



**Carnegie Mellon  
Software Engineering Institute**

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Pittsburgh, PA 15213-3890

# CMMI<sup>®</sup> Today

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## Brief History – CMMI

1992 – Software CMM created

1994 – Systems Engineering CMM created

1998 – CMMI Product Suite initiated

2001 – CMMI-SE/SW V1.0 released

2002 – CMMI-SE/SW/IPPD/SS V1.1 Product Suite  
released

2003 – 10,000 people trained in “Intro to CMMI;” 150+  
SCAMPI benchmark appraisals in at least 12  
countries; CMMIweb site “hits” exceed 1M/month



## CMMI Today

Stable Version 1.1 CMMI Product Suite was released January 2002.

Errata sheets cover known errors and changes with book publication.

FAQs are generated to cover broader issues.

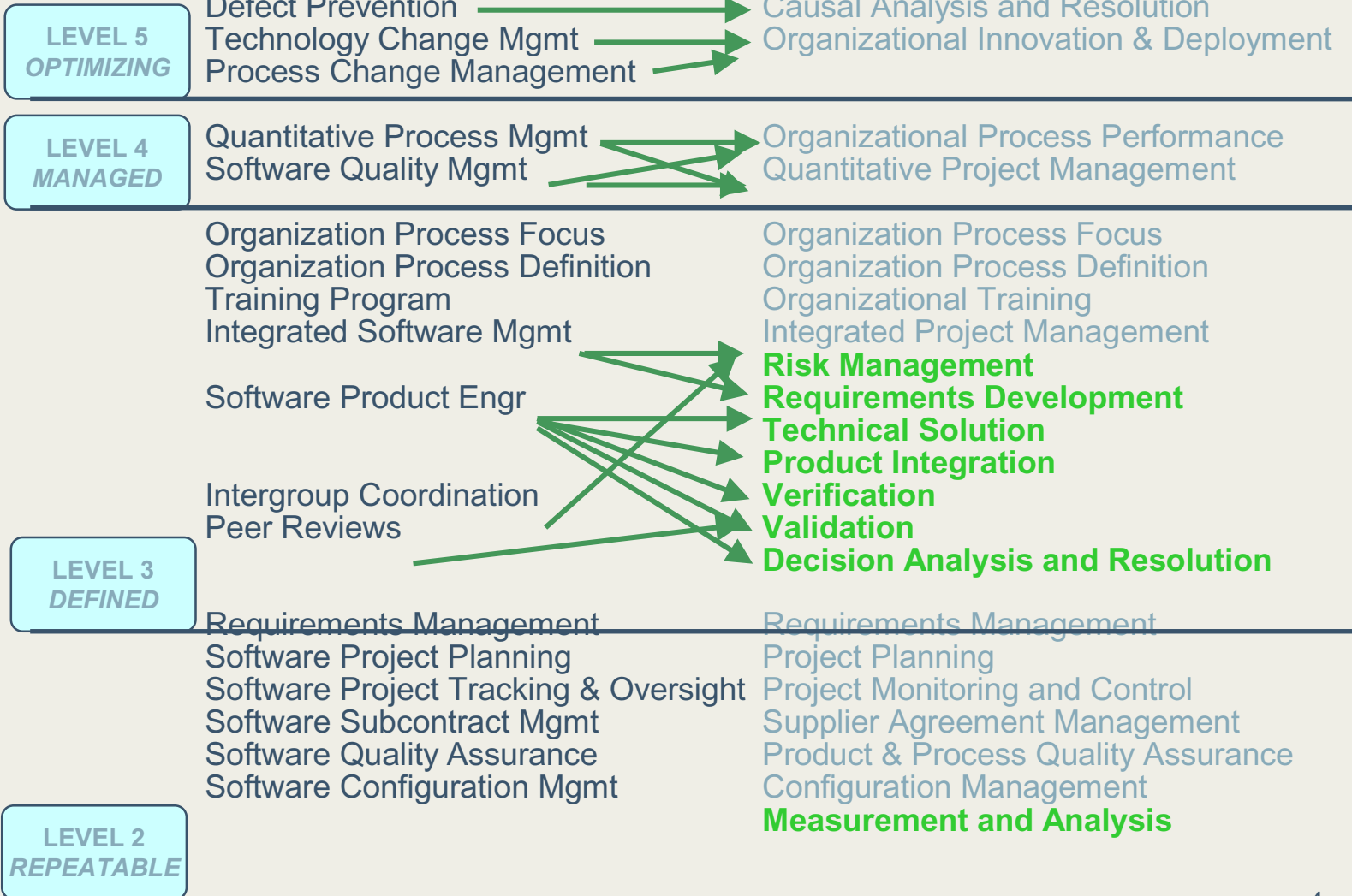
Yahoo has CMMI Process Improvement and Lead Appraiser Group sites.

CMMI web pages hits have surpassed 1M/month.

Change Request announcement addressed 90 day review period through Dec 12.



# SW-CMM v1.1 vs. CMMI Process Areas





## CMMI Improvements over the CMM

Emphasis on measurable improvements to achieve business objectives.

Process areas have been added to place more emphasis on some important practices:

- Risk Management
- Measurement and Analysis
- Engineering Process Areas
- Decision Analysis



## Adoption—What else is happening now?

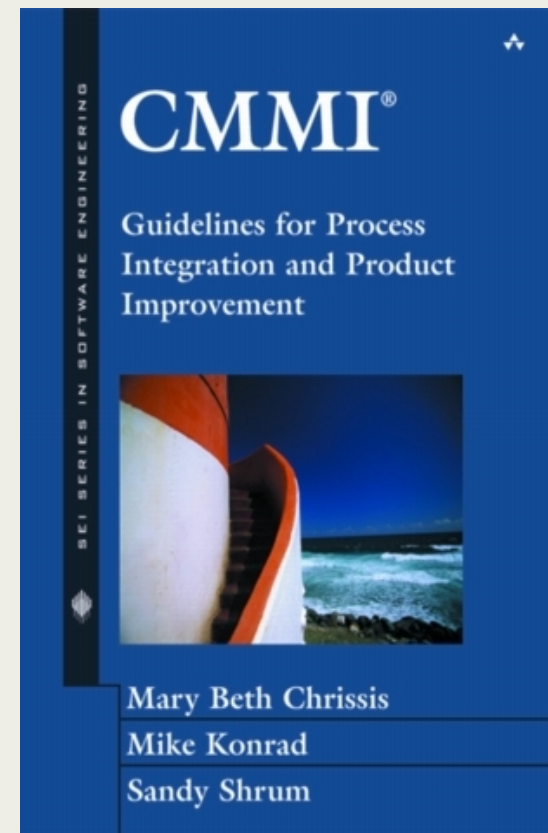
Publication of SEI Series Book with Addison-Wesley: others include:

- CMMI Distilled: Second Edition
- Systematic Process Improvement Using ISO 9001:2000 and CMMI
- Balancing Agility and Discipline

Annual NDIA/SEI CMMI User Workshop

- Denver Hyatt Technical Center
- Nov 17-20  
400+ attendees

Mappings taken on by IEEE





## How about SEI Publications?

Technical notes and special reports:

- Interpretive Guidance Project: Preliminary Report
- CMMI and Product Line Practices
- CMMI and Earned Value Management
- Interpreting CMMI for Operational Organizations
- Interpreting CMMI for COTS Based Systems
- Interpreting CMMI for Service Organizations
- Providing Safety and Security Assurance (in progress)
- Interpreting CMMI for Acquisition (in progress)



# CMMI Transition Status

As of 12/31/03

## Training

**Introduction to CMMI – 10103 trained**

**Intermediate CMMI – 777 trained**

**Introduction to CMMI Instructors – 219 trained**

**SCAMPI Lead Appraisers – 379 trained**

## Authorized

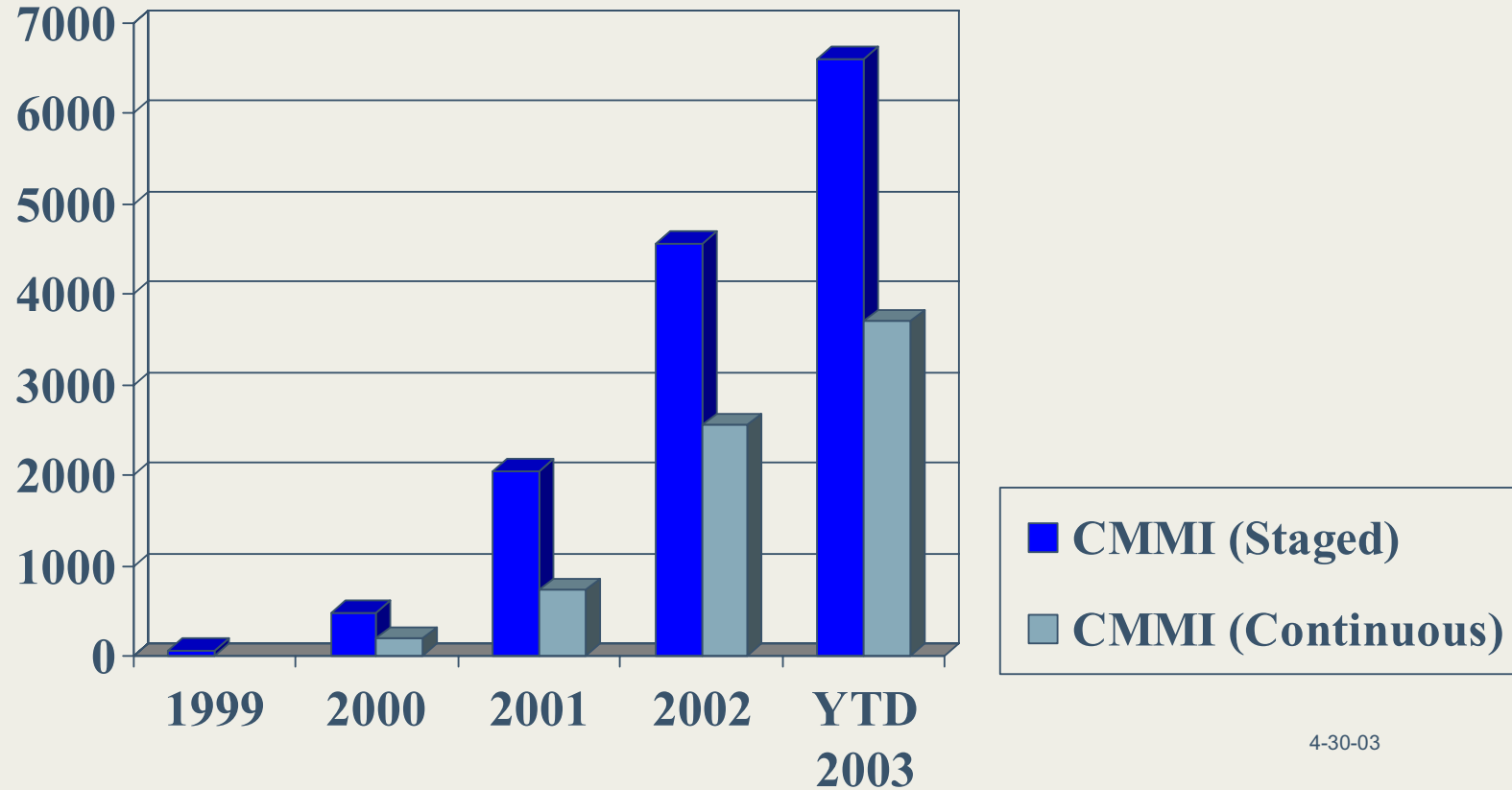
**Introduction to CMMI V1.1 Instructors - 176**

**SCAMPI V1.1 Lead Appraisers – 267**



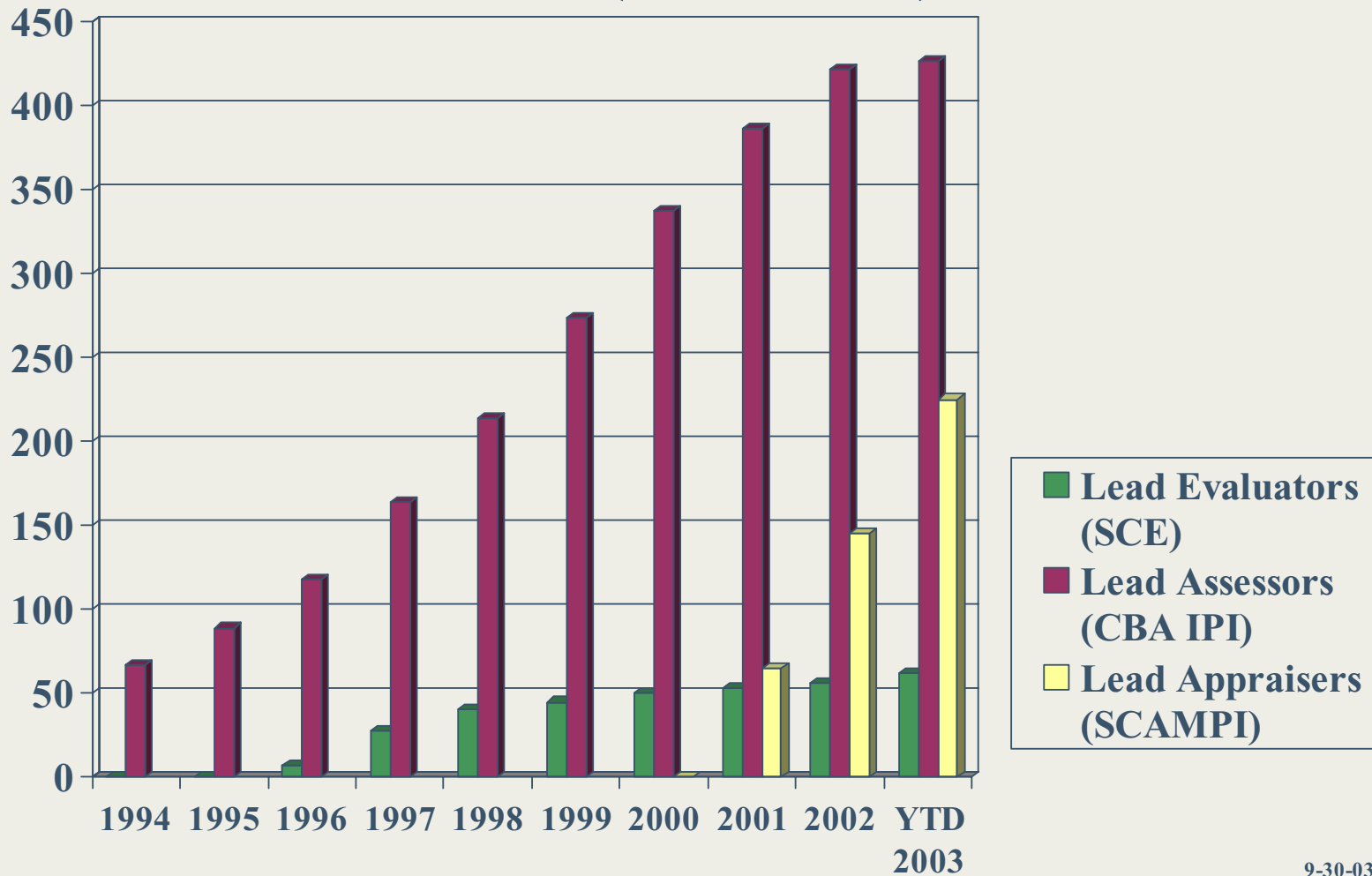


## Number of CMMI Students Trained (Cumulative)



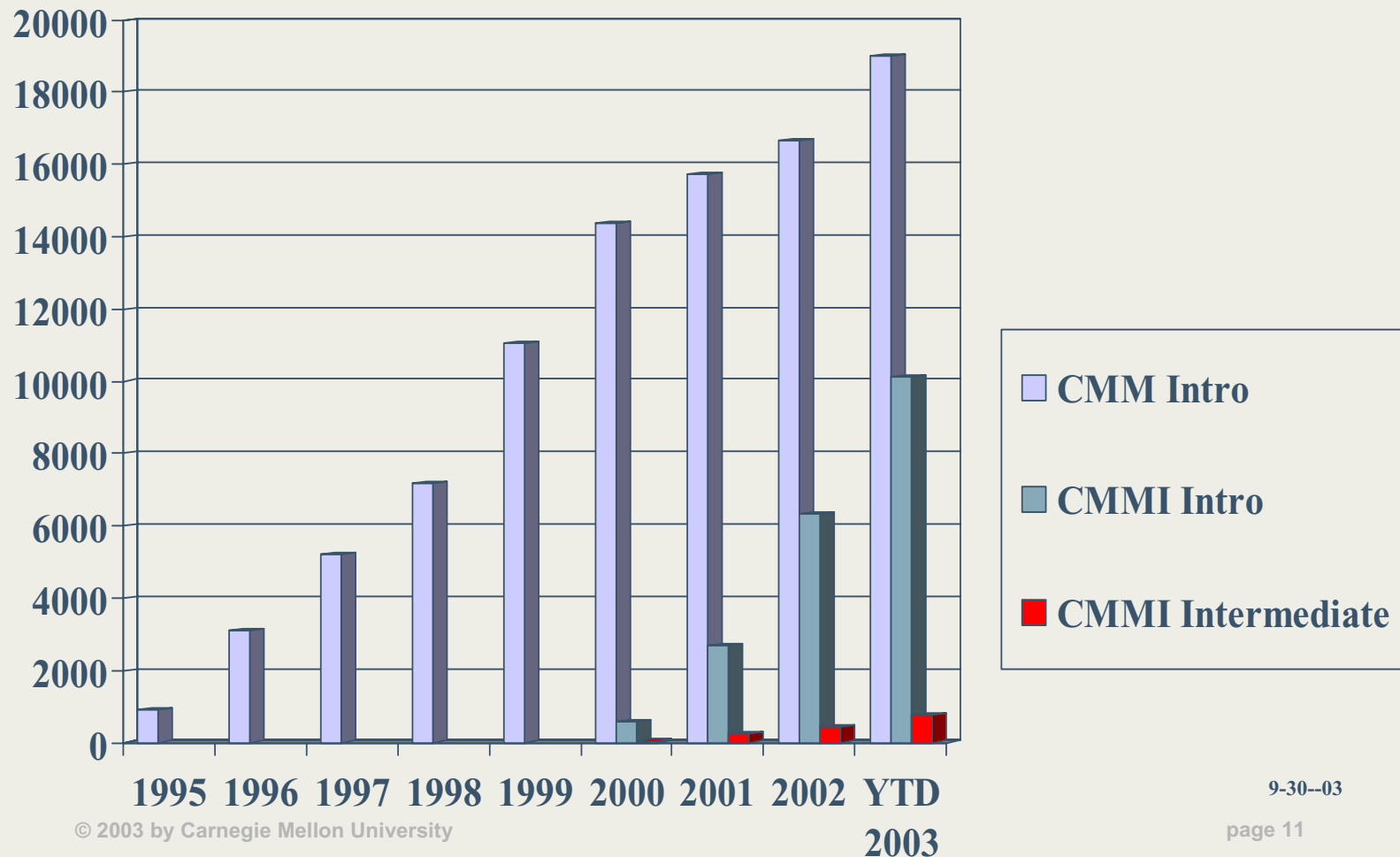


## Number of Lead Appraisers Authorized (Cumulative)



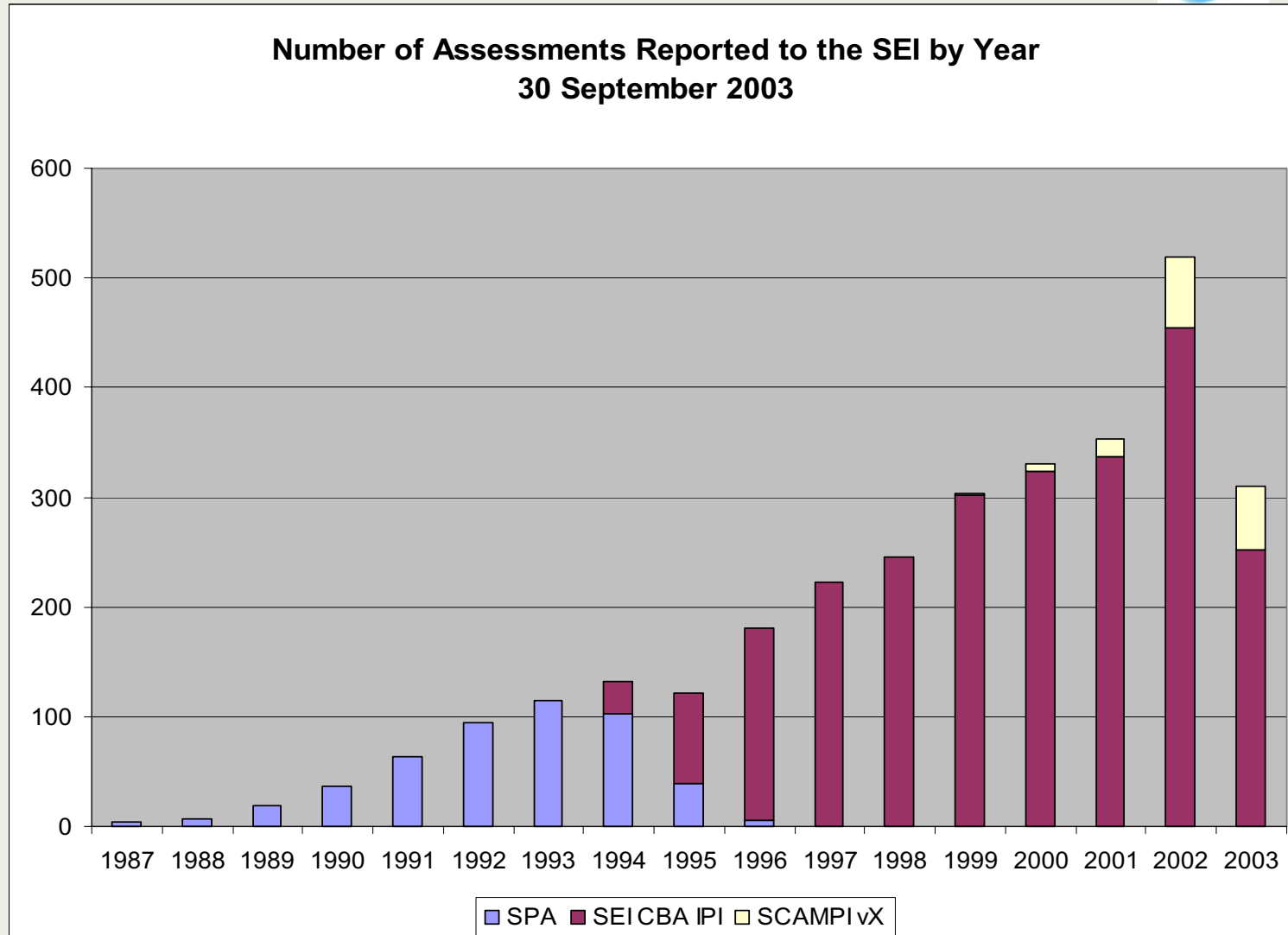


# Intro to the CMM and CMMI Attendees (Cumulative)





Number of Assessments Reported to the SEI by Year  
30 September 2003

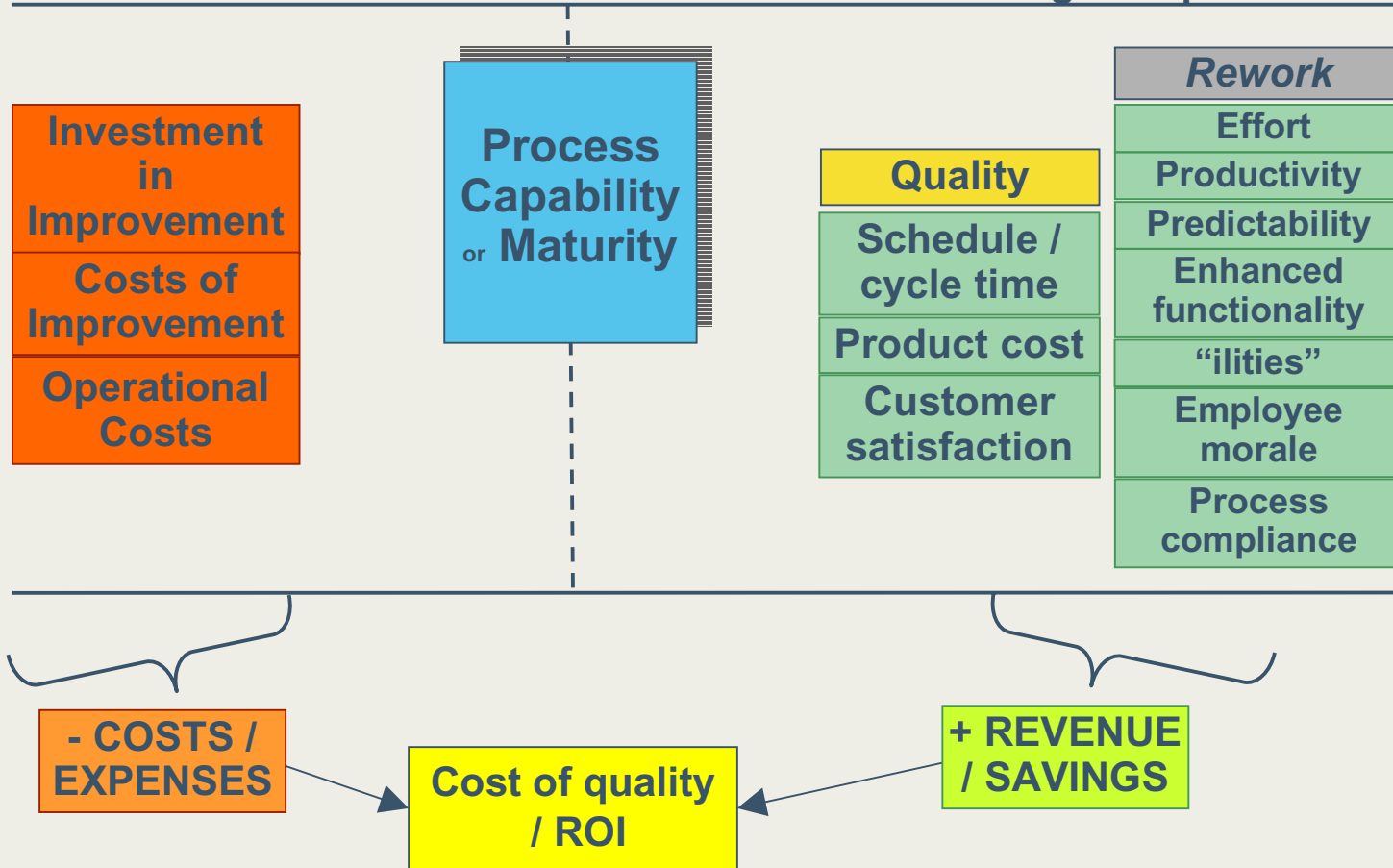




# CMMI<sup>®</sup> Results Study Framework

Costs

Benefits / Savings / Improvements





## Boeing, Australia

Making transition to CMMI from SW-CMM and EIA 731;  
early CMMI pilot in Australia

### RESULTS on One Project

- 33% decrease in the average cost to fix a defect
- Turnaround time for releases cut in half
- 60% reduction in work from Pre-Test and Post-Test Audits,  
passed with few outstanding actions
- Increased focus on product quality
- Increased focus on eliminating defects
- Developers seeking improvement opportunities

Product cost

Schedule /  
cycle time

Quality

In Processes is there a Pay-Off? Terry Stevenson, Boeing Australia, Software Engineering Australia 2003 conference.



# Lockheed Martin M&DS

SW CMM ML2 (1993) to ML 3 (1996) to CMMI ML5 (2002)

## Results

- Award Fees during 2002 are 45% percent of unrealized award fees at ML2

Customer satisfaction

1996 - 2002

- Increased software productivity by 30%
- 16% reduction in Dollars/KLOC
- Decreased defect find and fix costs by 15%

Productivity

Product cost

Quality

Internal data shared through Collaboration; August 2003.



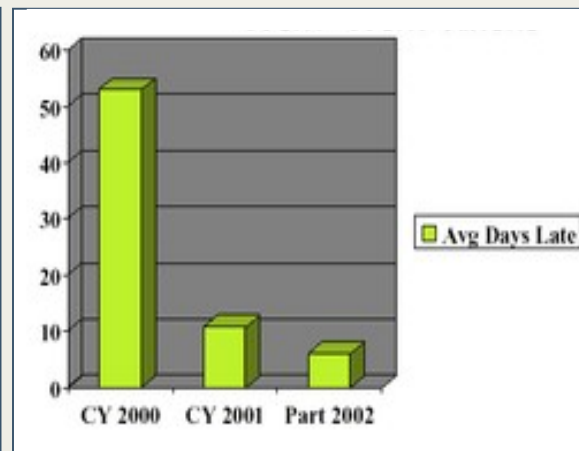
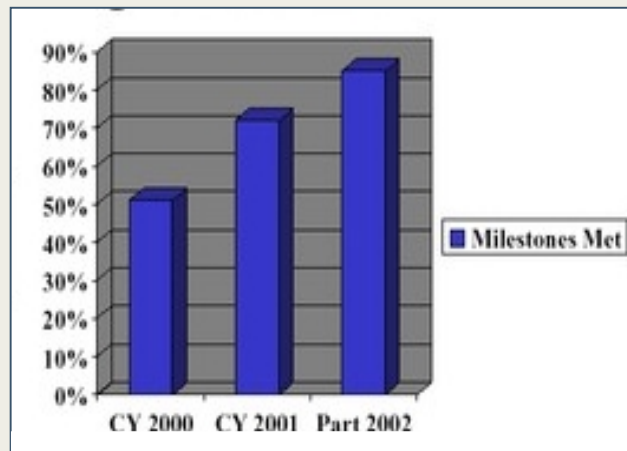
# General Motors Corporation

## CMMI focus 2001

Goal is Integration of Supplier Work & GM Project Execution

### Results:

- Improved schedule – projects met milestones and were fewer days late



Schedule /  
cycle time

Camping on a Seesaw: GM's IS&S Process Improvement Approach. Hoffman, Moore & Schatz, SEPG 2003.











# Aggregated Appraisal Results

	Process Management			Project Management				Engineering						Support					
GG3	0%	0%	0%	0%	0%	10%	14%	0%	0%	0%	0%	0%	0%	9%	0%	0%	0%	GG3	
GG2	0%	0%	9%	0%	13%	33%	22%	14%	31%	44%	25%	50%	27%	36%	36%	36%	0%	GG2	
GG1	45%	18%	18%	0%	22%	44%	90%	24%	39%	50%	57%	81%	53%	50%	44%	44%	0%	GG1	
SG3					56%			41%			56%	100%	88%	88%		56%			SG3
SG2	45%	27%		100%	22%	61%	90%	65%		65%	86%	94%	53%	69%	63%	63%		SG2	
SG1	45%	27%	18%	0%	39%	50%	100%	24%	39%	72%	64%	94%	88%	59%	44%	63%	7%	SG1	
	OT	OPF	OPD	IPM	PP	PMC	SAM	RISK	RM	RD	TS	PI	VER	VAL	PPQA	CM	DAR	M&A	

Goals		Goal Satisfaction	
	Generic Goal		Majority of organisations appraised achieved Goal Satisfaction
	Specific Goal		Majority of organisations appraised did not achieve Goal Satisfaction
	Process Areas of Immediate Concern		Not Applicable

Results from 18 Defence Community\* appraisals conducted over the period Mid 2000 - Present

- \*Includes Defence Industry and Department of Defence appraisal results



## The Road Ahead....

Formal Review period ends mid-December

CMMI Team will review CRs to determine possible Change Packages for a V1.2 of model and/or method

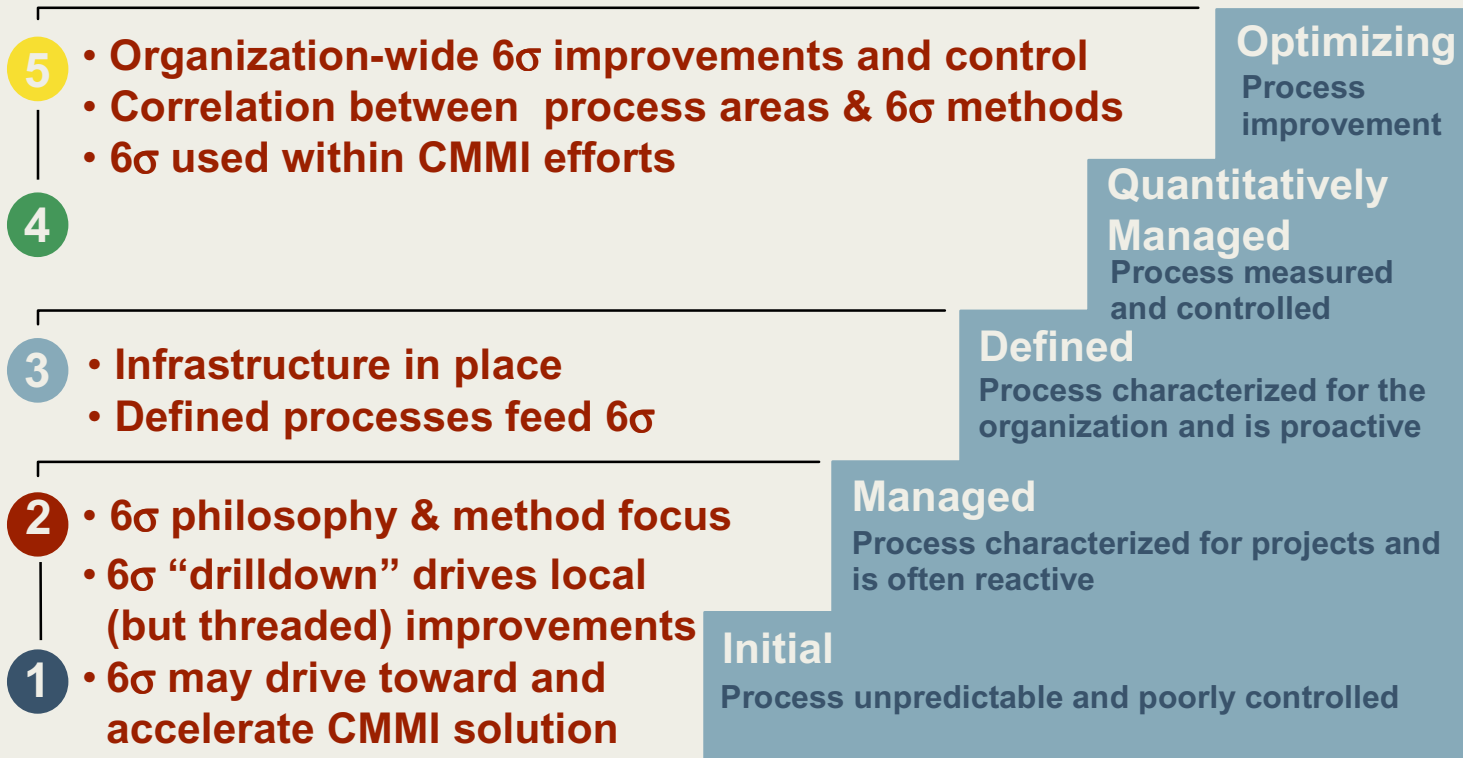
CCB will determine which CPs, if any, are needed (stability goal remains)

Improvement Packages would be an FY 05 effort, with piloting

V1.2 would be ~FY 06



# CMMI Staged and Six Sigma



**Six Sigma is enterprise wide.  
Six Sigma addresses product and process.  
Six Sigma focuses on “critical to quality” factors.**

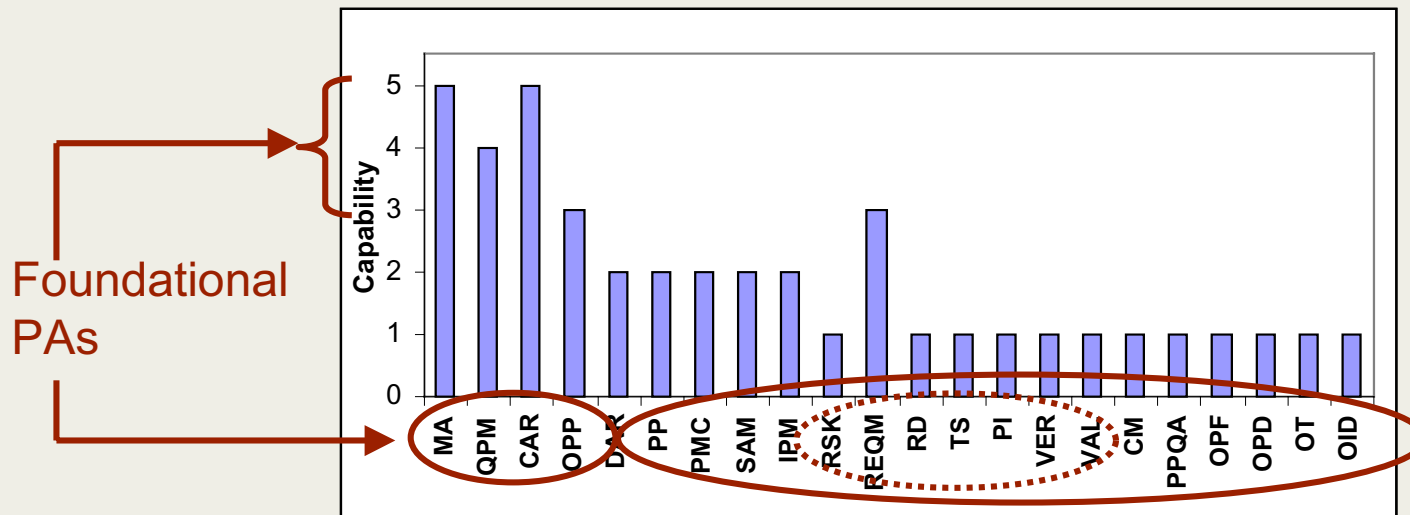


# Six Sigma and CMMI Continuous

Achieve high capability in PAs that build Six Sigma skills.

- MA, QPM, CAR, OPP

Use capability to help prioritize remaining PAs



Remaining PAs ordered by business factors, improvement opportunity, etc. which are better understood using foundational capabilities. CMMI Staged groupings and DMAIC vs. DMADV are also factors that may drive the remaining order.

[Vickroy 03]



# LMC M&DS Process Standard Roadmap

CMMI SE/SW V1.1 - 2002	ISO 9001 - 2000	EIA 632 - 1999	ISO/IEC 12207 - 1995
<b>Organizational Process Focus (OPF):</b> SG1: Determine Process Improvement Opportunities SG2: Plan and Implement Process Improvement Activities	General Requirements Monitoring and measurement	5.3	7.3 Improvement process
<b>Organizational Process Definition (OPD):</b> SG1: Establish Organizational Process Assets	General Requirements Documentation requirements		5.3.1 Process implementation 7.3 Improvement process
<b>Organizational Process Management (OPM):</b> SG1: Establish Organizational Process Assets SG2: Plan and Implement Process Improvement Activities	Management Commitment General Monitoring & measurement of processes	5.1 Enterprise Factors 5.2 Project Factors 5.3 External Factors 5.4 Influence of other Enterprise Factors	5.2.4 Planning 5.2.5 Execution 7.4 Training & control process 8 Problem resolution process
<b>Measurement and Analysis (MA):</b> SG1: Establish Organizational Process Assets SG2: Plan and Implement Process Improvement Activities	Monitoring & measurement of processes Analysis of data Continual improvement	5.1 Enterprise Factors 5.2 Project Factors 5.3 External Factors 5.4 Influence of other Enterprise Factors	5.1 Enterprise Factors 5.2 Project Factors 5.3 External Factors 5.4 Influence of other Enterprise Factors
<b>Process Management (PM):</b> SG1: Establish Organizational Process Assets SG2: Plan and Implement Process Improvement Activities	1.3 Program Plan Process 2.3 Contract Management 1.1 The Program Process 2.6 Quality	4.1 Supply Process R1: Product Supply 4.2.1 Planning Process R4: Process Implementation R5: Technical Effort Definition R6: Schedule & Organization R7: Technical Plans R8: Work Directives	4.1 Supply Process R1: Product Supply 4.2.1 Planning Process R4: Process Implementation R5: Technical Effort Definition R6: Schedule & Organization R7: Technical Plans R8: Work Directives

**Program Process Standard 2002**

**EIA 632 - 1999**

**CMMI SE/SW v1.1**

**ISO 9001 -2000**

**ISO/IEC 12207 - 1995**



**Six Sigma links:**  
**Level 2 Measurement & Analysis PA, Level 4/5 PAs**

[S-P 03]

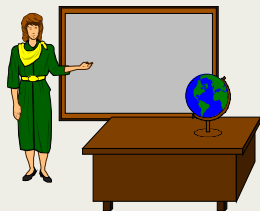


# Six Sigma Approach at Northrop Grumman



## Linked with Business Planning and Oversight

- Business planning
- Project selection

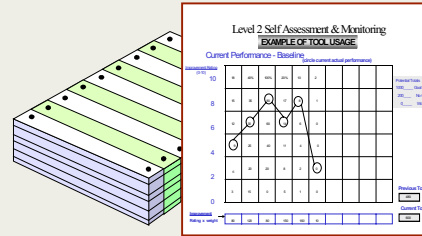


## Enabled by Infrastructure

- Training
- Tools
- Awareness
- Database

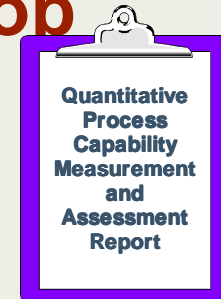


Minitab.Ink



## Quantitatively Driven

- Six Sigma improvements are quantified



Self Assessment & Monitoring  
EXAMPLE OF TOOL USAGE

Process	1	2	3	4	5	6	7	8	9	10
Process 1	10	8	6	4	2	1	2	4	6	8
Process 2	10	8	6	4	2	1	2	4	6	8
Process 3	10	8	6	4	2	1	2	4	6	8
Process 4	10	8	6	4	2	1	2	4	6	8
Process 5	10	8	6	4	2	1	2	4	6	8

## Integrated with Quality Program

- Integrated Training, Awareness, & Policies
- Integrated CMMI & Six Sigma projects
- Integrated tracking and reporting via DB, PRA, etc.



## Tied to Employee Performance

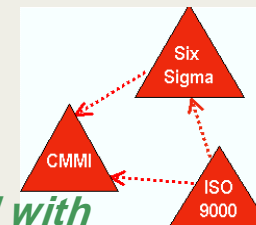
- Goals, awards
- Job and career paths

Identification Information:

Name:	
Nickname:	
Job Title:	
Unit:	
Location:	
Six Sigma Status:	
Employee ID:	

## Engaged with External Customers

- Visibility
- Participation





## Northrop Grumman's Six Sigma Implementation

Started implementing Six Sigma in 2001

Trained over 3000 Green Belts (80 hours), and over 200 Black Belts (160 hours)

Completed several hundred projects covering all functional areas

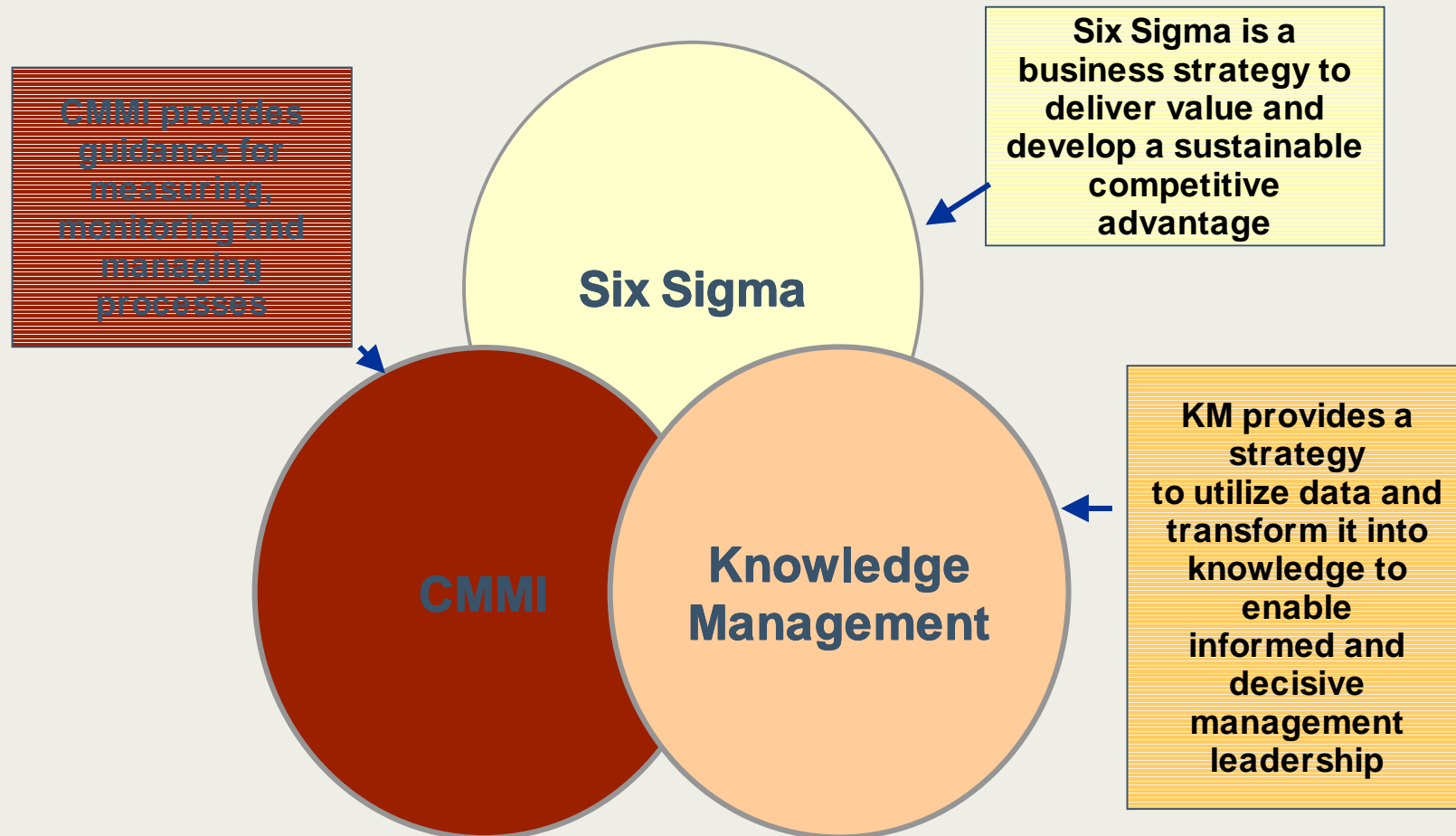
- Customer involvement and award fee citations

About half of the projects are improving an engineering process





## 3 Keys to Competitive Leverage at Northrop Grumman







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# Process Maturity Profile

## **CMMI® v1.1** **SCAMPI<sup>SM</sup> v1.1 Appraisal Results**

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# Outline

Introduction

Current Status

Summary

Terms used in this Briefing

How to Report your Appraisal Results to the SEI



## Introduction: Purpose

Characterize the adoption of the CMMI

Describe results from Standard CMMI Appraisal Method for Process Improvement (SCAMPI v1.1) Class A appraisals using Capability Maturity Model Integration (CMMI) v1.1 \*

Encourage continued reporting of results

\* Organizations previously appraised against CMMI v1.0 and who have not reappraised against v1.1 are not included in this report

Please visit: [http://www.sei.cmu.edu/sema/profile\\_about.html](http://www.sei.cmu.edu/sema/profile_about.html) for additional information or questions you may have about this briefing before contacting the SEI directly



# Current Status

SCAMPI v1.1 appraisals conducted since April 2002  
release through ~~September 2003~~ **October 2003** and reported to the SEI by

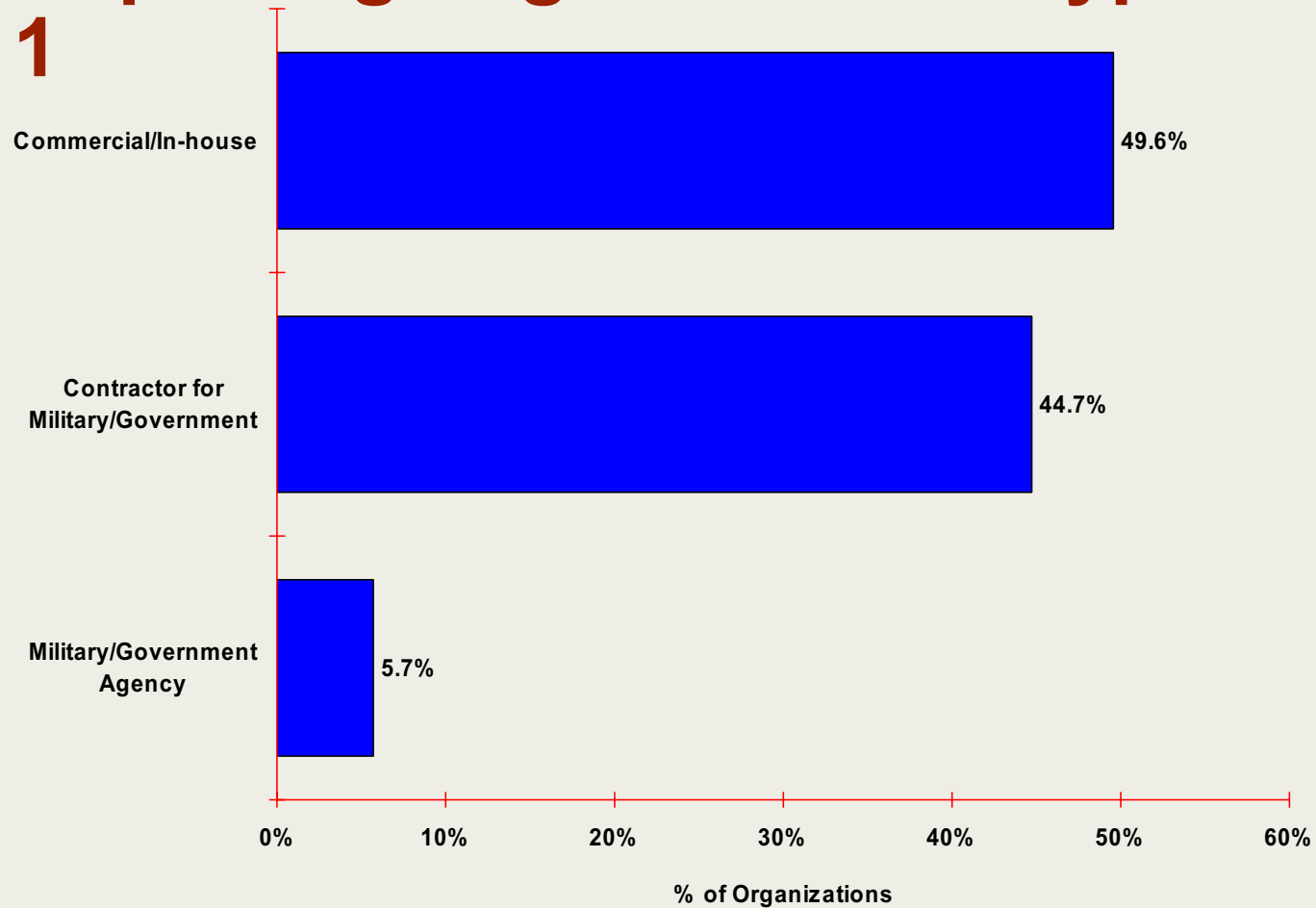
- **136** appraisals
- **123** organizations
- **68** participating companies
- **11** reappraised organizations
- **520** projects
- **44%** offshore organizations

Please refer to: Terms Used in this Report on page 21



# Reporting Organizational Types -

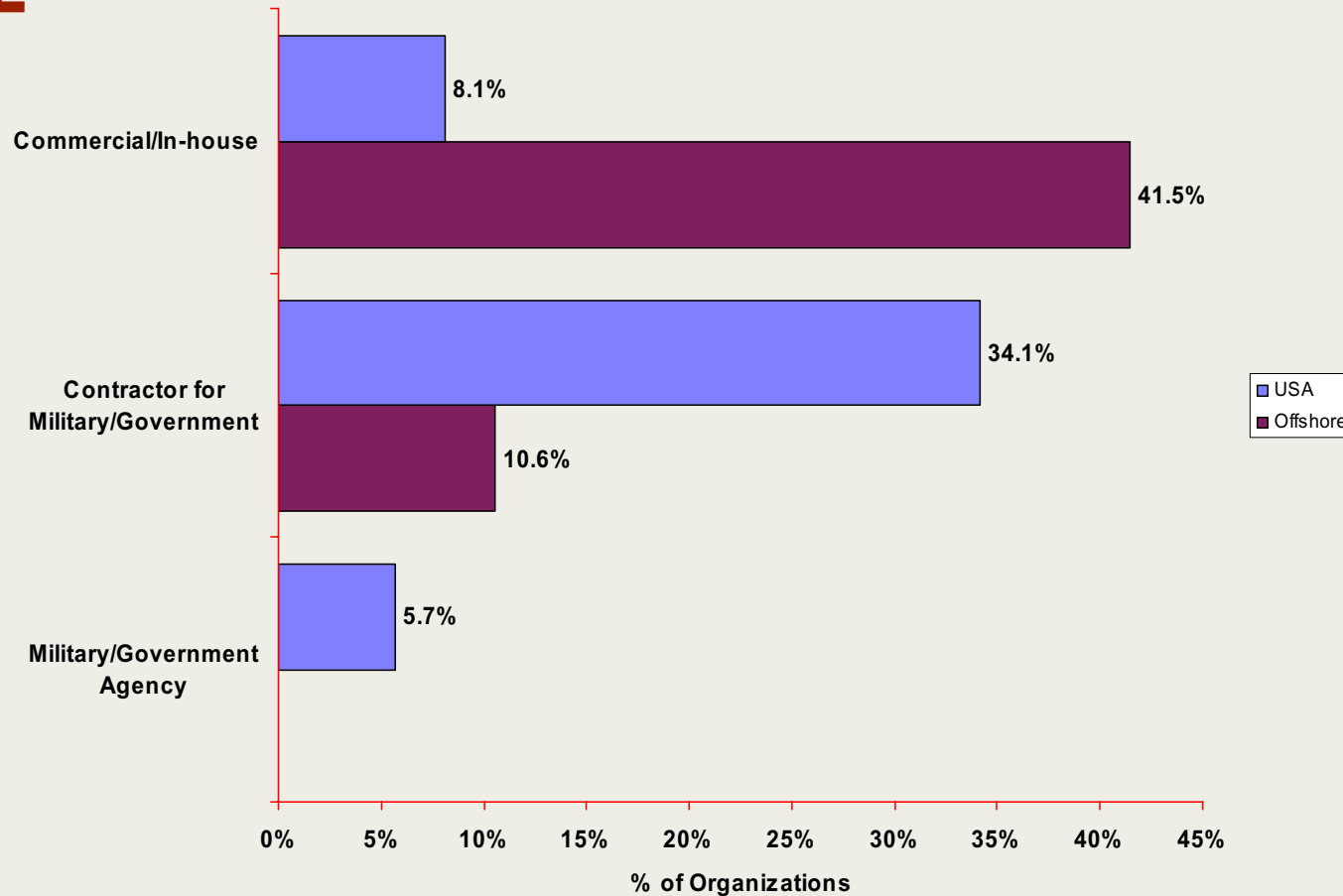
## 1



Based on 123 organizations



# Reporting Organizational Types - 2

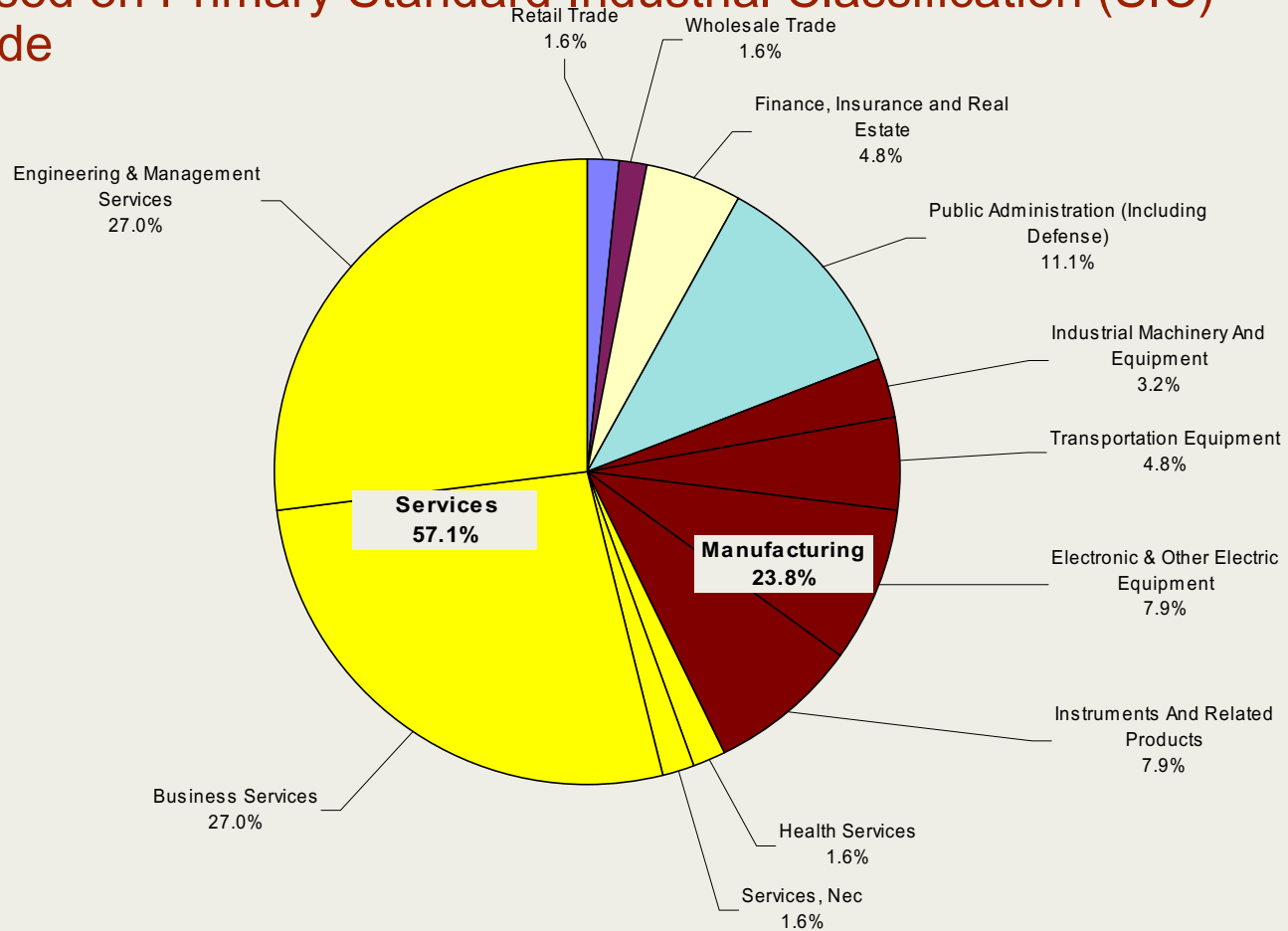


Based on 123 organizations



# Types of Organizations

Based on Primary Standard Industrial Classification (SIC) Code

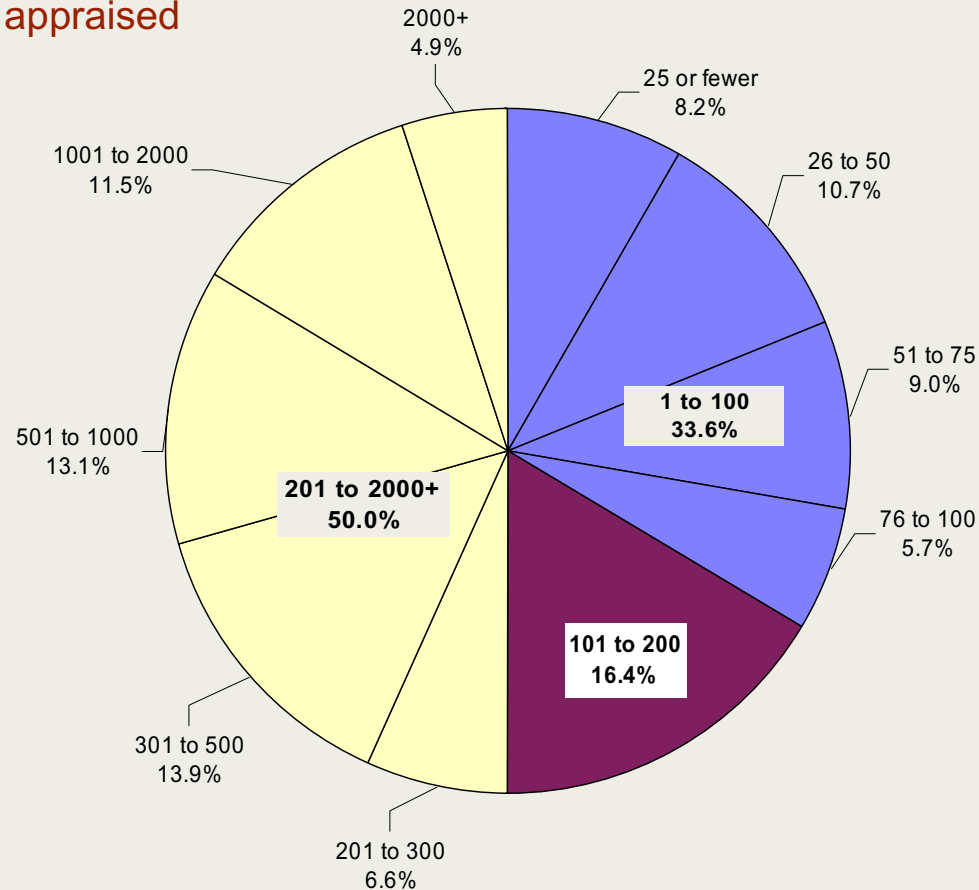


Based on 63 organizations reporting SIC code. For more information visit: <http://www.osha.gov/oshstats/sicser.html>



# Organization Size

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

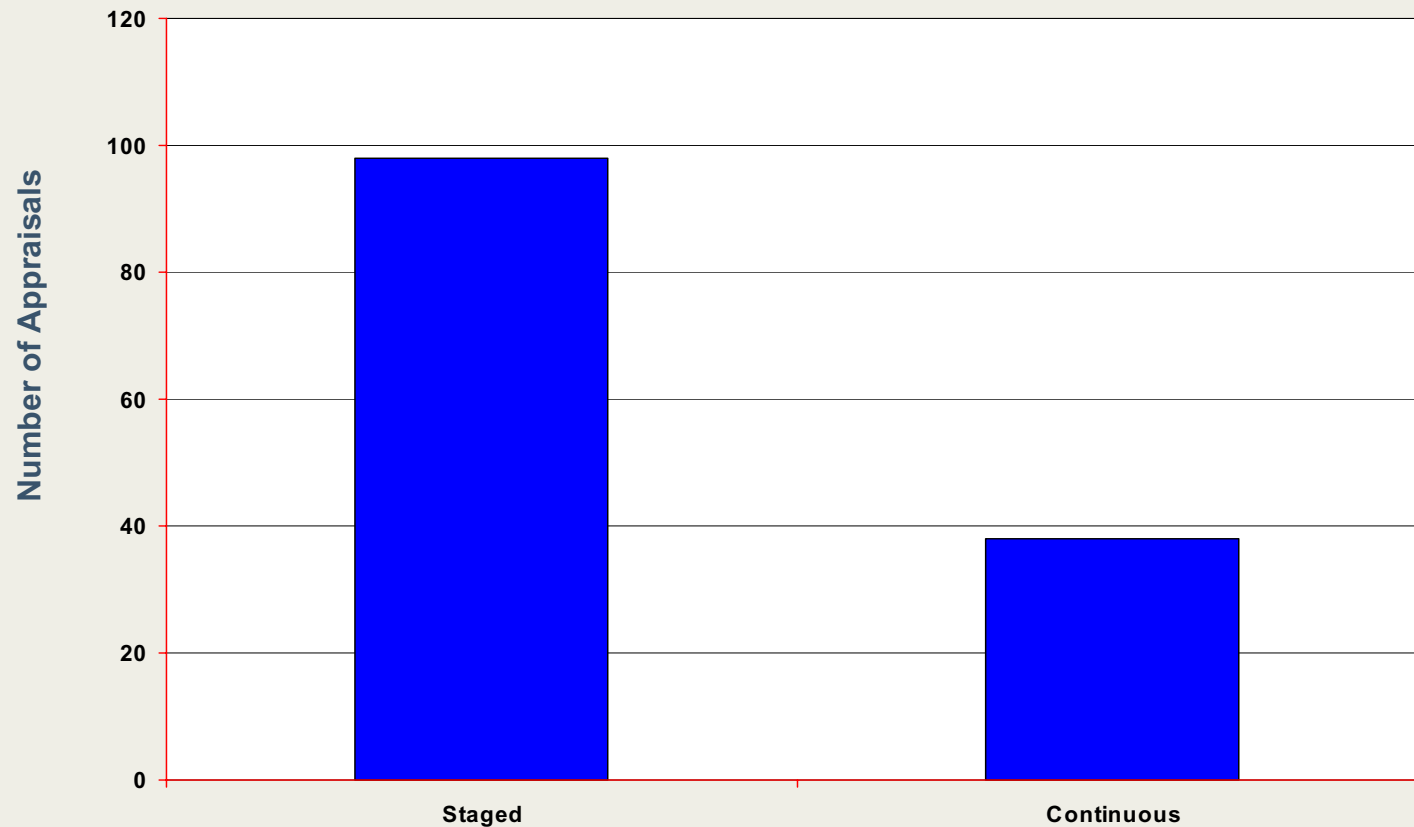


Based on **122** organizations reporting size data





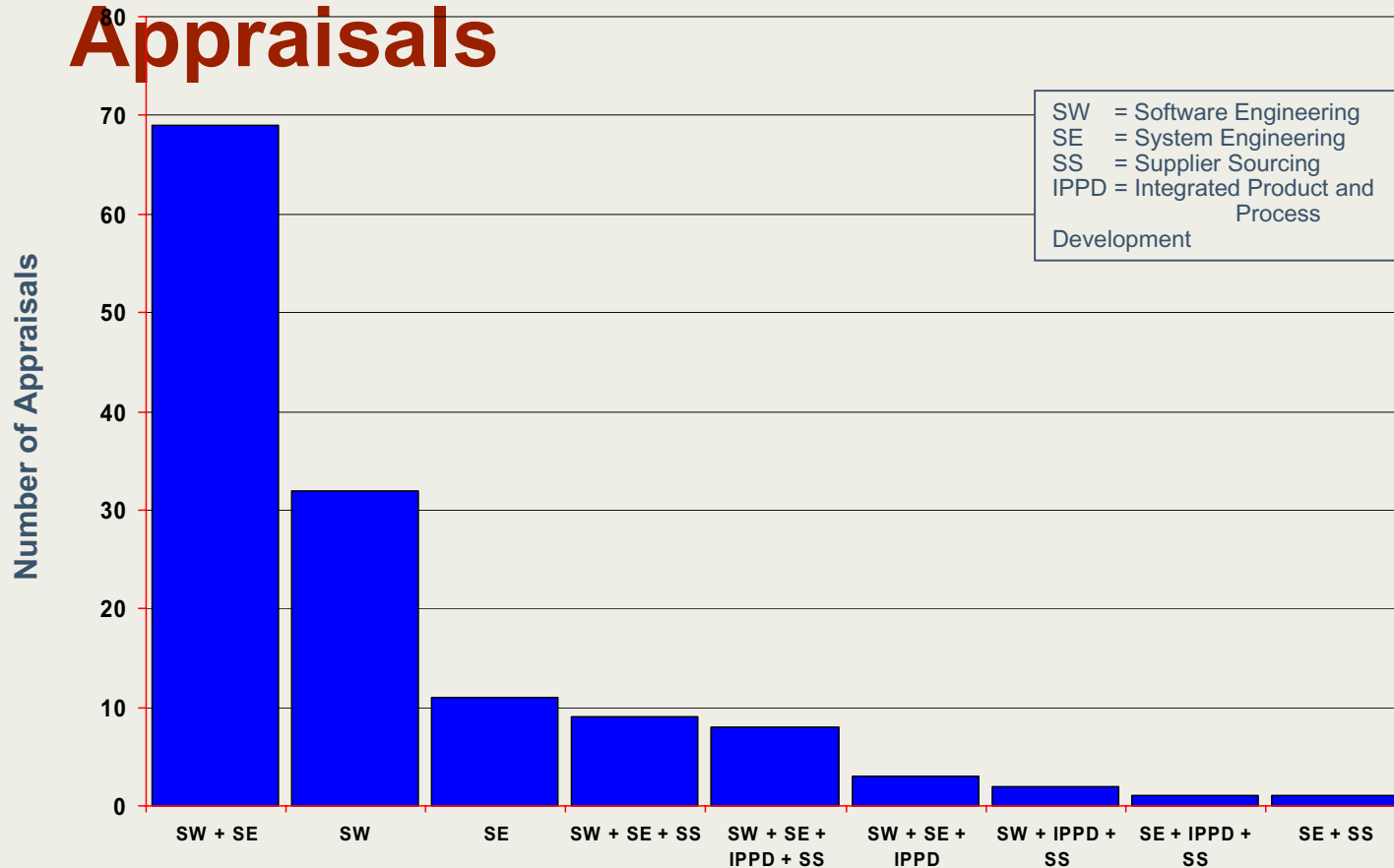
# Use of Model Representations in Appraisals



Based on **136** appraisals



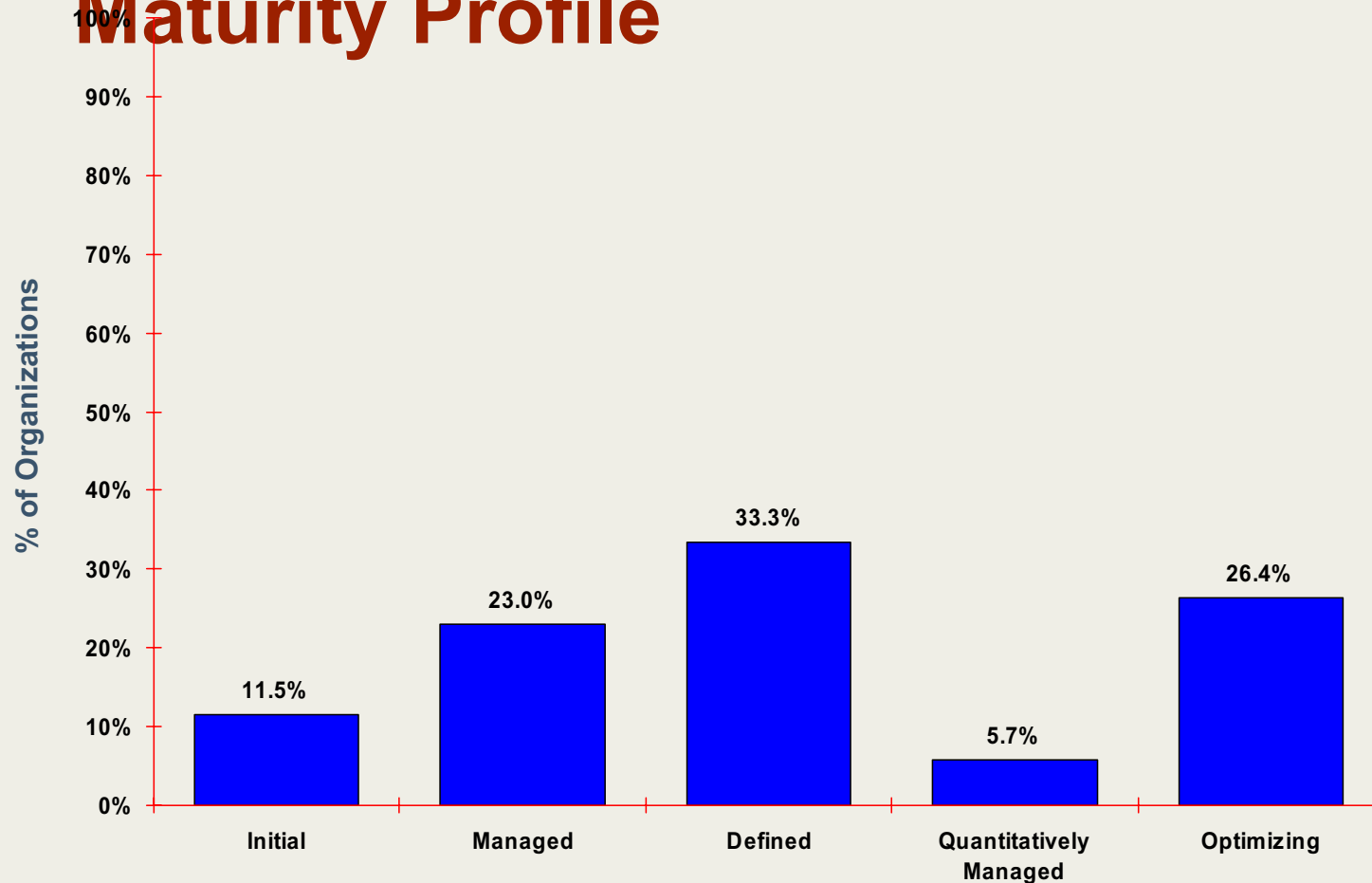
# Disciplines Selected for Appraisals



Based on **136** appraisals reporting coverage



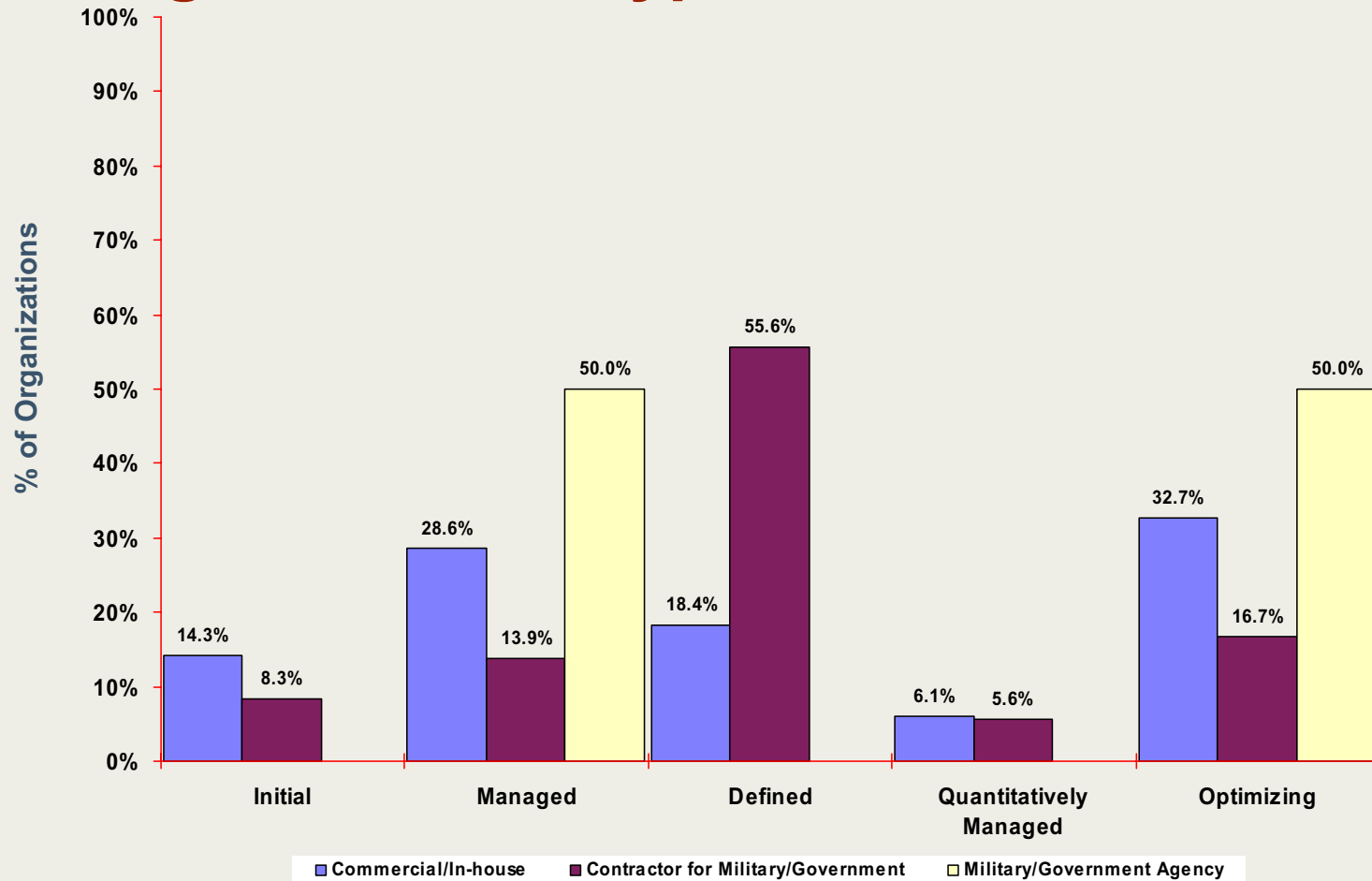
# Summary Organizational Maturity Profile



Based on most recent appraisal of **87** organizations reporting a maturity level rating



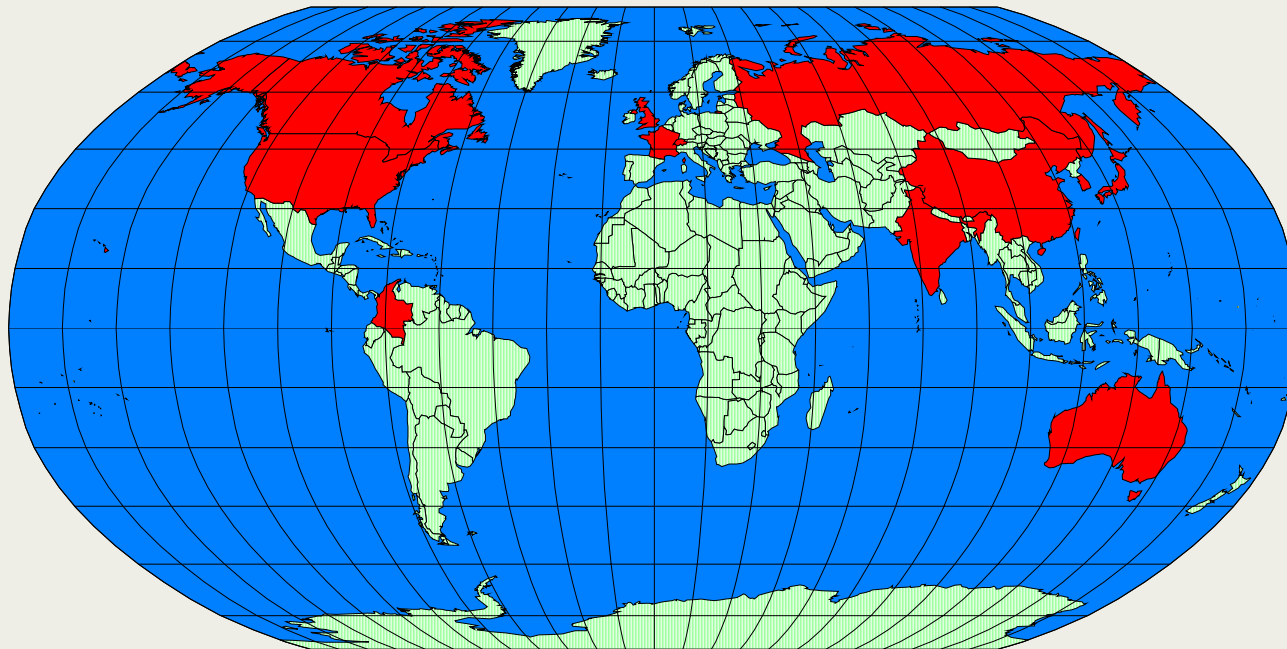
# Maturity Profile by Organizational Type



Based on most recent appraisal of **87** organizations reporting organization type and a maturity level rating



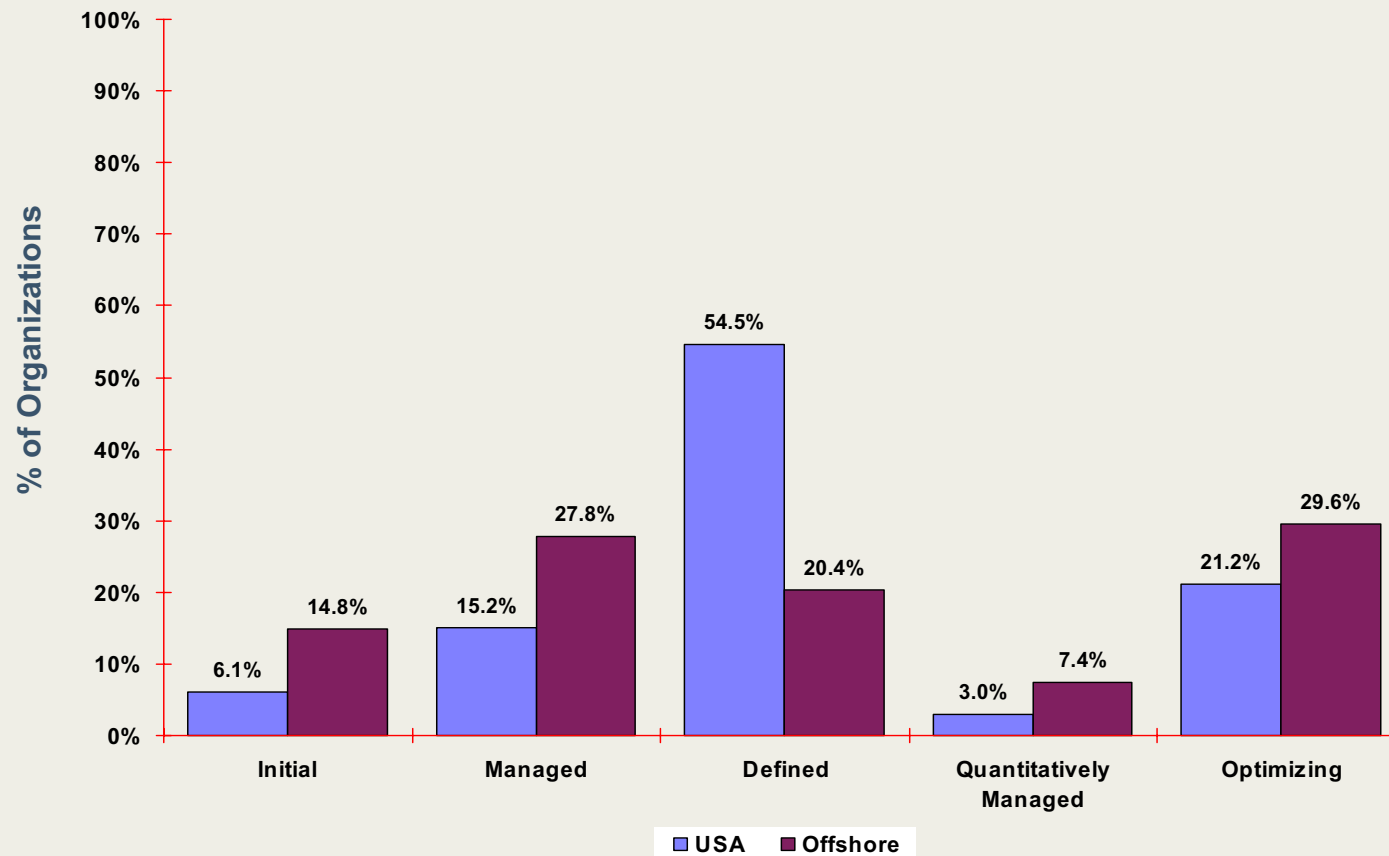
# Countries Where Appraisals Have Been Performed and Reported to the SEI



Australia    Canada    China    Colombia    France    India  
Japan    Korea, Republic of    Russia    Switzerland    Taiwan    United Kingdom  
United States



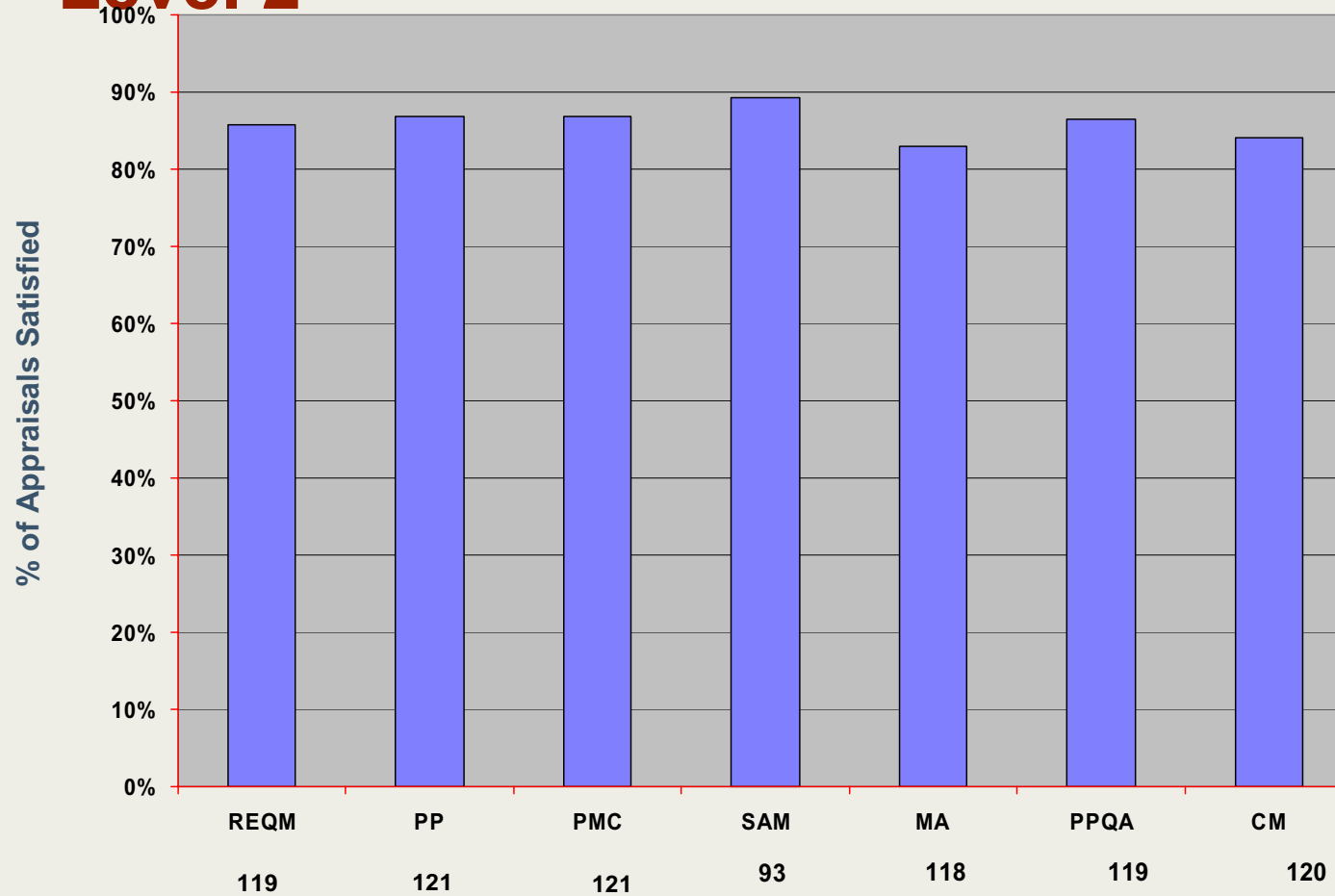
# USA and Offshore Summary Organizational Maturity Profiles



Based on **33** U.S. organizations and **54** offshore organizations reporting their maturity level rating



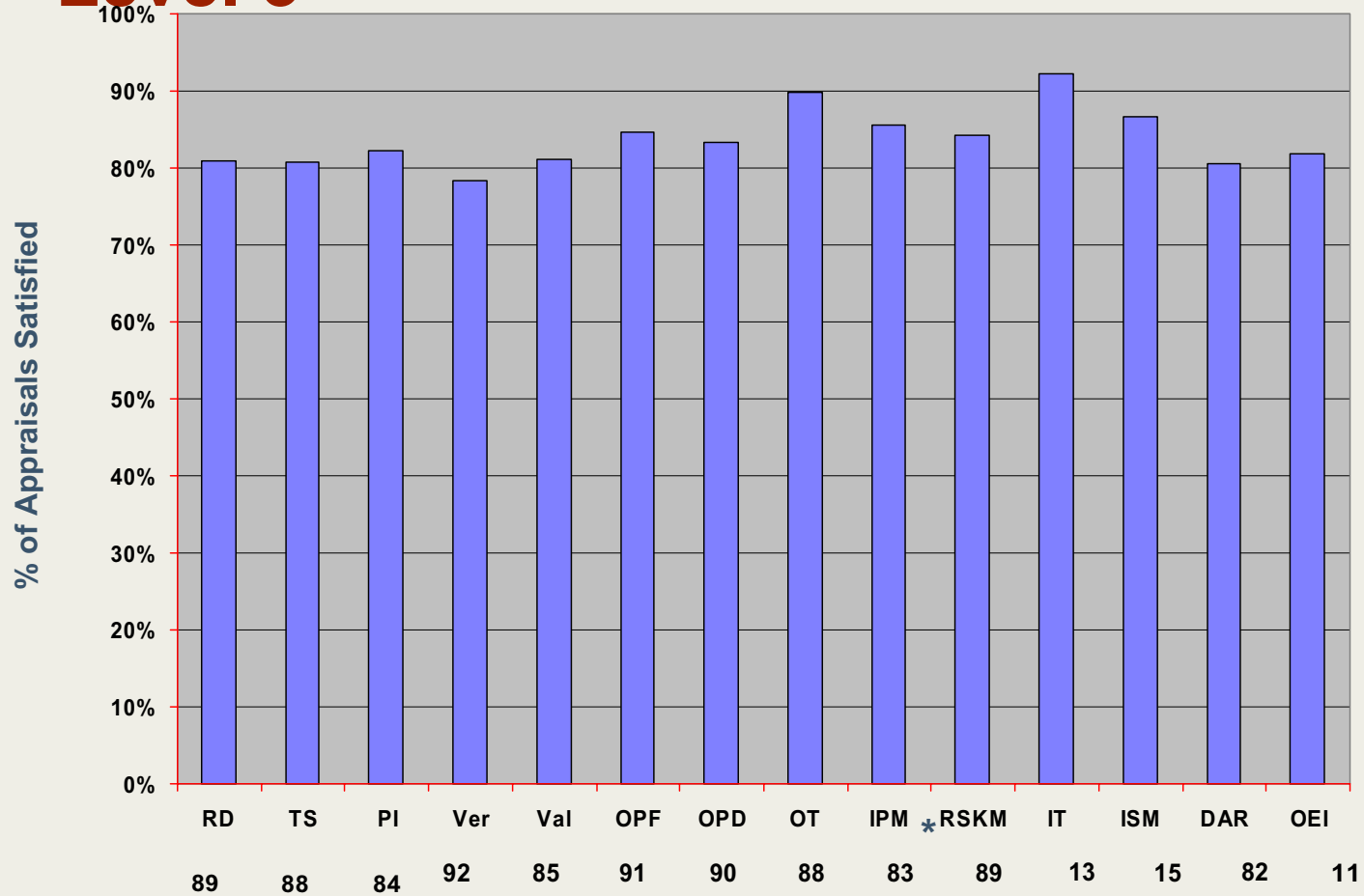
# Process Area Satisfaction – Maturity Level 2



Based on the number of appraisals listed above that rated the process area



# Process Area Satisfaction – Maturity Level 3



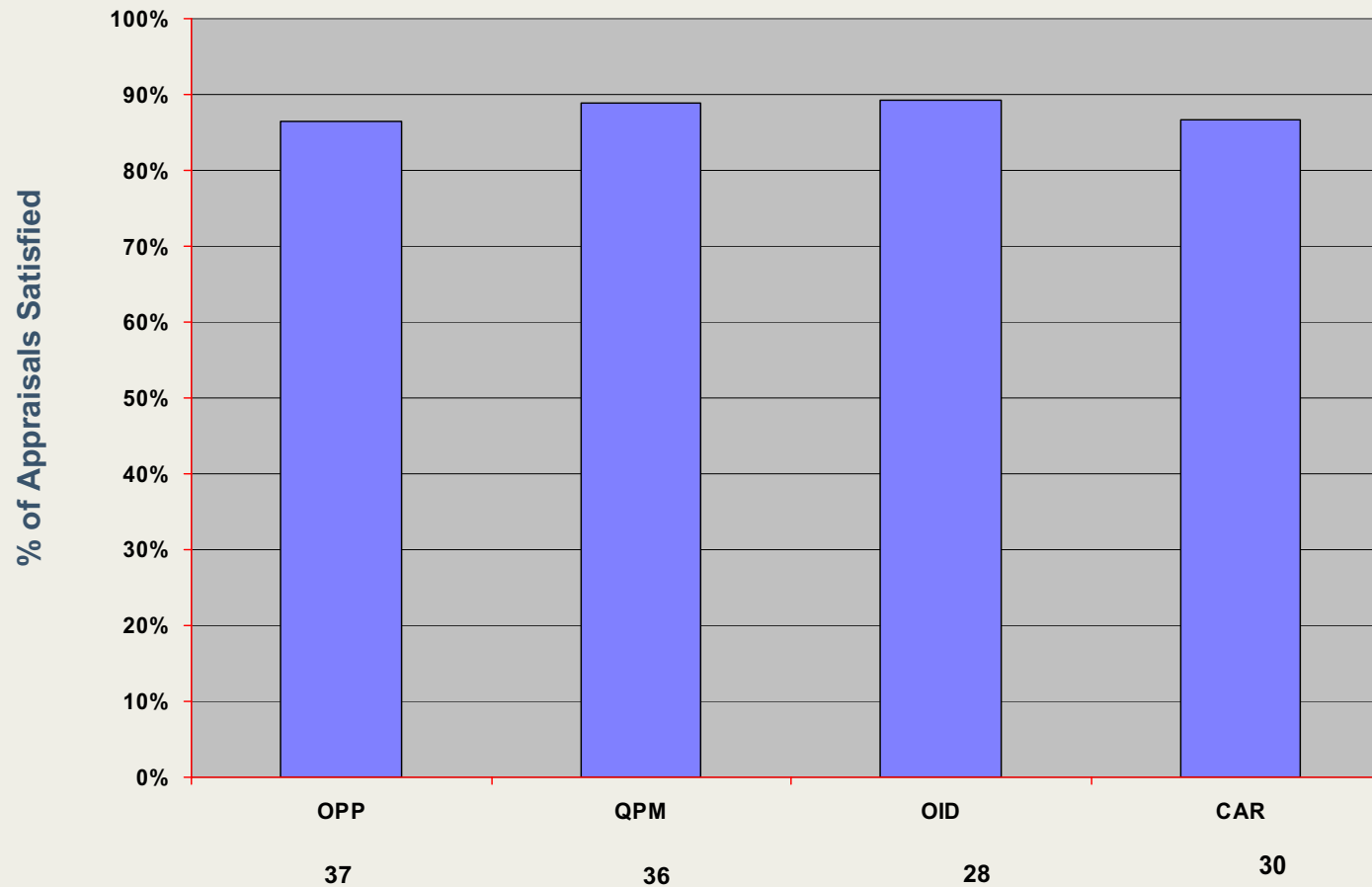
Based on the number of appraisals listed above that rated the process area

11 of the 83 appraisals rating IPM also examined the IPPD goals. 10 of these 11 appraisals satisfied IPM with the IPPD goals.





# Process Area Satisfaction – Maturity Levels 4&5



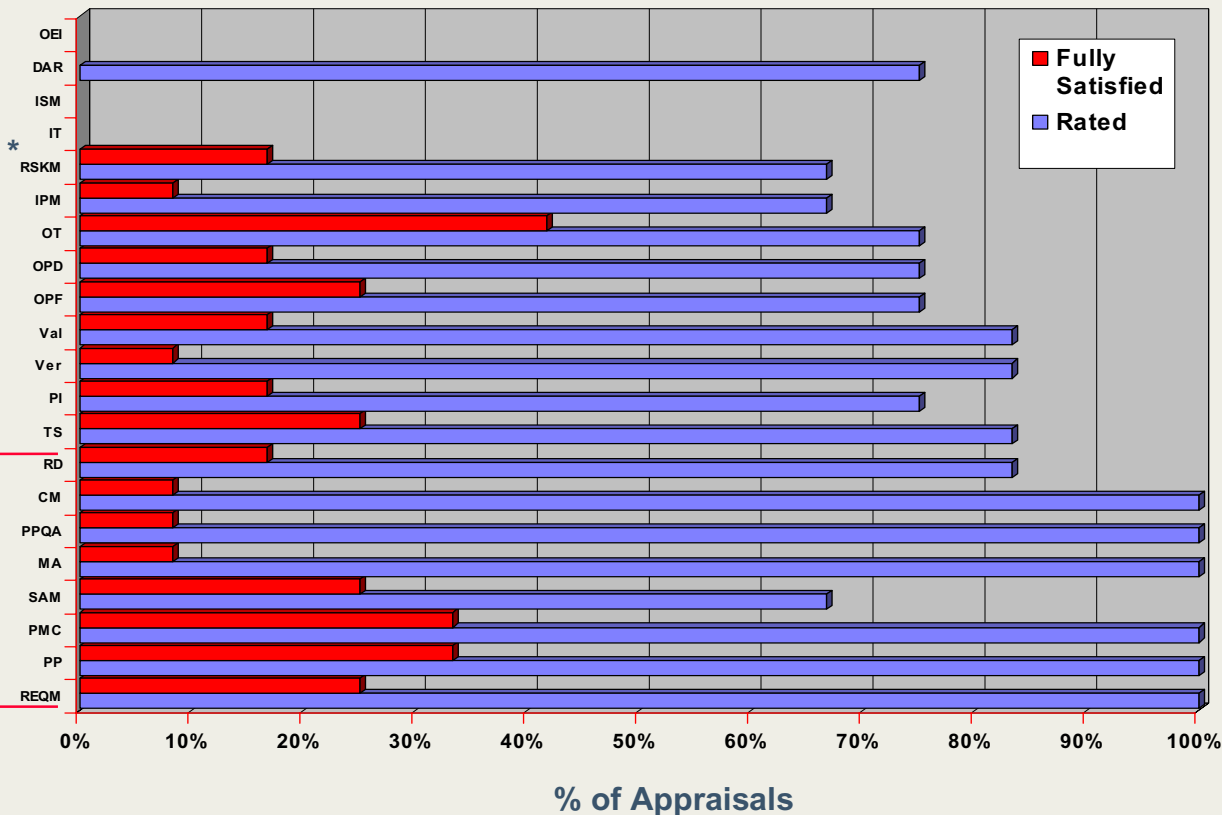
Based on the number of appraisals listed above that rated the process area



# Process Area Profiles - 1

## Organizations Appraised at Maturity Level 1

Defined



Based on 12 appraisals reporting a maturity level rating

\* None of the 14 appraisals selected the IPPD discipline



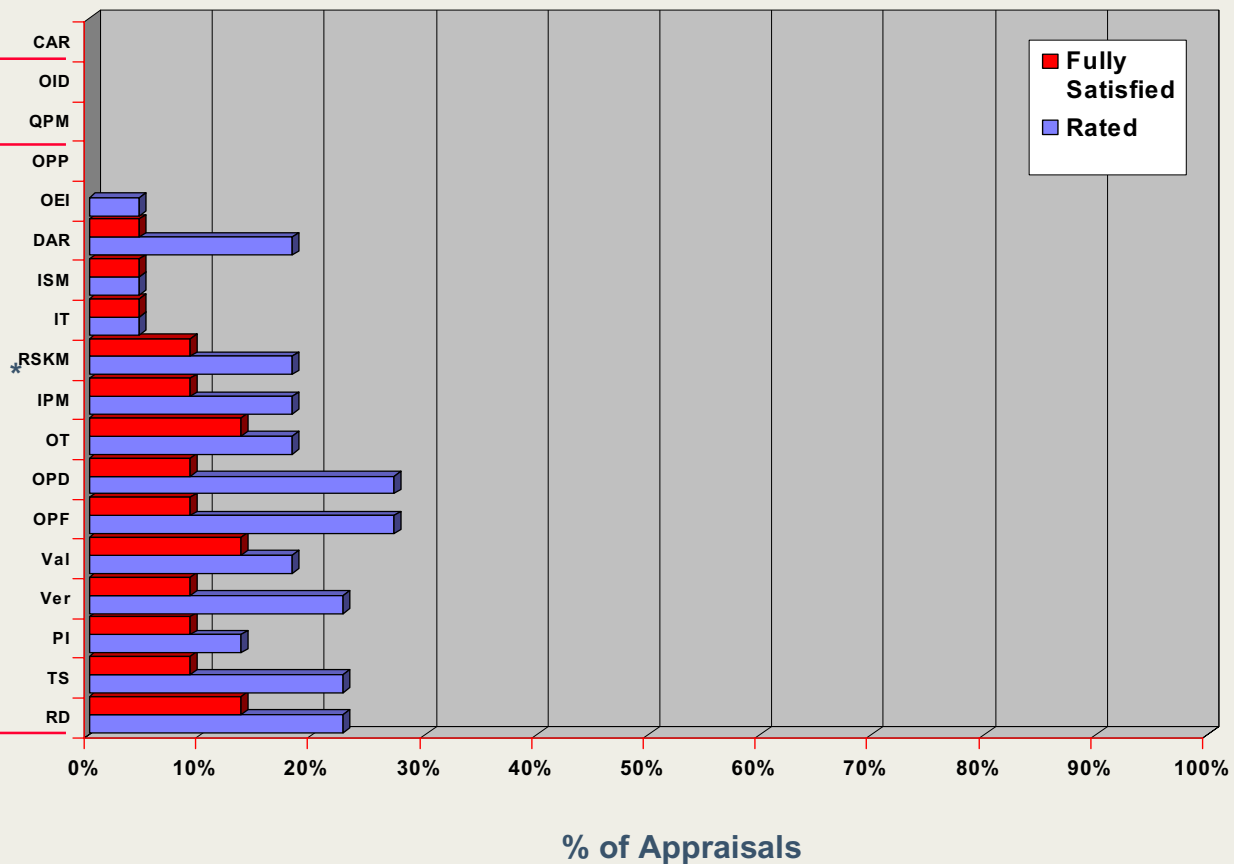
# Process Area Profiles - 2

## Organizations Appraised at Maturity Level 2

Optimizing

Quantitatively  
Managed

Defined



Based on 22 appraisals reporting a maturity level rating

\* 1 of the 22 appraisals rating IPM also examined the IPPD goals.  
That appraisal satisfied IPM.



## Summary

Relatively even reporting from the Commercial and Contractor communities, however Commercial organizations are primarily outside of the U.S. and Government Contractors are primarily located in the U.S.

Of U.S. organizations, the services and manufacturing industries reported most appraisals.

Compared to the early reports of the SW-CMM maturity profile, the early data reflects a relatively more mature CMMI profile.

Additional information and charts will be added to this briefing as more appraisals are reported and therefore more data is available to support these breakdowns.



# Terms Used in this Report

- Company** - Parent of the appraised entity  
A company can be a commercial or non-commercial firm, for-profit or not for-profit business, a research and development unit, a higher education unit, a government agency, or branch of service, etc.
- Organization – a.k.a. Appraised entity**  
The organization unit to which the appraisal results apply. An appraised entity can be the entire company, a selected business unit, units supporting a particular product line or service, etc.
- Offshore** - Appraised entity whose geographic location is not within the United States. The parent of the appraised entity may or may not be based within the United States.



## Report your Appraisal Results to the SEI

The briefing is only possible due to the cooperation of organizations and individuals sending in their appraisal results to the SEI

In order to provide this information and service in the future, it will depend on this continued cooperation

Please visit:

<http://www.sei.cmu.edu/sema/report.html>

for forms, information, and instructions on how to report appraisals to the SEI



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## Contact Information

Please visit:

[http://www.sei.cmu.edu/sema/profile\\_about.html](http://www.sei.cmu.edu/sema/profile_about.html)

and review the information provided before contacting:

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