



Keynote
IMPROVING PROCESSES FOR BETTER PRODUCTS

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METRO TORONTO CONVENTION CENTRE
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CMMI[®] -- Improving Processes for Better Products

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Three Questions...

How do we know it is working?

Is it catching on?

What is next for CMMI?

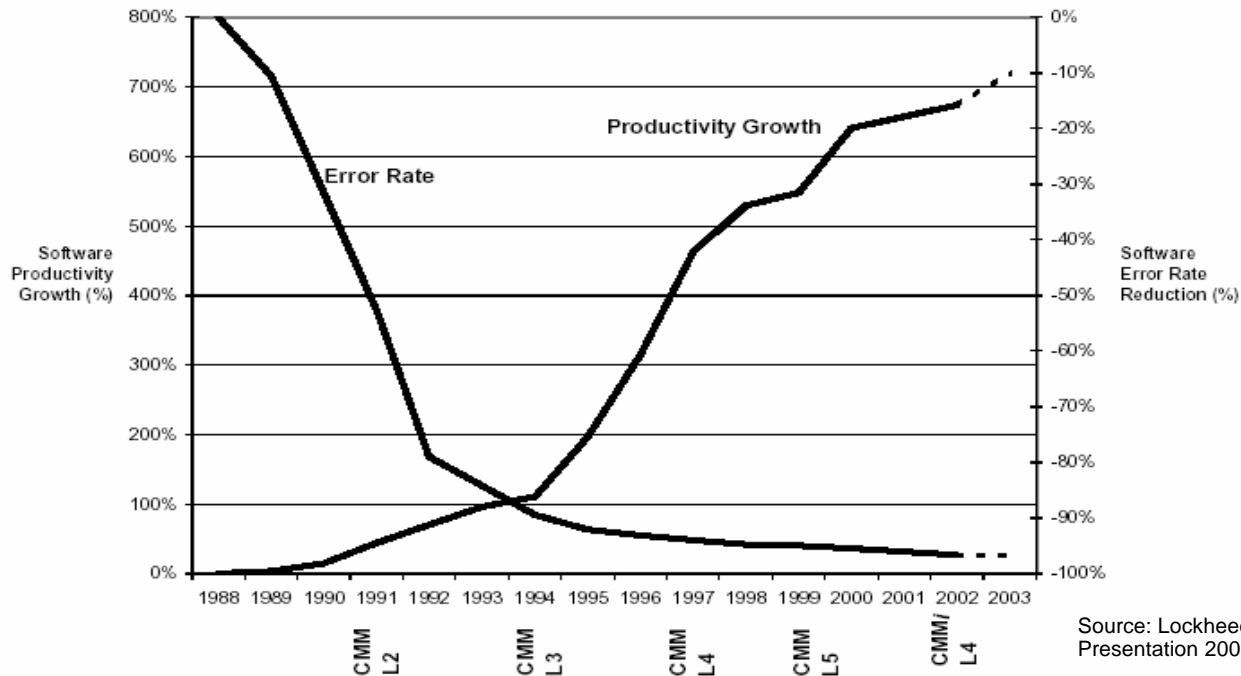


One Example – Productivity



SPI Benefits at Lockheed Martin (1)

Lockheed Martin: NE&SS-Syracuse - Software Productivity & Quality Performance History



Source: Lockheed Martin SEPG Presentation 2003

Software Productivity and Quality Performance Application of Best Practices and Investment Has Resulted in Significant Improvements in Quality and Cost. As error rates declined, productivity increased by 80+%.



Examples of Impact: Schedule

- 50% reduction in release turn around time (Boeing, Australia)
- Increased the percentage of milestones met from approximately 50 percent to approximately 95 percent (General Motors)
- Decreased the average number of days late from approximately 50 to fewer than 10 (General Motors)
- Increased through-put resulting in more releases per year (JP Morgan Chase)
- Met every milestone (25 in a row) on time, with high quality and customer satisfaction (Northrop Grumman Defense Enterprise Systems)



Examples of Impact: Productivity

- Improved productivity substantially, with “significantly more rigorous engineering practices” due to CMMI (Fort Sill Fire Support Software Engineering Center)
- Improved software productivity (including reuse) from a 1992 baseline by approximately 80 percent at SW-CMM maturity level 5 in 1997 to over 140 percent at CMMI ML 5 in 2001 (Lockheed Martin Systems Integration)
- 25 percent productivity improvement in 3 years (Siemens Information Systems Ltd, India)
- Used Measurement & Analysis to realize an 11 percent increase in productivity, corresponding to \$4.4M in additional value (reported under non-disclosure)



Examples of Impact: Quality

- Reduced software defects per million delivered SLOC by over 50 percent compared to defects prior to CMMI (Lockheed Martin Systems Integration)
- Reduced defect rate at CMMI ML5 approximately one third compared to performance at SW-CMM ML5 (Lockheed Martin Maritime Systems & Sensors – Undersea Systems)
- Improved defect removal before test from 50 percent to 70 percent, leaving 0.35 post release defects per KLOC (Siemens Information Systems Ltd, India)
- Only 2 percent of all defects found in the fielded system (Northrop Grumman Defense Enterprise Systems)
- 44 percent defect reduction following causal analysis cycle at maturity level 2 (reported under non disclosure)



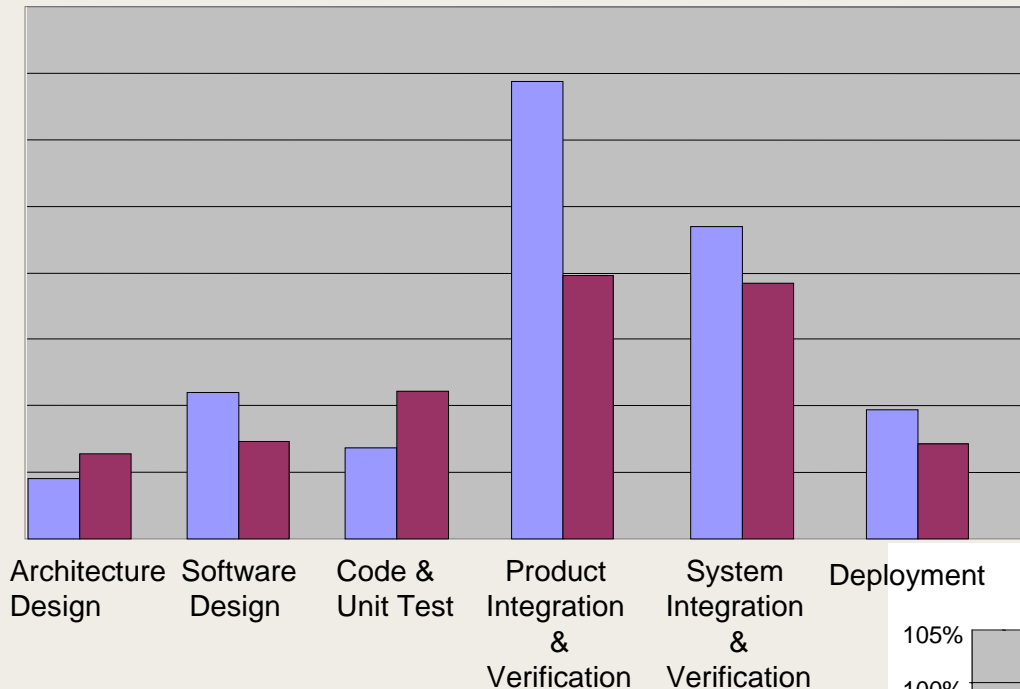
Examples of Impact: Return on Investment

- 5:1 ROI for quality activities (Accenture)
- 13:1 ROI calculated as defects avoided per hour spent in training and defect prevention (Northrop Grumman Defense Enterprise Systems)
- Avoided \$3.72M in costs due to better cost performance (Raytheon North Texas Software Engineering)
 - As the organization improved from SW-CMM level 4 to CMMI level 5
- 2:1 ROI over 3 years (Siemens Information Systems Ltd, India)
- 2.5:1 ROI over 1st year, with benefits amortized over less than 6 months (reported under non disclosure)



Improved Defect Find & Fix

Hours/KLOC

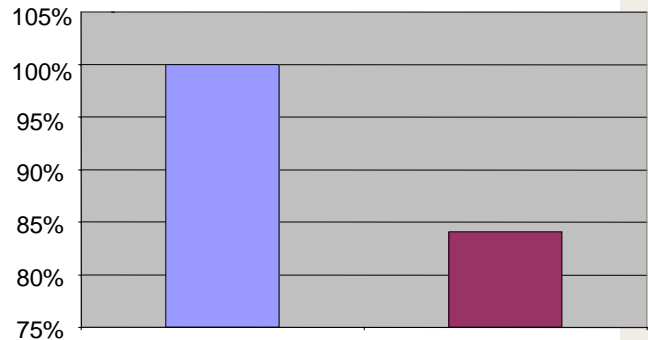


**Improved
Product Quality
With Real
Cost Savings**

■ SW CMM ML3 Program
■ CMMI Level ML5 Program

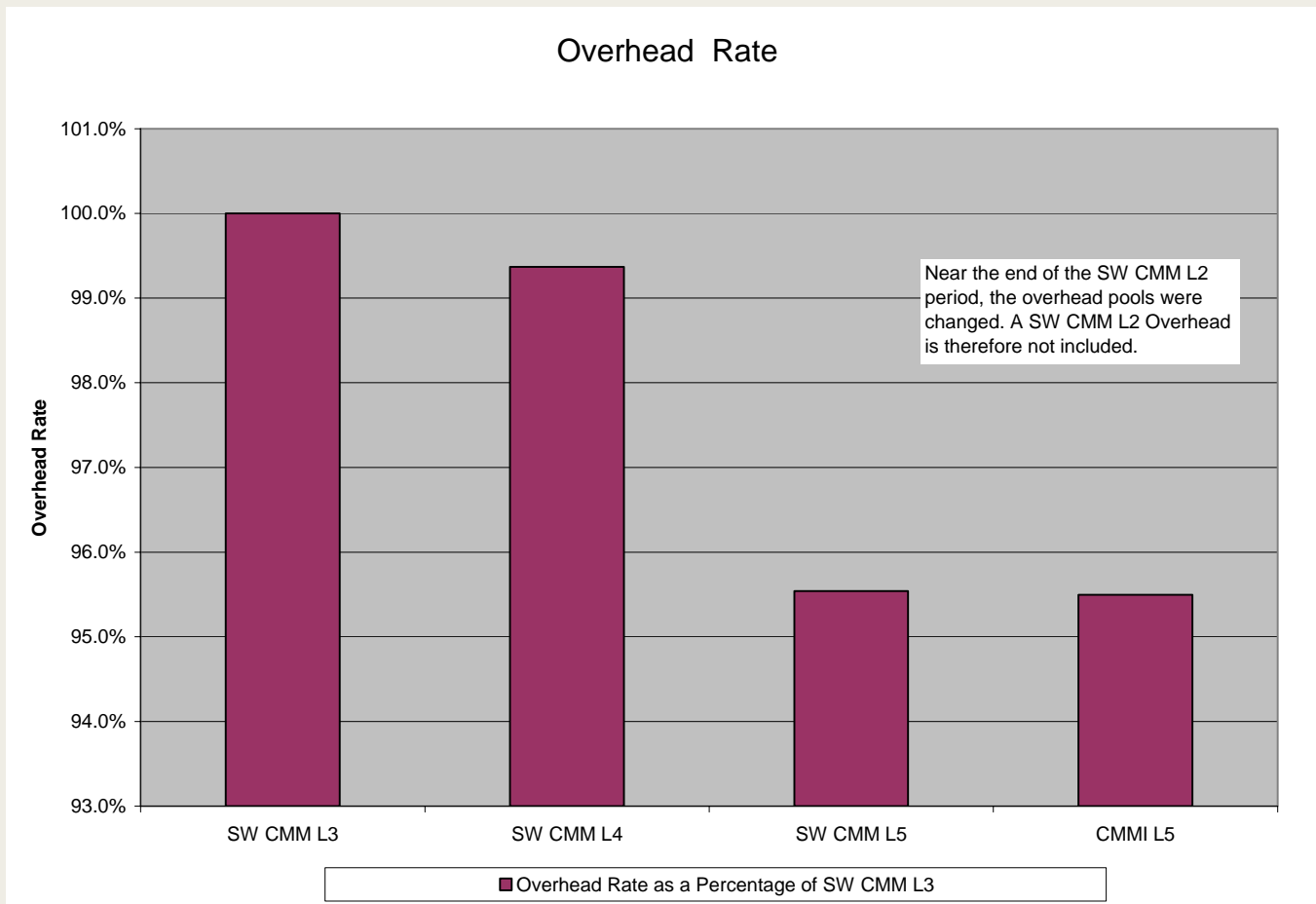
15 % decrease in defect find & fix costs

Dollars per Kloc





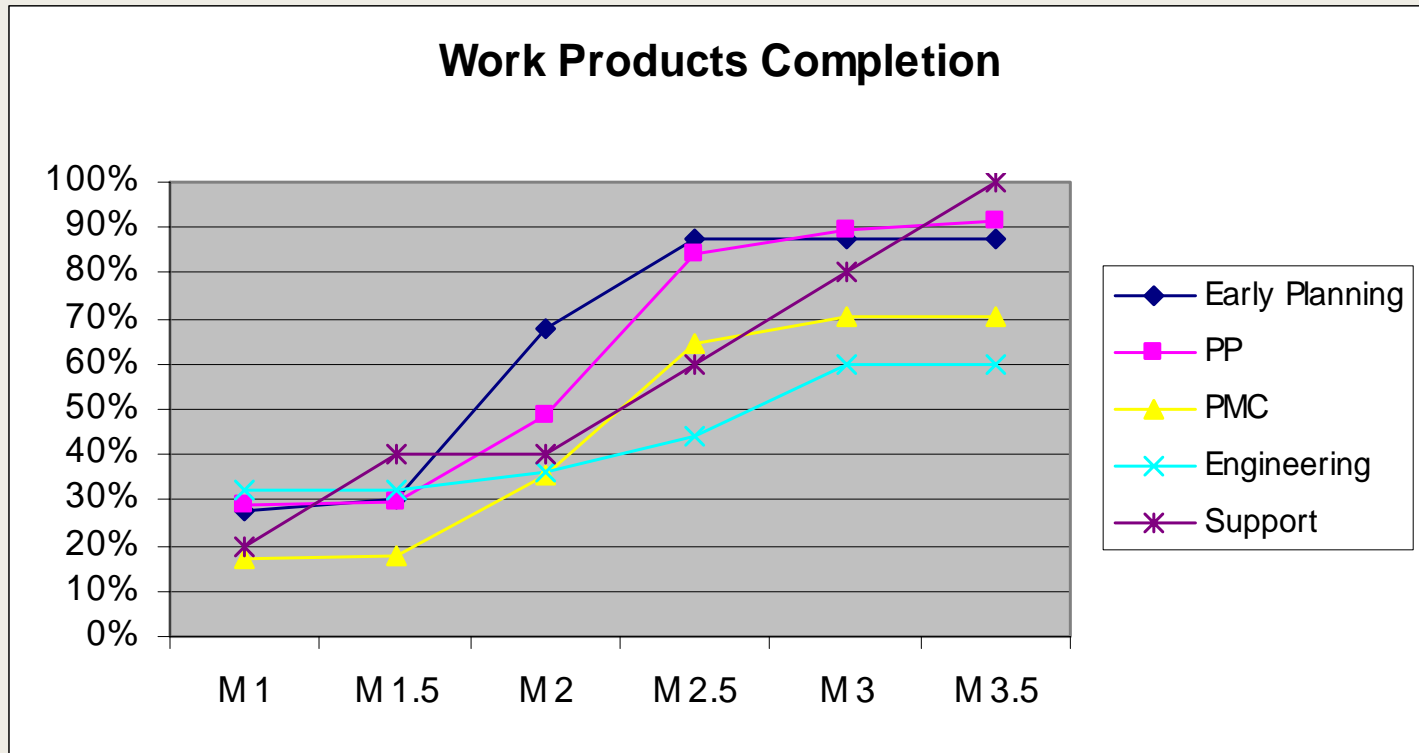
Overhead Rates: LM IS&S



CMII Does Not Come with Overhead Baggage



Progress during PI Effort at CMS



Work product completion improved dramatically
CMS Information Services, Inc. – ML3



Process Improvement Pay-Off

Data Source	Process Improvement	ROI/Benefit Conclusions
Software Engineering Institute	Twelve medium to large-scale industrial, commercial or defense industry organizations examined in regards to improvement efforts. Implementation of CMMI or SW-CMM	Samples across 12 organizations: <ul style="list-style-type: none"> • 4.5% Decline in overhead rate • 20% Reduction in average cost variance • Increased % of milestones met from ~ 50% to ~ 95% • 30% Increase in software productivity • 5:1 ROI for quality activities • 13:1 ROI calculated as defects avoided per hour spent in training and defect prevention
Space and Naval Warfare Systems Center (SSC-SD)	Achieve a SW-CMM level 3 for the SmartNet scheduling tool for High Performance Computing Environments. Produce high quality, high reliability product, while maintaining high level of control in configuration management	<ul style="list-style-type: none"> • 45% reduction in Software Change Requests over 18 months • Better overall performance of the software, better documentation, reduced scheduled variance, higher quality, higher customer satisfaction, improved employee morale, better communication among team
Software Productivity Research	Four development projects using SW CMM in the Test Software Branches of the Oklahoma City Air Logistics Center (OC-ALC), Directorate of Aircraft, Software Division (LAS)	<ul style="list-style-type: none"> • 7:1 ROI and savings of \$11M over eight years • 90% reduction in defect rates compared to baseline project • 26% reduction in average cost of maintenance actions over 24 months.
NASA - Goddard Space Flight Center	Improvements in: staff training, reduced cycle time, defect prevention, requirements definition	7:1 ROI over 17 years (Project Overhead, Data Processing, Model Development)



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

Product cost

Schedule /
cycle time

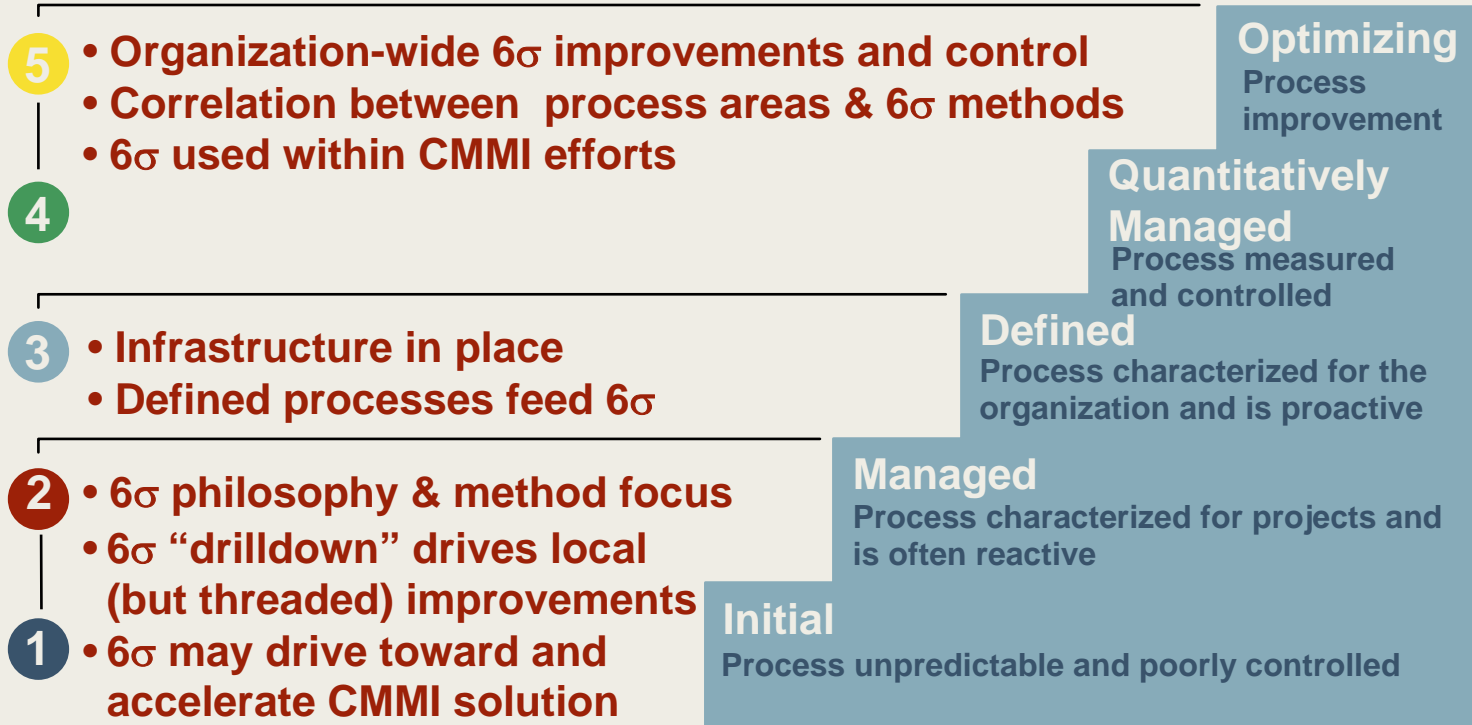
- Increased focus on product quality
- Increased focus on eliminating defects
- Developers seeking improvement opportunities

Quality

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



CMMI and Six Sigma



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



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CMMI Today

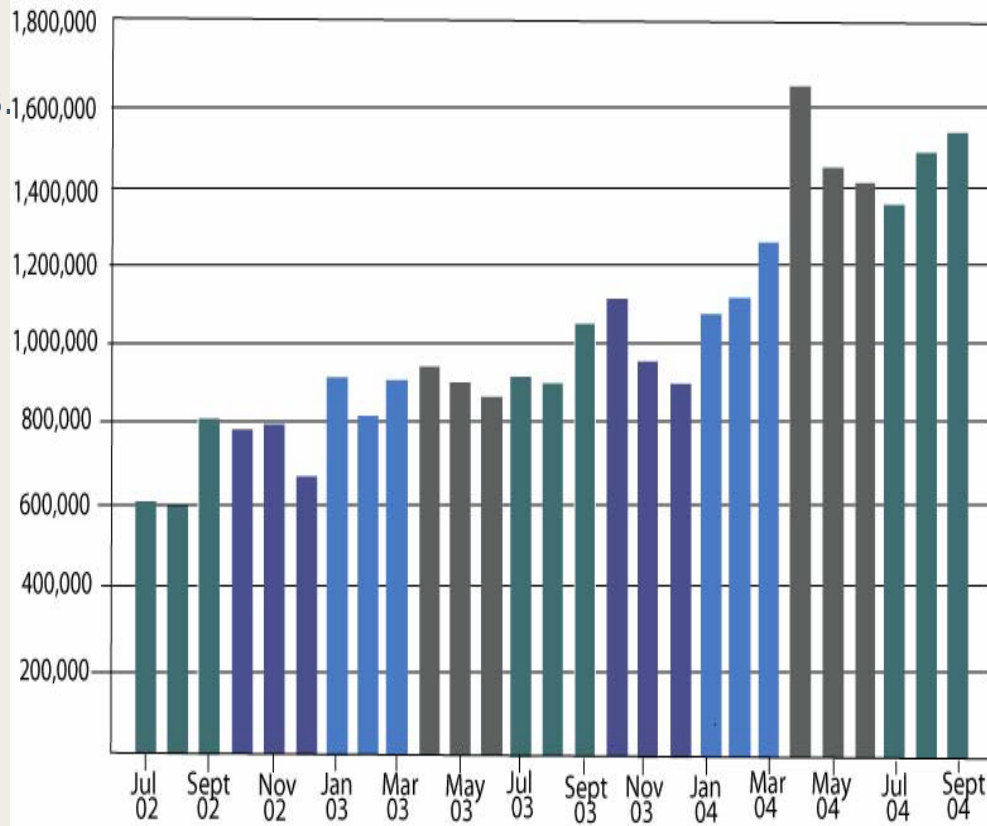
Version 1.1 CMMI Product Suite in use for almost 3 years.

Errata sheets cover known errors and changes with book publication; FAQs cover broader issues.

CMMI web pages hits

- 1.5M/month
- 50K/day

Total number of page views per month





CMMI Transition Status as of 11-30-04₁

Training

Introduction to CMMI – 26,420 trained

Intermediate CMMI – 1,251 trained

Introduction to CMMI Instructors - 366 trained

SCAMPI Lead Appraisers - 470 trained

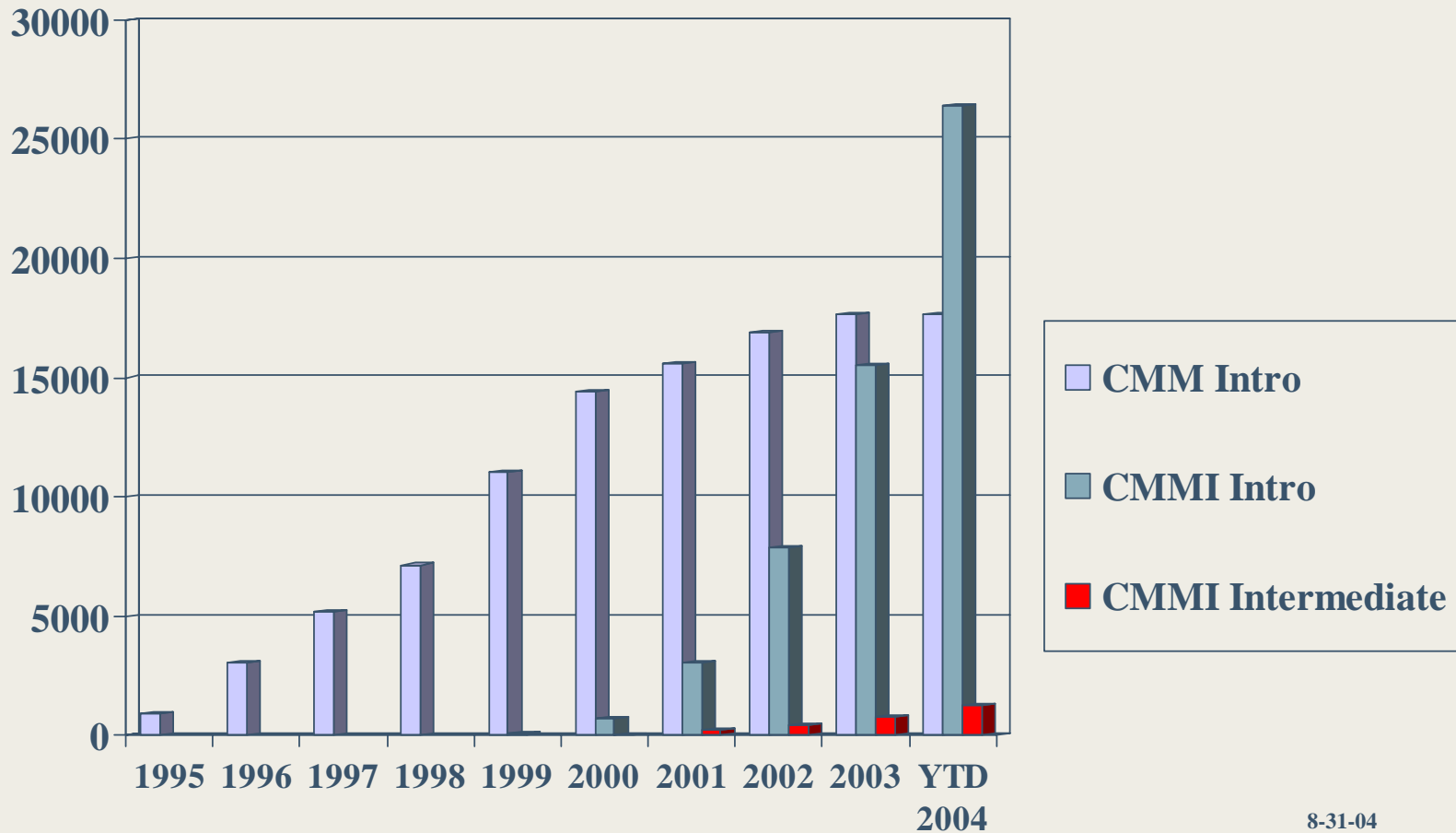
Authorized

Introduction to CMMI V1.1 Instructors – 232

SCAMPI V1.1 Lead Appraisers – 352



Intro to the CMM and CMMI Attendees (Cumulative)

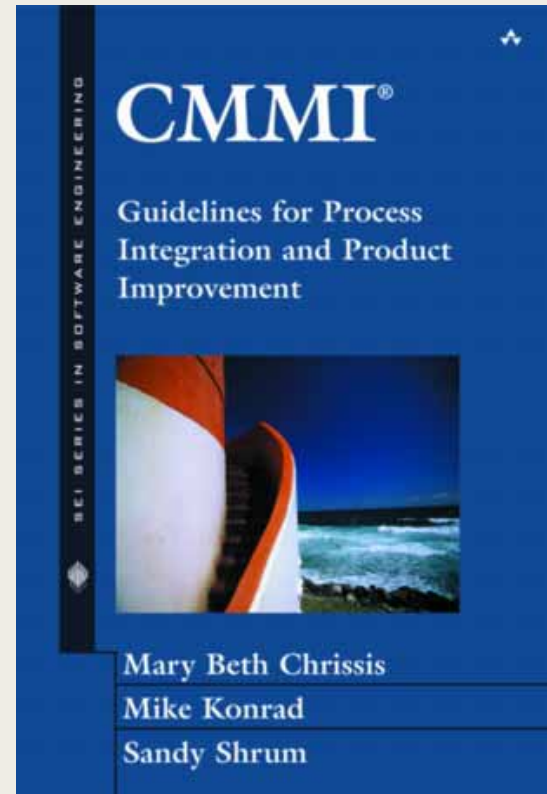




Adoption—What's Available?

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
- Practical Insight into CMMI
- Interpreting the CMMI
- Real Process Improvement Using the CMMI
- Making Process Improvement Work
- CMMI: Un Itinéraire Fléché





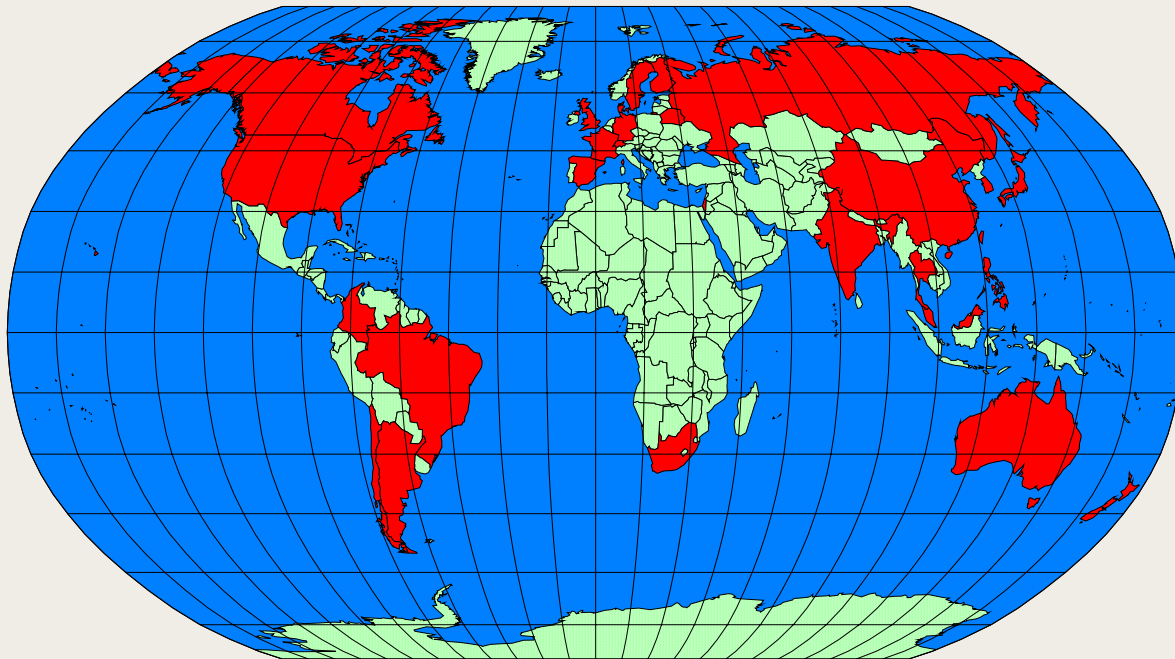
How about SEI Publications?

Technical notes and special reports:

- Interpretive Guidance Project: Preliminary and Final Reports
- 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
- CMMI Acquisition Module (CMMI-AM)
- Interpreting CMMI for Marketing (in progress)
- Providing Safety and Security Assurance (in progress)
- Demonstrating the Impact and Benefits of CMMI



Countries where Appraisals have been Performed and Reported to the SEI

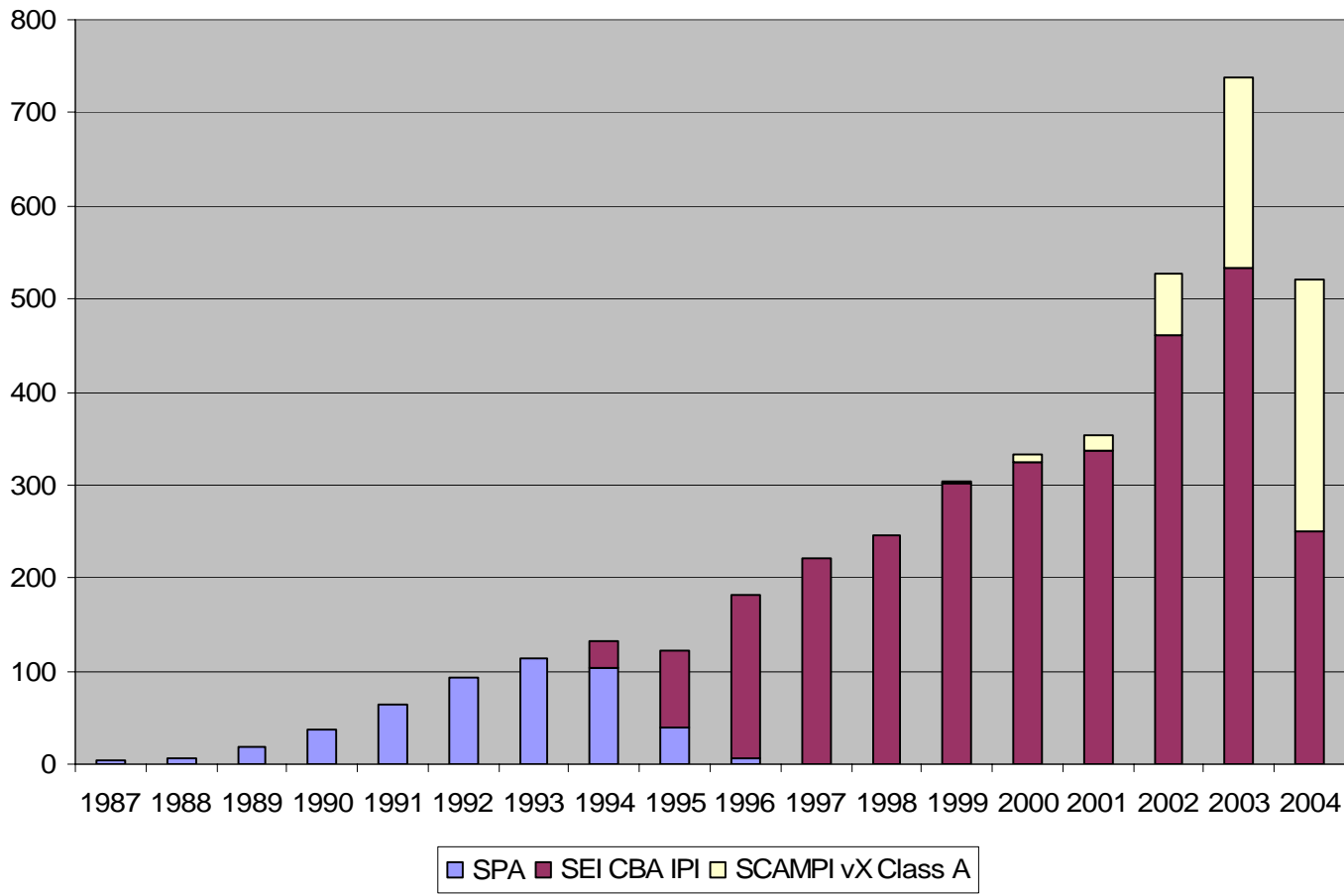


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|-----------------------|----------------------|---------------------------|-----------------|--------------------|--------------------|-----------------|
| Argentina | Australia | Belarus | Brazil | Canada | Chile | China |
| Colombia | Denmark | Finland | France | Germany | Hong Kong | India |
| Israel | Japan | Korea, Republic of | Malaysia | New Zealand | Philippines | Russia |
| Singapore | South Africa | Spain | Sweden | Switzerland | Taiwan | Thailand |
| United Kingdom | United States | | | | | |

Red country name: New additions with this reporting since Nov. 2003



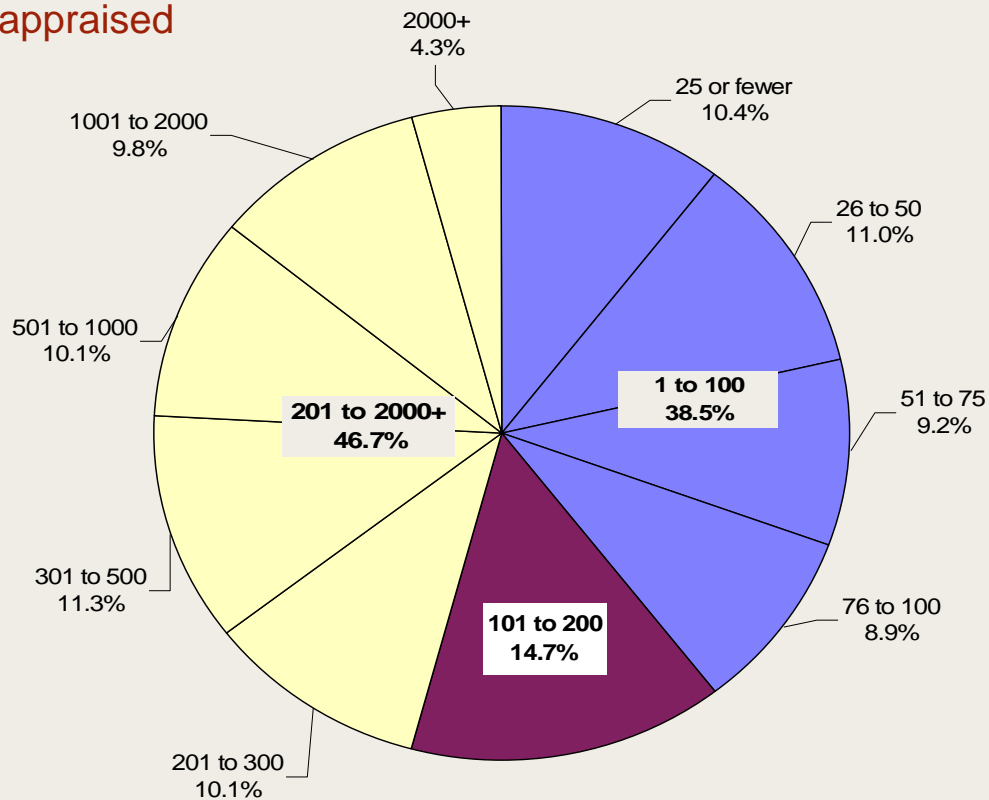
Number of Appraisals Conducted by Year Reported as of 1 November 2004





Organization Size

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

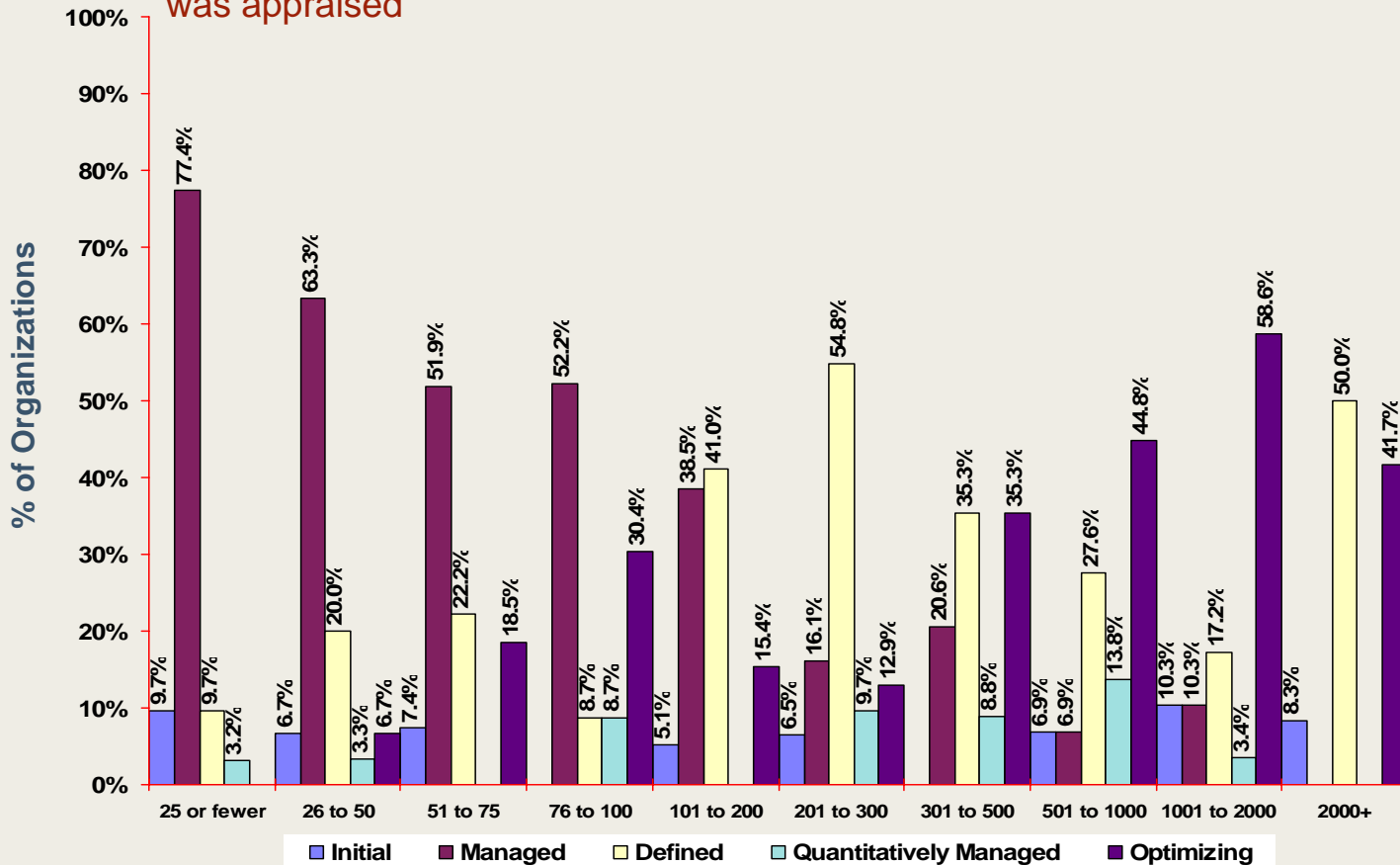


Based on **326** organizations reporting size data



Maturity Profile by Organization Size

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



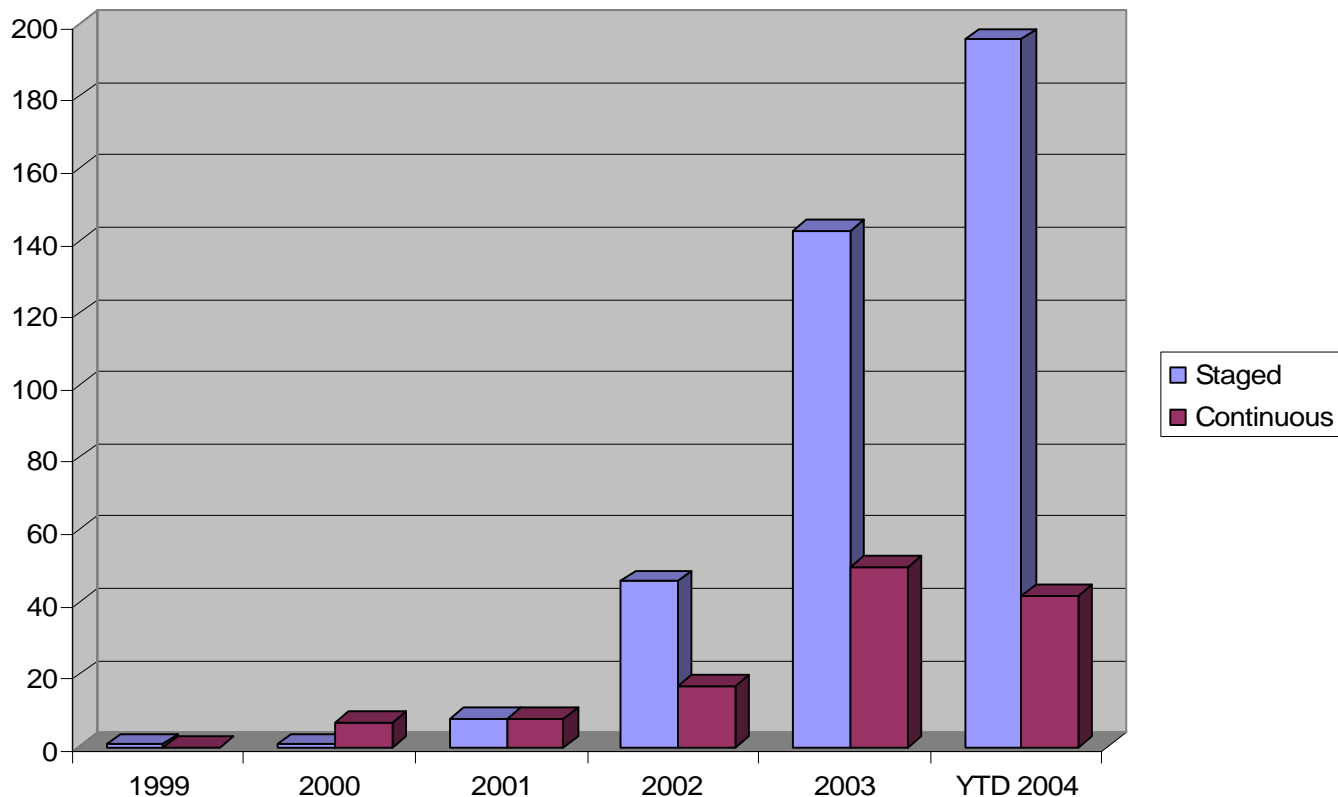
Based on 285 organizations reporting size data and maturity level rating



Number of SCAMPI v1.x Appraisals Conducted by Year by Model Representation*

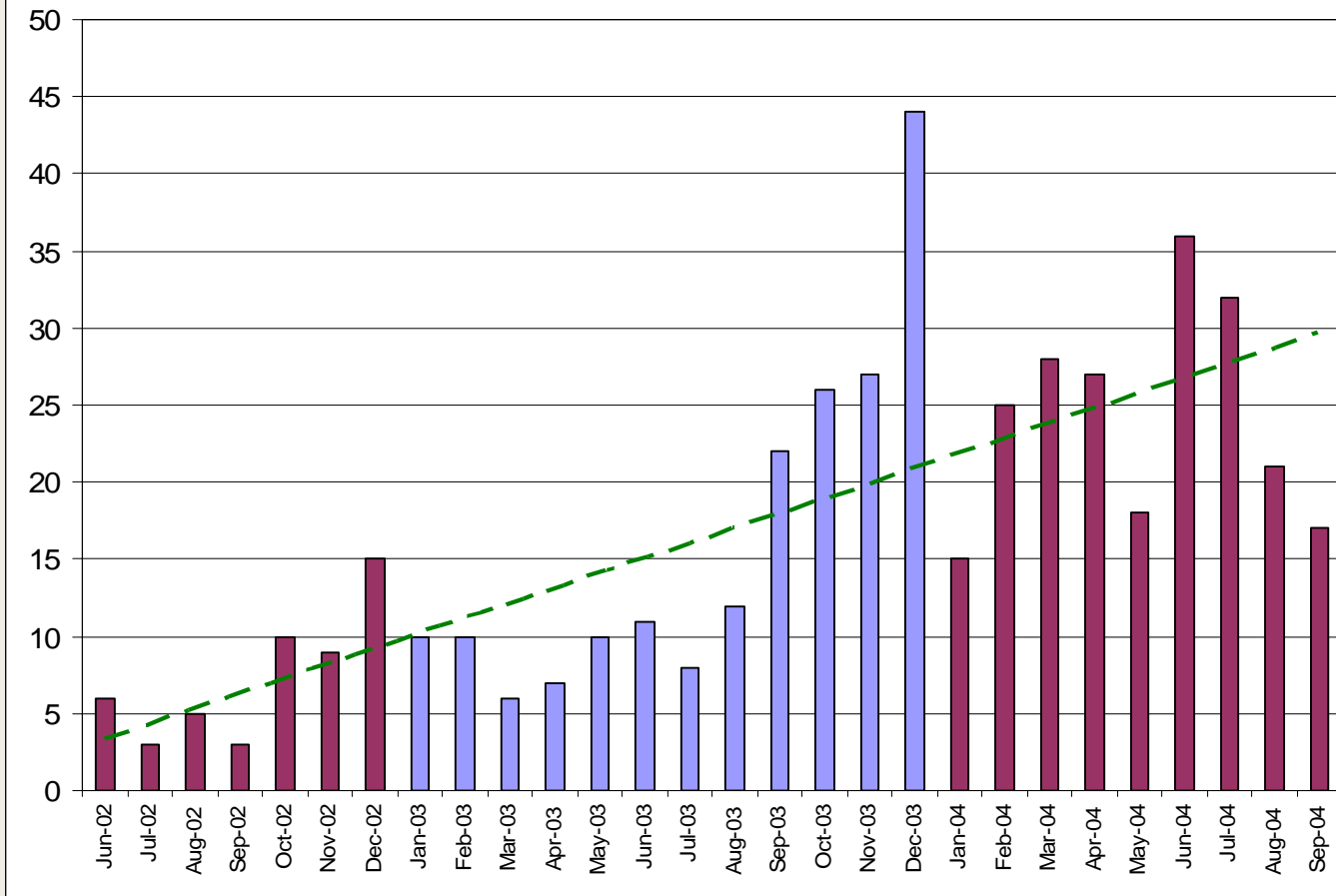
Reported as of 1 November 2004

*Where Representation is reported





Number of SCAMPI v1.1 Appraisals Conducted by Month
Reported as of 1 November 2004





Appraisal Results – Staged Example



List of Published SCAMPI Appraisal Results

ORGANIZATION NAME: CMS Information Services, Inc.
SPONSOR NAME: Bob Turner
LEAD APPRAISER NAME: Gene Jorgensen
SEI PARTNER: Not Reported
APPRAISAL END DATE: 4/11/2003
MATURITY LEVEL ASSIGNED: 3
APPRAISED ORGANIZATIONAL UNIT:
 Entity Name: CMS Information Services, Inc.
 Location(s): Vienna, VA
CMMI MODEL USED: CMMI v1.1-SE/SW, Staged
APPRAISAL METHOD USED: SCAMPI v1.1

MODEL SCOPE & CAPABILITY RATINGS ASSIGNED:

Process Management	Project Management	Engineering	Support
OPF Satisfied	PP Satisfied	REQM Satisfied	CM Satisfied
OPD Satisfied	PMC Satisfied	RD Satisfied	PPQA Satisfied
OT Satisfied	SAM Not Applicable	TS Satisfied	MA Satisfied
OPP Not Rated	IPM Satisfied	PI Satisfied	DAR Satisfied
OID Not Rated	RSKM Satisfied	VER Satisfied	OEI Not Rated
	IT Not Rated	VAL Satisfied	CAR Not Rated
	ISM Not Rated		
	QPM Not Rated		



Appraisal Results – Continuous



List of Published SCAMPI Appraisal Results

ORGANIZATION NAME: Science Applications International Corporation
SPONSOR NAME: Dennis Eisenstein
LEAD APPRAISER NAME: Floyd (Sonny) Wolfe
SEI PARTNER: Not Reported
APPRAISAL END DATE: 1/23/2003
MATURITY LEVEL ASSIGNED: Not Assigned
APPRAISED ORGANIZATIONAL UNIT:
 Entity Name: Enterprise Management Services Operation Center
 Location(s): Falls Church; San Diego, VA; CA
CMMI MODEL USED: CMMI v1.1-SE/SW, Continuous
APPRAISAL METHOD USED: SCAMPI v1.1

MODEL SCOPE & CAPABILITY RATINGS ASSIGNED:

Process Management		Project Management		Engineering		Support	
OPF	Not Rated	PP	Not Rated	REQM	Not Rated	CM	Not Rated
OPD	Not Rated	PMC	Not Rated	RD	Not Rated	PPQA	Not Rated
OT	Not Rated	SAM	Not Rated	TS	Not Rated	MA	Not Rated
OPP	Not Rated	IPM	Not Rated	PI	Not Rated	DAR	Not Rated
OID	Not Rated	RSKM	Not Rated	VER	Capability Level 3	OEI	Not Rated
		IT	Not Rated	VAL	Not Rated	CAR	Not Rated
		ISM	Not Rated				
		QPM	Not Rated				



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CMMI Version 1.2 Plan

“Single book, single course” strategy begun

- V1.2, like the Addison-Wesley book, will consolidate both staged and continuous representations
- Single course for “Intro to CMMI” has been created
- SCAMPI refinements will complement the strategy



Architectural Refinement

Improved architecture will allow post-V1.2 expansion

- Extensions of the life cycle (Operations, Services) could expand use of a common organizational framework
 - Allows coverage of more of the enterprise, or potential partnering organizations
 - Adapts model features to fit non-developmental efforts (e.g., CMMI-Services)
- V1.2 enhancements will not contain these elements, nor require any “repeat” of existing courses



Current planned enhancements

To address size and complexity:

- “Single book” approach
- Eliminate concept of advanced practices.
- Eliminate concept of common features.
- Improve model-method interactions for artifacts.
- Clarify material based on 1000+ CRs

To address confusion on coverage:

- Add “hardware” amplifications to assure all of development is covered.

Pilot changes in early FY06; release V1.2 late FY06.



For More Information About CMMI

- Go to CMMI Website

- <http://sei.cmu.edu/cmmi>
- <http://seir.sei.cmu.edu/seir/>
- <https://bscw.sei.cmu.edu/pub/bscw.cgi/0/79783>
- <http://dtic.mil/ndia> (first, second, and third annual CMMI Conferences)
- <http://seir.sei.cmu.edu/pars> (publicly released SCAMPI summaries)