



**Carnegie Mellon
Software Engineering Institute**

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CMMI[®]

Improving and Integrating

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This Presentation

Provides an overview of CMMI

The Past—where we've been and what has influenced us

The Present—where we are

The Future—where we are going and how you can help



The Past

era of “manufacturing in quality”

The premise of “manufacturing in quality”

- Implies a focus on **processes** as well as on **products**
- Is a long-established premise in manufacturing
- Is based on Total Quality Management principles as taught by Shewhart, Juran, Deming, and Humphrey

“It costs a lot of money to build bad products.”

Augustine’s 12th Law

“The quality of a system is highly influenced by the quality of the process used to acquire, develop, and maintain it.”

Phillip Crosby “*Quality is Free: The Art of Making Quality Certain*”



Quality Management Maturity Grid

Management Categories	Stage 1: Uncertainty	Stage 2: Awakening	Stage 3: Enlightenment	Stage 4: Wisdom	Stage 5: Certainty
Cost of quality as % of sales	Reported: unknown Actual: 20%	Reported: 5% Actual: 18%	Reported: 8% Actual: 12%	Reported: 6.5% Actual: 8%	Reported: 2.5% Actual: 2.5%
Summation of company quality posture	"We don't know why we have quality problems."	"Must we always have quality problems?"	"We are identifying and resolving our quality problems."	"We routinely prevent defects from occurring."	"We know why we don't have quality problems."

Crosby, P. *Quality is Free: The Art of Making Quality Certain*. New York: McGraw-Hill, 1979.



The Present

era of “engineering in quality”

CMMs focus on

- Process and product quality
- Business results
- Engineering in quality

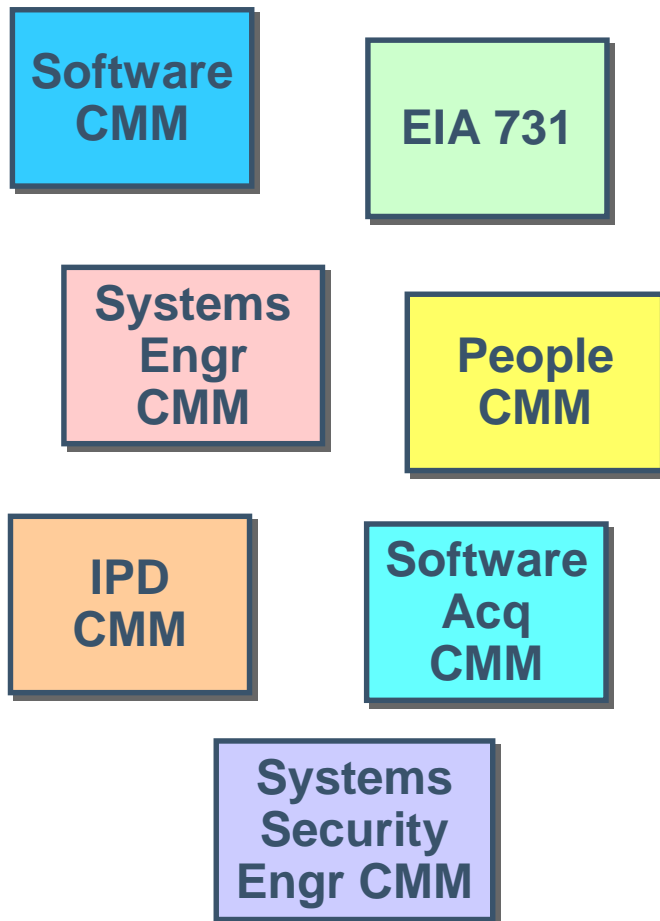
CMMs continue to be adopted and used

Companies in key markets are adopting CMMs

- Defense
- Aerospace
- Automotive
- Entertainment
- Telecommunications
- Finance



Multiple Process Models



Success of the Software CMM[®] caused development of other CMMs, but they

- Have different structures, formats, terms, ways of measuring maturity
- Cause confusion, especially when more than one are used
- Are difficult to integrate into a combined improvement program
- Are difficult to use in supplier selection



Sunsetting of SW-CMM

Introduction to SW-CMM training course

- Last public offering from SEI is December 2003
- Continued availability from transition partners

CBA-IPI Assessments and SCE Evaluations

- Last Lead Assessor (LA) training is December 2003; last Lead Evaluator (LE) training is October 2003
- LA and LE authorizations expire December 31, 2005; LAs and LEs must upgrade to SCAMPI to continue providing SEI-Authorized appraisal services

For more information: See the Sunset FAQ at

<http://www.sei.cmu.edu/cmmi/adoption/sunset-faq.html>



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The Future

era of “innovating in quality”

We face unprecedented engineering challenges.

Customers demand quality products faster and cheaper.

Management expects higher productivity.

Engineering fields continually evolve and merge.

Organizations are dynamic; there is much more partnering.

Our knowledge and experience must be shared.

The future is now!
CMMI is our knowledge infrastructure



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A House in Four Hours



Start at t_0



$t_0 + 2\text{hrs } 45 \text{ min}$

©Building Industry Association, San Diego, CA, 1997.

© 2003 by Carnegie Mellon University





Process Observations

Building the four-hour house as it parallels product development processes:

- Plan the work
- Monitor and measure the work
- Design before building the product
- Analyze and commit to the design
- Integrate the product
- Create team experience before, not during, the build
- Reuse knowledge of past designs and builds
- Utilize highly skilled staff



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CMMI Is Integration and Improvement

CMMI supports process integration and product improvement.

CMMI integrates multiple disciplines into one process-improvement framework that eliminates inconsistencies and reduces duplication.

CMMI provides a framework for introducing new disciplines as needs arise and therefore reduces the cost of implementing model-based improvement.

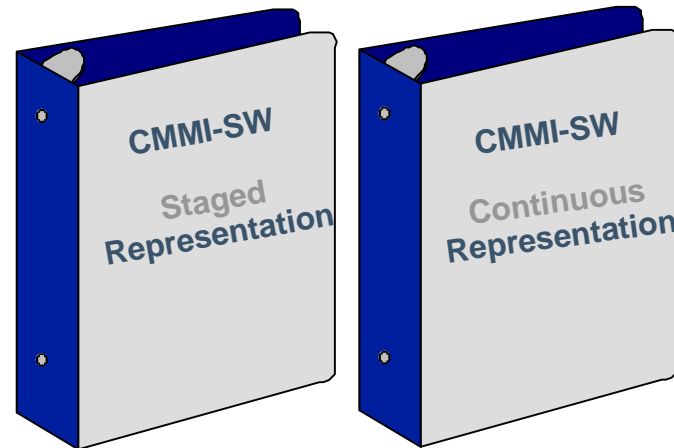
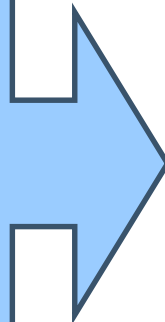
CMMI is designed to minimize the impact on legacy process improvement efforts and investment.



CMMI Models

Source Models

- Capability Maturity Model for Software V2, draft C (SW-CMM V2C)
- EIA 731, System Engineering Capability Model (SECM)
- Integrated Product Development Capability Maturity Model, draft V0.98 (IPD-CMM)



CMMI

- Meets the needs of software organizations
- Is an upgrade of SW-CMM
- Benefits from best practices contributed from all three source models



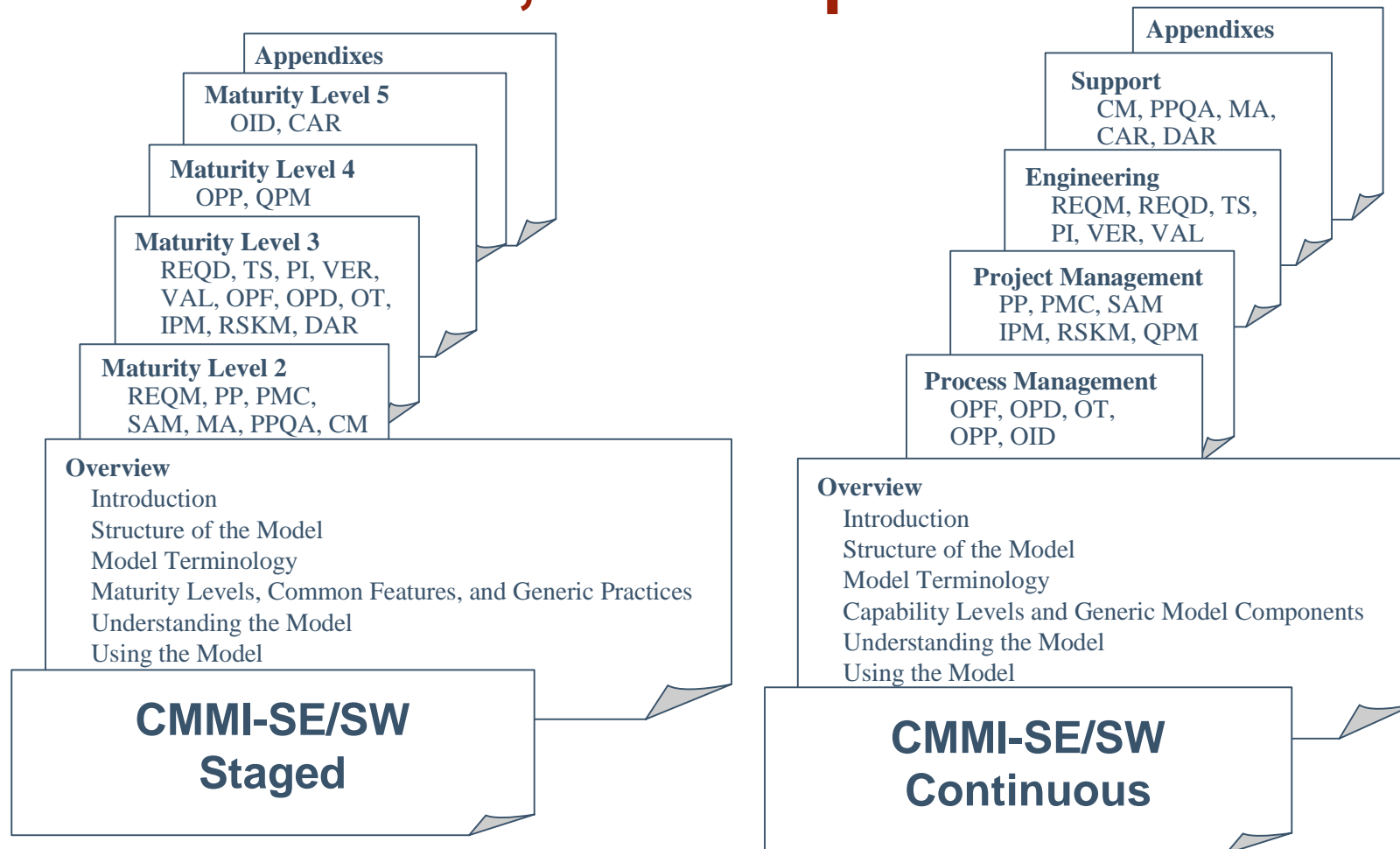
Improving on the Software CMM

CMMI Models improve on SW-CMM Version 2.0 Draft C:

- Incorporate additional years of learning
- More explicitly link best practices to **business objectives**
- Expand the scope of and visibility into the product life cycle and engineering activities
- Add more best practices, (e.g., measurement, risk management, product integration, decision analysis and resolution, and supplier management)
- Capture more robust high-maturity practices
- Address additional generic practices needed for institutionalization
- More fully comply with relevant ISO standards



One Model, Two Representations





Understanding CMMI Representations

A representation allows an organization to pursue different improvement objectives and presents model components differently. The content is **nearly identical** in both representations.

So why both?

- The representation of each source model was different
 - Software CMM—Staged
 - SE-CMM, SECM—Continuous
- Ease adoption by legacy communities.
- Both representations provide inherent benefits.



Advantages of Each Representation

Continuous Representation	Staged Representation
Provides maximum flexibility for order of process improvement	Predefined and proven path with case study and ROI data
High visibility of improvement within process areas	Focuses on organizational improvement
Easy upgrade from EIA 731	Easy upgrade from SW-CMM
Easy comparison to ISO 15504	Provides familiar benchmarking capability
Improvement of process areas can occur at different rates	Overall results summarized in a maturity level



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CMMI in a Nutshell

A CMMI model provides a structured view of process improvement across an organization.

CMMI can help

- set process improvement goals and priorities
- provide guidance for quality processes
- provide a yardstick for appraising current practices



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CMMI Today

Stable Version 1.1 CMMI Product Suite was released January 2002.

CMMI models will not change until 2005 at earliest.

Many defense, aerospace, and commercial organizations are upgrading to CMMI.

One appraisal method, SCAMPI, covers

- internal process improvement
- supplier source selection
- contract process monitoring



Discoveries in Use

Ease of upgrade to CMMI reported by:

- Multiple SW-CMM level 5 organizations that upgraded and maintained their maturity level
- Multiple organizations that upgraded from EIA/IS 731 systems engineering assessments
- Numerous European companies in group discussion of CMMI adoption at recent SEI-Europe quarterly meeting

Appraisal times reflect excellent learning curves

- Australian group reported 40% reduction in appraisal time over five appraisals

Mappings and gap analyses confirm evolutionary expansion from predecessor models

- Government and contractors agree on CMMI's improved engineering coverage in contract monitoring
- ISO/CMMI compatibility appears favorable



Where We're Going

Adoption activities

- Transition Partner data
- Early adoptors
- Workshops, technical notes, and book publication
- Interpretive Guidance project

Appraisal enhancement activities

- SCAMPI appraisal data
- CMMI adoption worldwide
- SCAMPI enhancements

Training activities

- CMMI training data
- Training course upgrades



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Transition Partner Status

Transition Partners

- 50 for CMMI introduction training
- 86 for SCAMPI appraisal services

Authorization

- Introduction to CMMI Instructors – 103
- SCAMPI Lead AppraisersSM – 162

As of 1/22/03



Early Adopters

The screenshot shows the Carnegie Mellon Software Engineering Institute website. The main navigation bar includes links for Home, Search, Contact Us, Site Map, and What's New. A secondary navigation bar lists various categories: About the SEI, Management Practices, Engineering Practices, Technology Adoption, Collaboration Opportunities, and Products and Publications Services. The page title is 'CMMI Early Adopters'. A sidebar on the left contains a list of links under the heading 'ABOUT THE SEI', including 'CMMI Main Page', 'General Information', 'News and Communications', 'Publications and Transition Materials', 'Product Suite', 'Project Groups', 'Organizing Documents', and 'Related Web Pages'. The main content area features a CMMI logo and a paragraph explaining that the listed organizations were among the first to implement CMMI-based process improvement initiatives. Below this, three organizations are listed with their names, key personnel, and contact information (World Wide Web and email addresses):

- The Boeing Company**
Al Brown
World Wide Web: <http://www.boeing.com>
- Harris Corporation**
Gary Natwick, Senior Principal Engineer
E-mail: gnatwick@harris.com
World Wide Web: <http://www.harris.com>
- Jacobs/Sverdrup Technology Inc., Advanced Systems Group Engineering Performance Improvement Center (EPIC)**
Jeffrey L. Dutton, Technical Director
E-mail: duttonjl@sverdrup.com
- U.S. Army TACOM-ARDEC Software Enterprise**
S. Wayne Sherer, Senior Technical Associate for Corporate Process Improvement
E-mail: wsherer@pica.army.mil

At the bottom of the page, a note states: 'If you have questions or comments, send email to: webmaster@sei.cmu.edu'

Currently there are 30 early adopters.

Are you an early adopter?
Send email to cmmi-comments@sei.cmu.edu to be listed.

See Early Adopter list at
<http://www.sei.cmu.edu/cm mi/adoption/early-adopters.html>



Adoption – What’s Happening Now

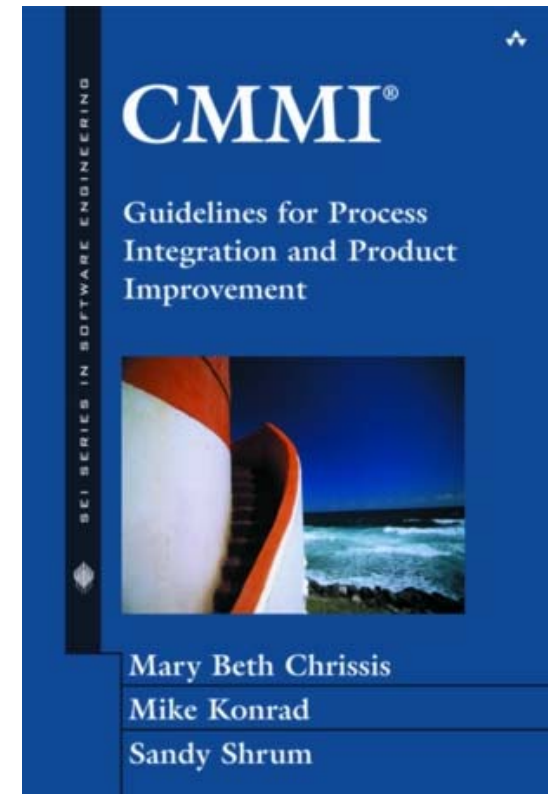
Events related to CMMI adoption:

- Quarterly transition workshops
- Annual NDIA/SEI CMMI User Workshop
- Interpretive Guidance project

Technical notes and special reports:

- CMMI and Product Line Practices
- CMMI and Earned Value Management
- Interpreting CMMI for Operational Organizations
- Interpreting CMMI for Service Organizations (in progress)
- CMMI Mappings
- Specific interests (e.g., safety, security)

Publication of SEI Series Book with
Addison-Wesley





Interpretive Guidance Project

The Interpretive Guidance project is investigating whether there is information in CMMI models that may be more easily used by software, IT, and IS organizations if special guidance or interpretation is provided.

This project is collecting information in the following ways:

- Birds-of-a-feather sessions at conferences
- Workshops at SPIN meetings
- Expert group meetings
- Detailed interviews with select software organizations
- Feedback from SCAMPI appraisals
- Web-based questionnaire



Interpretive Guidance on the Web

CMMI Interpretive Guidance Project - Mozilla {Build ID: 2002082606}

File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop <http://www.sei.cmu.edu/cmmi/adoption/interpretiveguidance.html>

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Organizations Improving management practices individuals

MANAGEMENT PRACTICES

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CMMI[®] Interpretive Guidance Project

February 19, 2003

Since the release of Version 1.1 of the Capability Maturity Model[®] Integrated (CMMI[®]) Product Suite, the Software Engineering Institute (SEISM) has been working to aid the adoption of CMMI. The Interpretive Guidance project was formed to collect information about how CMMI is being utilized by software, information technology (IT), and information systems (IS) organizations.

Based on the information gathered by the project from software, IT, and IS organizations, the project will determine what guidance or interpretation of CMMI model best practices are warranted to help these organizations upgrade or adopt CMMI for their process improvement programs.

To understand and address the issues that software organizations have when using CMMI

To allow current SW-CMM users to more easily upgrade to CMMI

To eliminate as many perceived barriers to CMMI adoption as possible

To make CMMI adoption easy



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SCAMPI Appraisals

SCAMPI appraisals conducted since 1999 and reported to the SEI by October 2002:

- 40 appraisals
- 30 organizations
- 24 participating companies
- 6 reappraised organizations
- 141 projects
- 54.5% offshore organizations

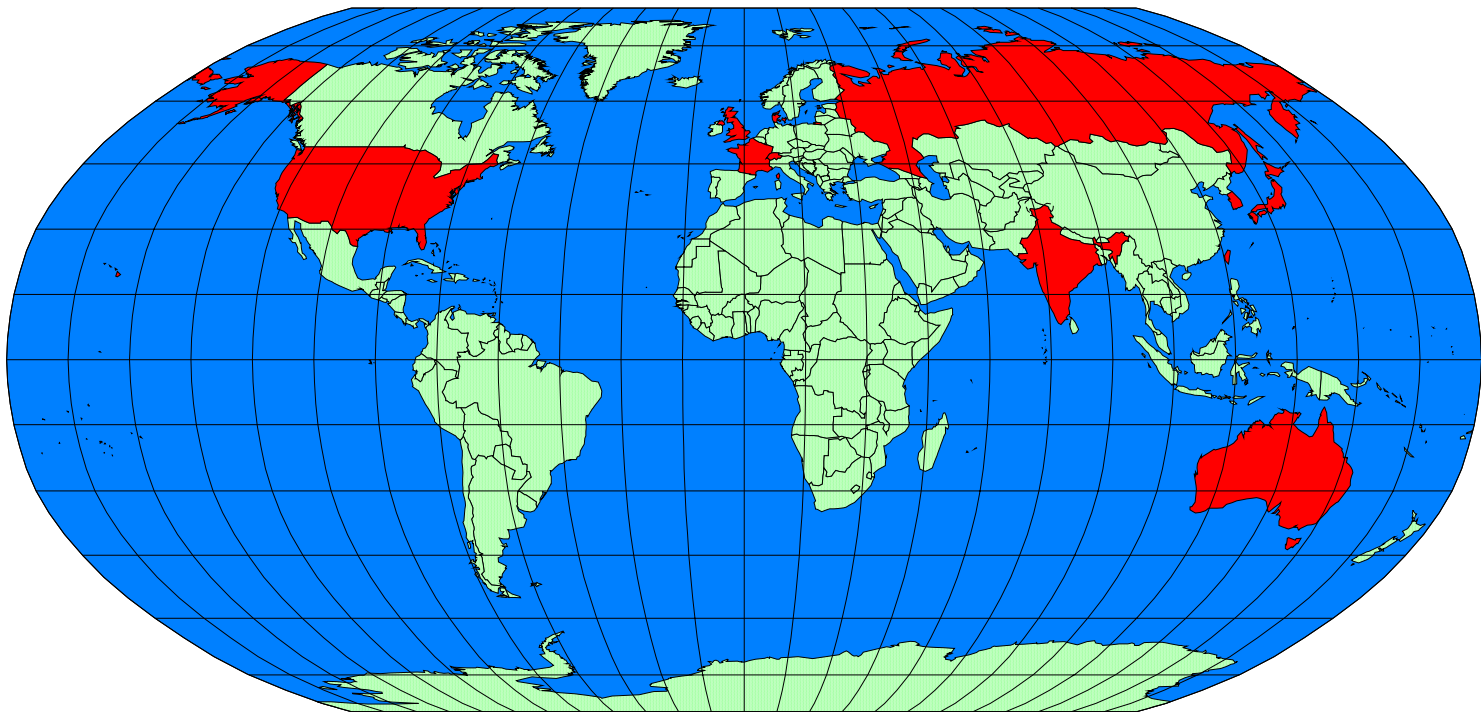
CMMI is being adopted!



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CMMI Appraisals Around the World



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



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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. (Check your SEPG program for more information.)

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



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Status of CMMI Training

Introduction to CMMI – 7,043 trained

Intermediate CMMI – 461 trained

Introduction to CMMI Instructors – 140 trained

SCAMPISM Lead Appraisers – 210 trained

As of 1/22/03



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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CMMI & SEPG – What’s Happening

CMMI Track all four days

CMM/CMMI presentations in other tracks by topic

Birds-of-a-Feather Sessions

- CMMI Interpretive Guidance
- SEI Lead Appraiser Program

SEI Booth Offerings

- CMMI poster
- CMMI reference cards
- CMMI FAQ
- CD of CMMI Product Suite work products
- Interpretive Guidance project general announcement
- Call for nominations for Interpretive Guidance Expert Group

Book signing events, including the new SEI Series book, *CMMI: Guidelines for Process Integration and Product Improvement*



In Summary

CMMI aids organizations to ...

- Improve delivery of **performance, cost, and schedule**
- Collaborate with external **stakeholders** and integrate their expectations into day-to-day activities
- Provide **competitive** world-class products and services
- Implement an **integrated** enterprise business and engineering perspective
- Use common, integrated, and **improving processes** for systems and software

We hope you choose to use CMMI for improving and integrating the processes in your organization.



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For More Information...

You can find this presentation on the SEI Web site at
<http://jo.sei.cmu.edu/pub/english.cgi/0/323123>.

For more information about CMMI, see
<http://www.sei.cmu.edu/cmmi/>

Or, contact

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