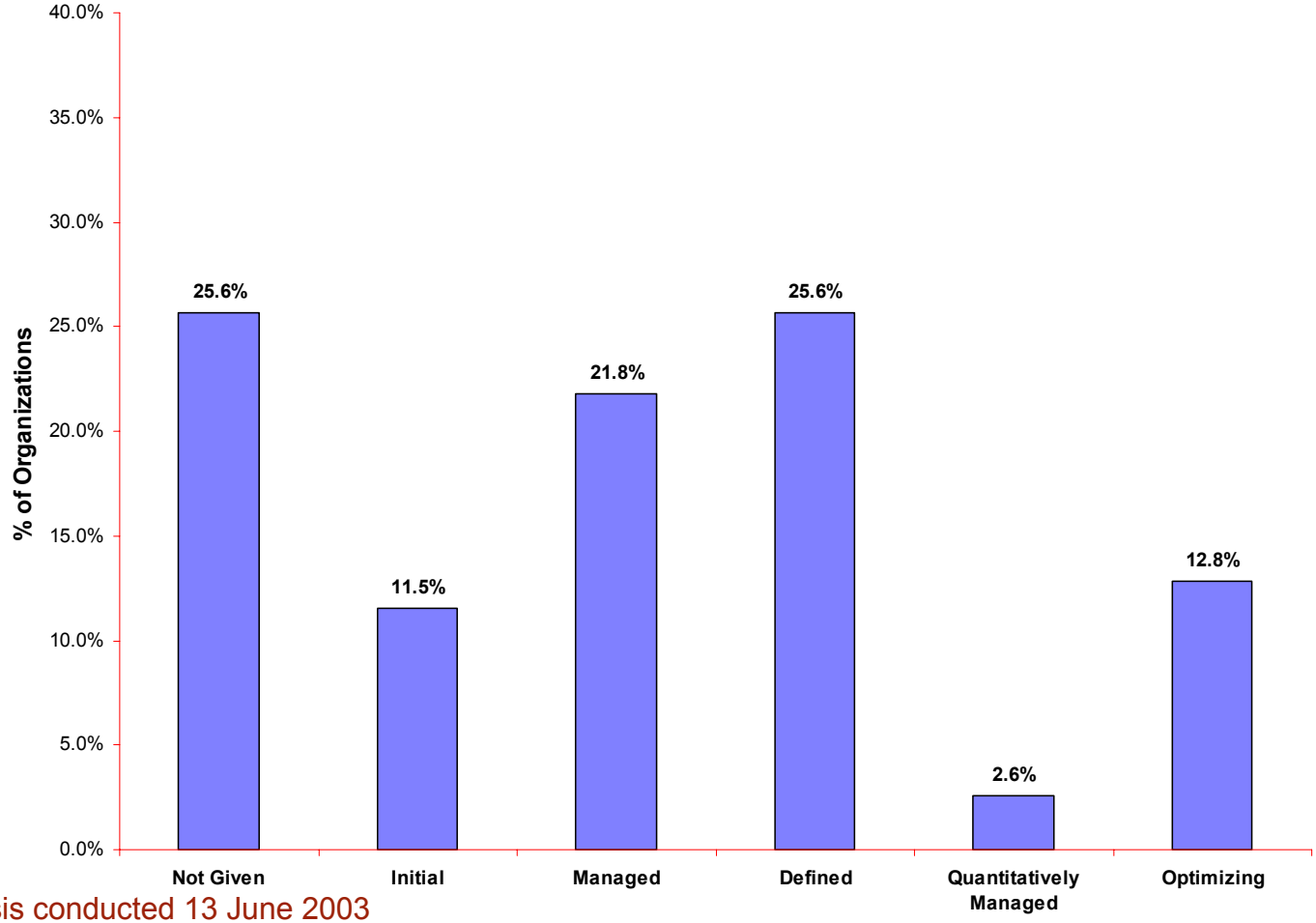
Organization Maturity Profile



Analysis conducted 13 June 2003

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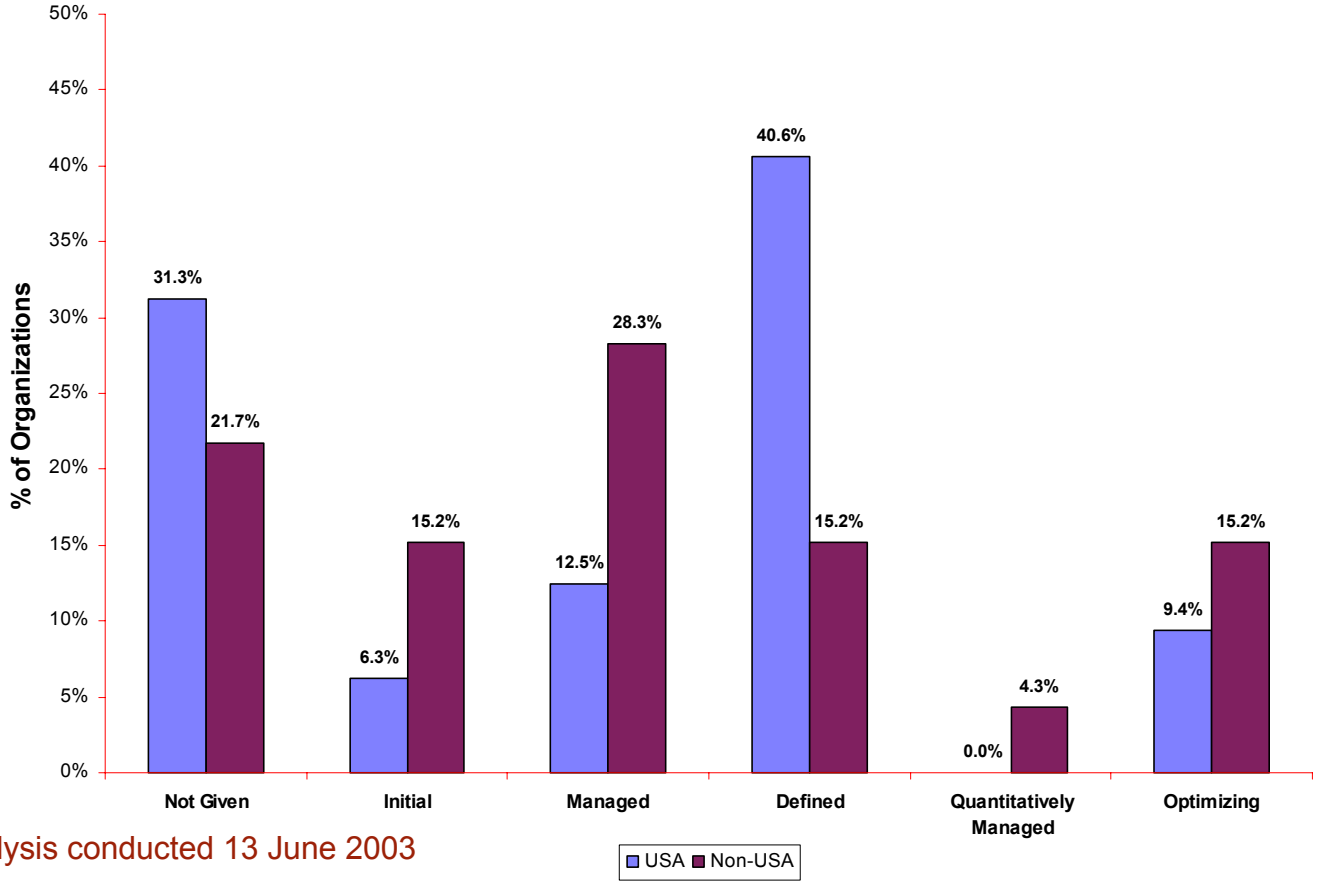
U.S. and Non-U.S. Organization Maturity Profiles



Analysis conducted 13 June 2003

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SEPG 2003 Appraisal Data Analysis - 1

For SEPG 2003 in February 2003, the SEI analyzed all CMMI appraisal data received to date. The following slides report on the results of this analysis.

One key decision resulting from this analysis was to only report V1.1-based appraisal data in the future.

- To simplify our reporting
- To enhance comparability of appraisal data

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SEPG 2003 Appraisal Data Analysis - 2

SCAMPI appraisals conducted since 1999 and reported to the SEI by February 2003:

- 73* appraisals
- 40 participating companies
- 30% organizations upgrading
- 70% organizations new to CMMs
- 52% offshore organizations

*Less than half were V1.1-based

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SEPG 2003 Appraisal Data Analysis - 3

Model and Appraisal Method Use

	CMMI v1.0	CMMI v1.1	Total
SCAMPI v1.1	2	27	29
SCAMPI v1.0	32		32
SCE	4		4
Total	38	27	65

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SEPG 2003 Appraisal Data Analysis - 4

Selected Models

Model	Count
SW + SE	18
SW + SE + IPPD	2
SW + SE + IPPD + SS	
SW + SE + + SS	4
SW	1
SE	1

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SEPG 2003 Appraisal Data Analysis - 5

Selected Architecture and Models

Representation/ Model	Staged	Continuous
Software	20	6
Systems	20	6
IPPD	2	
Supplier Sourcing	4	

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April 2003 CMMI Transition Analysis - 1

In late April 2003, we performed several analyses of CMMI transition.

The following slides report on some of these analyses.

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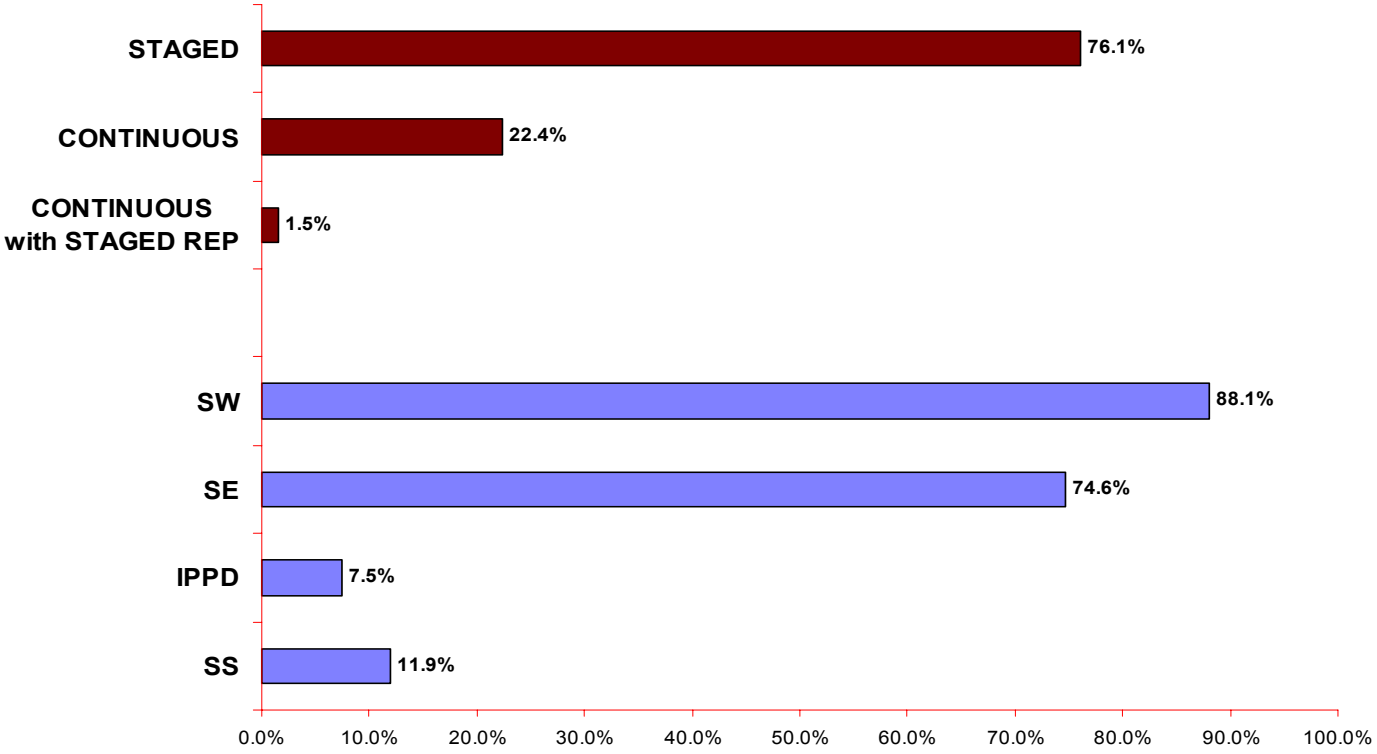
April 2003 CMMI Transition Analysis - 2

CMMI Model Representations and Disciplines Used



Based on 67 assessments

CMMI Maturity Profile, April 29, 2003

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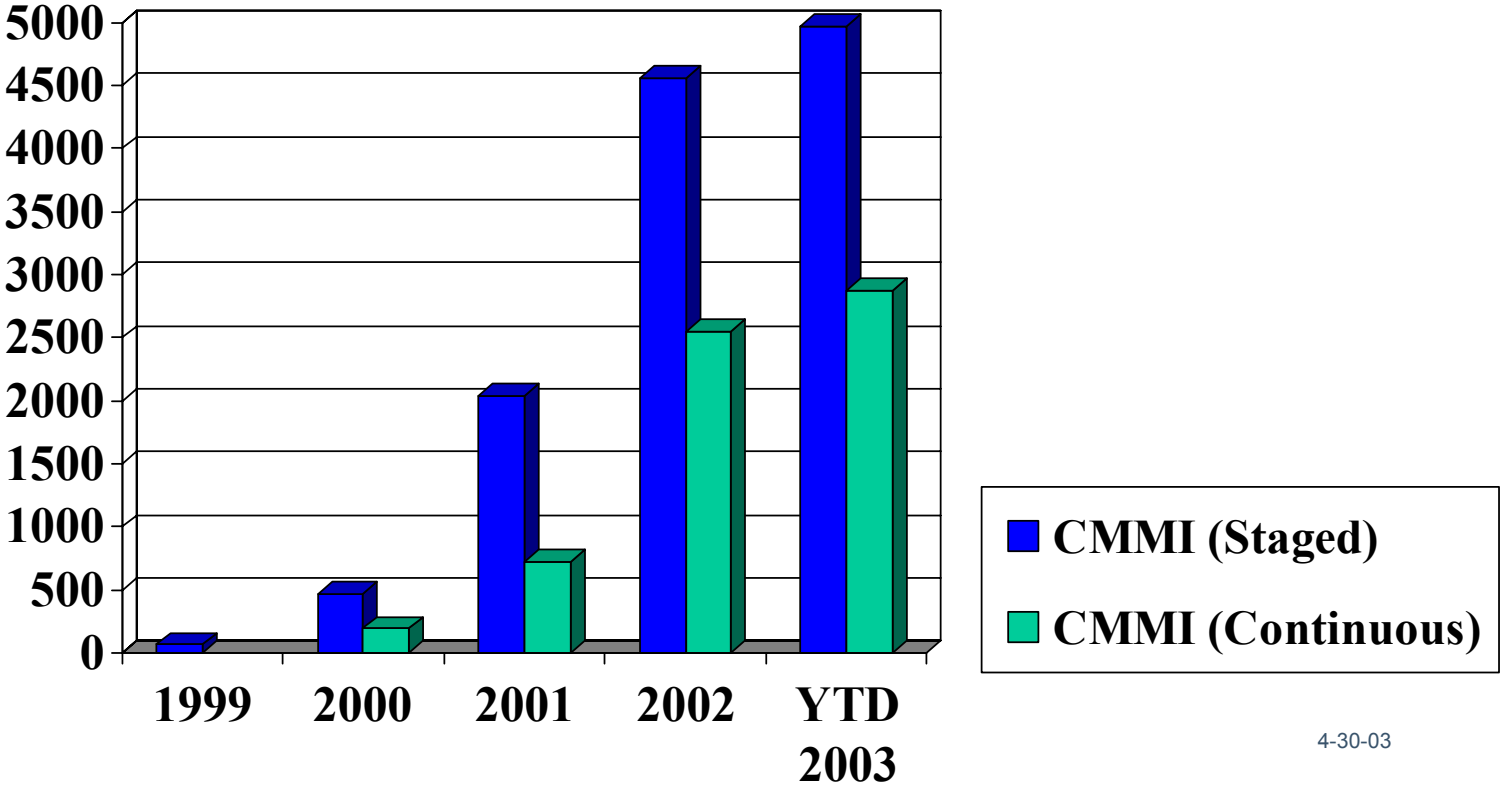
Number of CMMI Students Trained (Cumulative)



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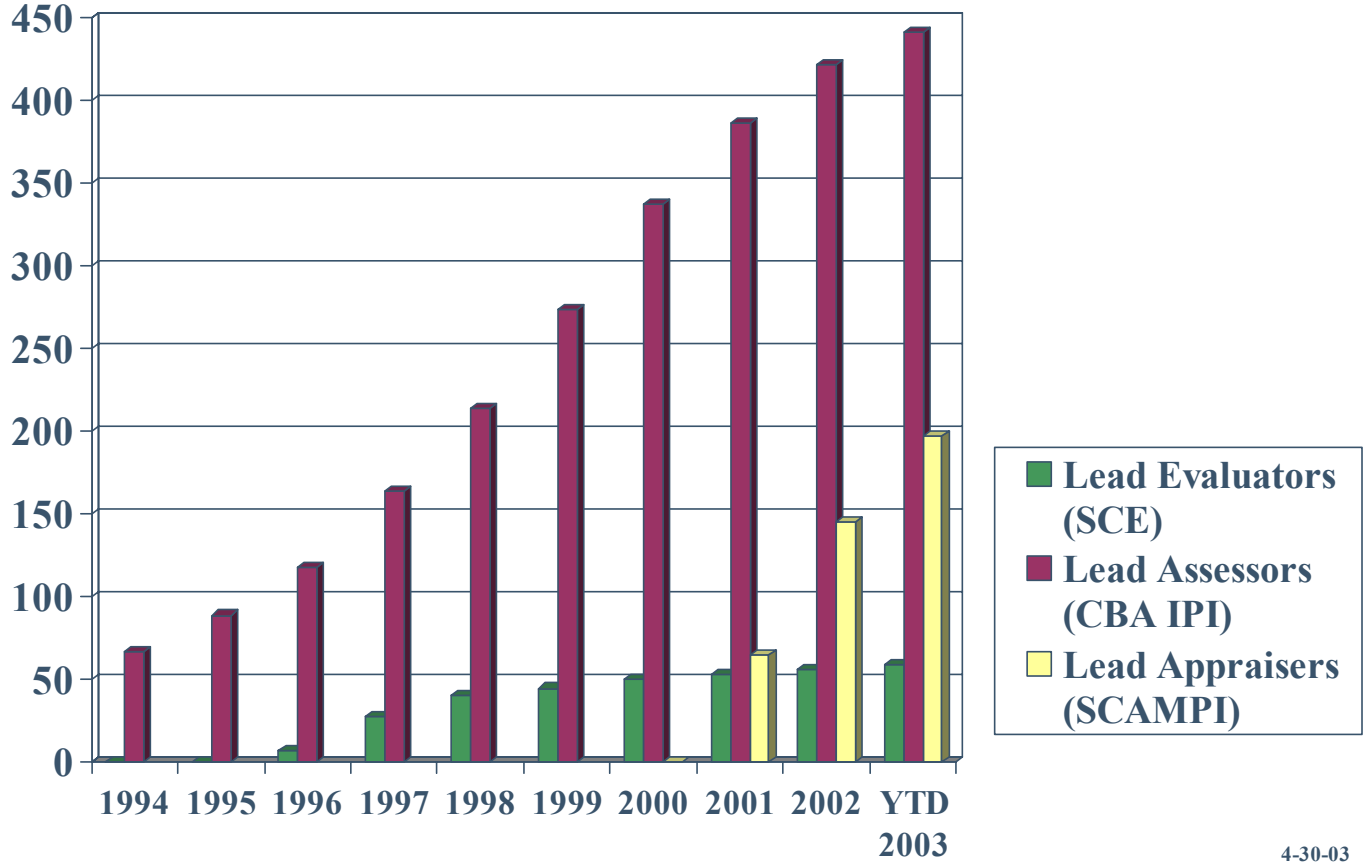
Number of Lead Appraisers Authorized (Cumulative)



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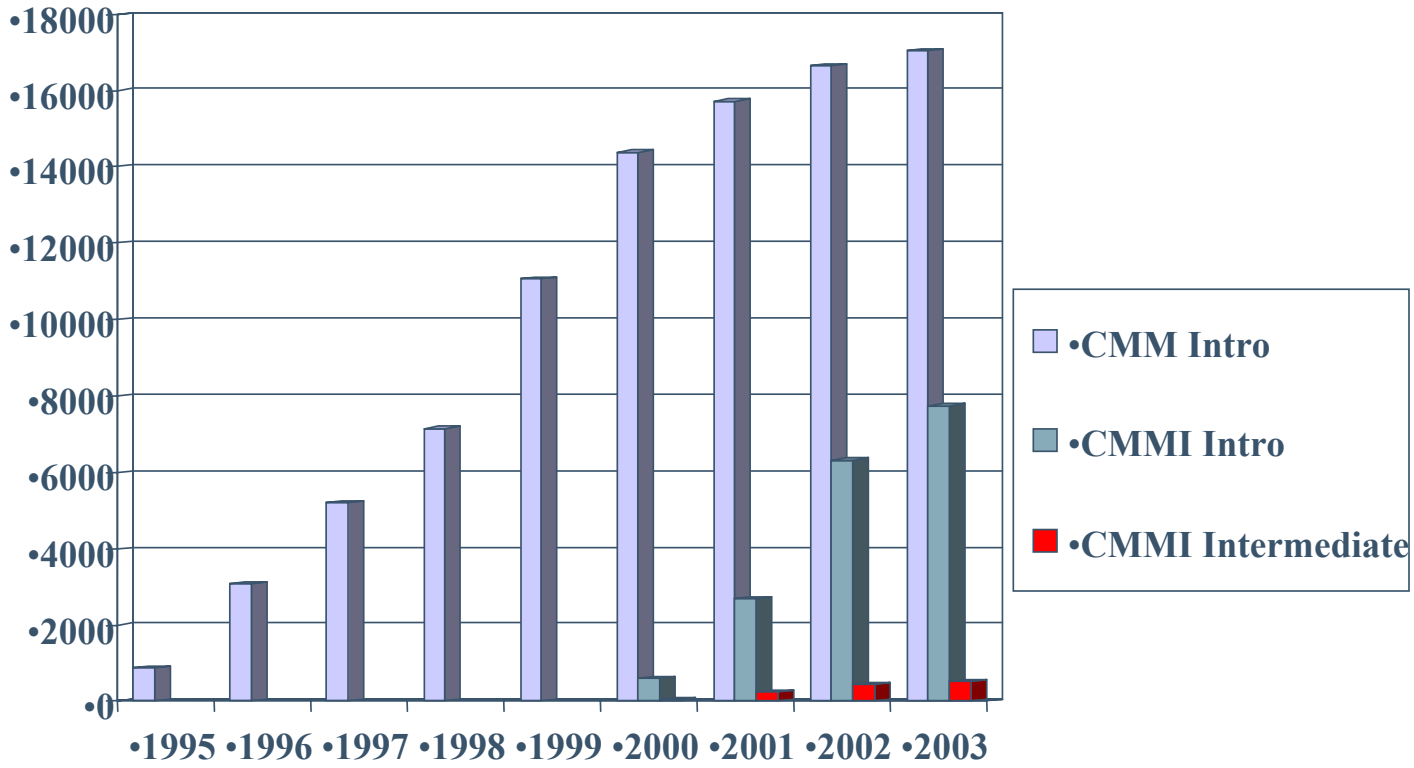
Intro to CMM and CMMI Attendees (Cumulative)



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May 2003 CMMI Transition Analysis

In early May 2003, we performed several analyses of CMMI transition.

The following slides report on some of these analyses.

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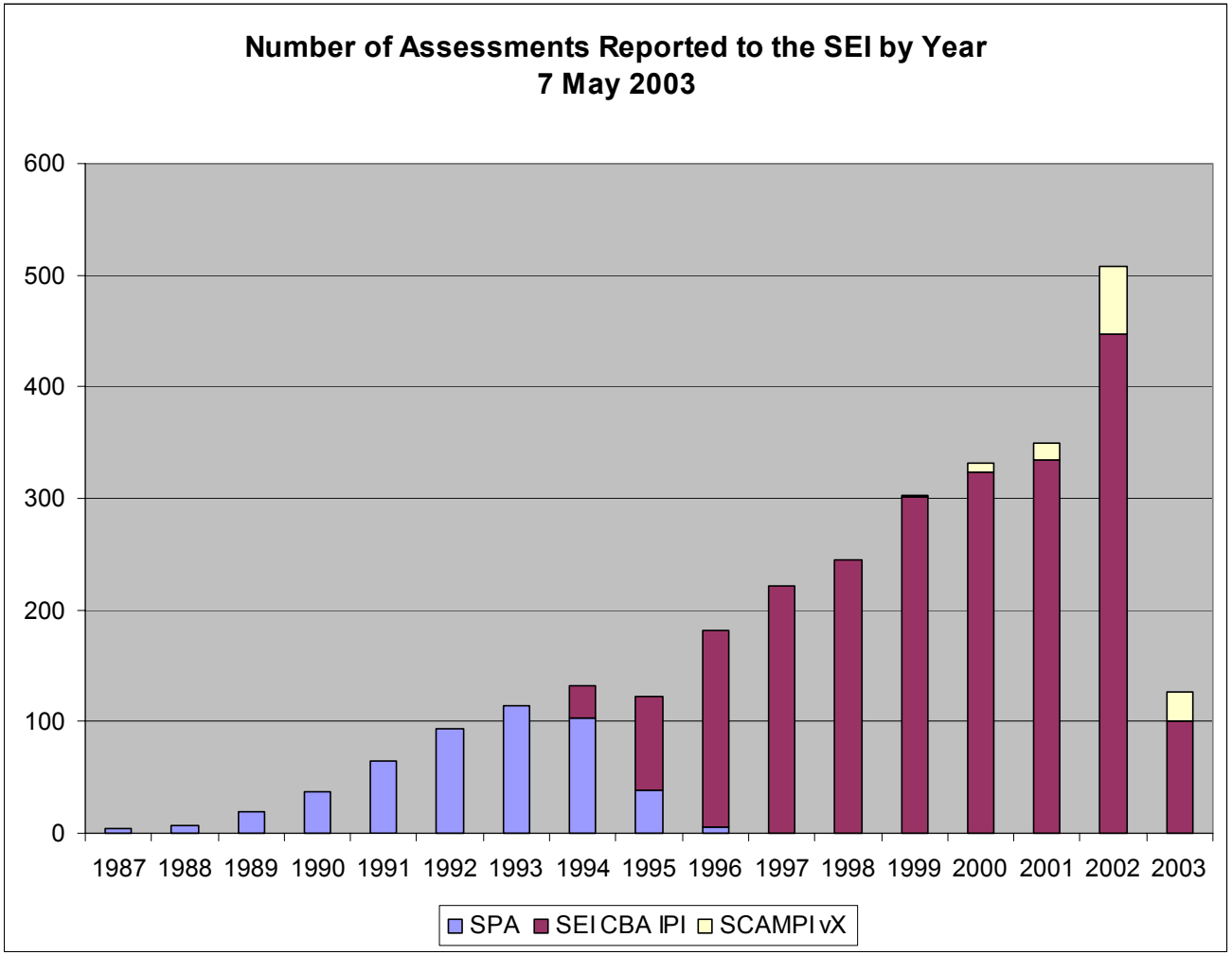

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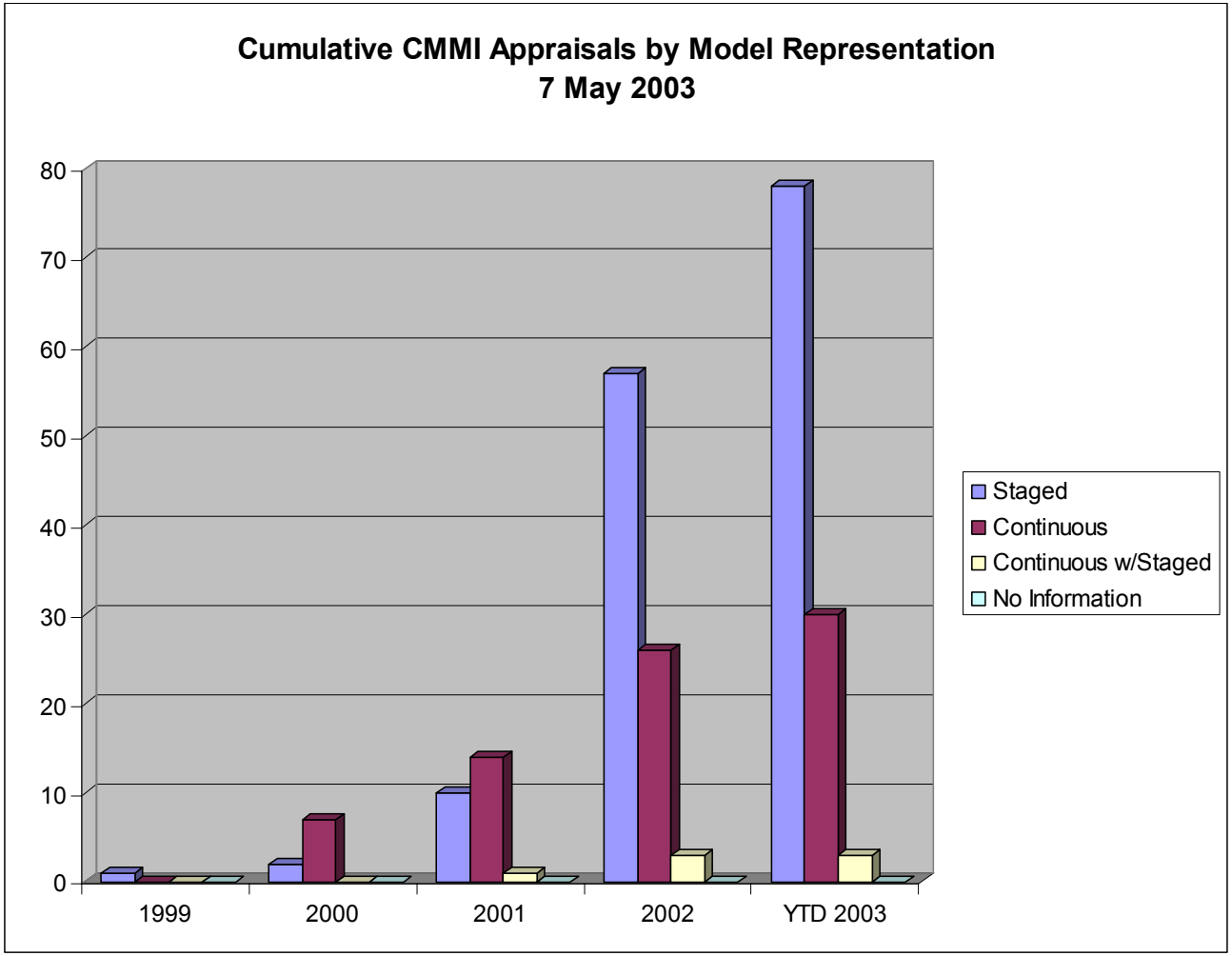

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CMMI Appraisals—What's Happening?

SCAMPI Class B & Class C appraisal methods and training will be piloted; public release is planned for 2004.

Information about upgrading to CMMI/SCAMPI is being added to CBA-IPI Lead Assessor training.

Additional information on upgrading from CBA-IPI will be available.

SCAMPI for SW-CMM and other models will be announced.

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CMMI Training—What's Happening?

CMMI Training course materials will be improved based on change requests submitted by students and instructors.

- *Introduction to CMMI, Staged Representation*
- *Introduction to CMMI, Continuous Representation*
- *Intermediate Concepts of CMMI*
- *CMMI Instructor Training*

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