Overview of the Capability Maturity Model[SM] Integration (CMMI*) Development Project

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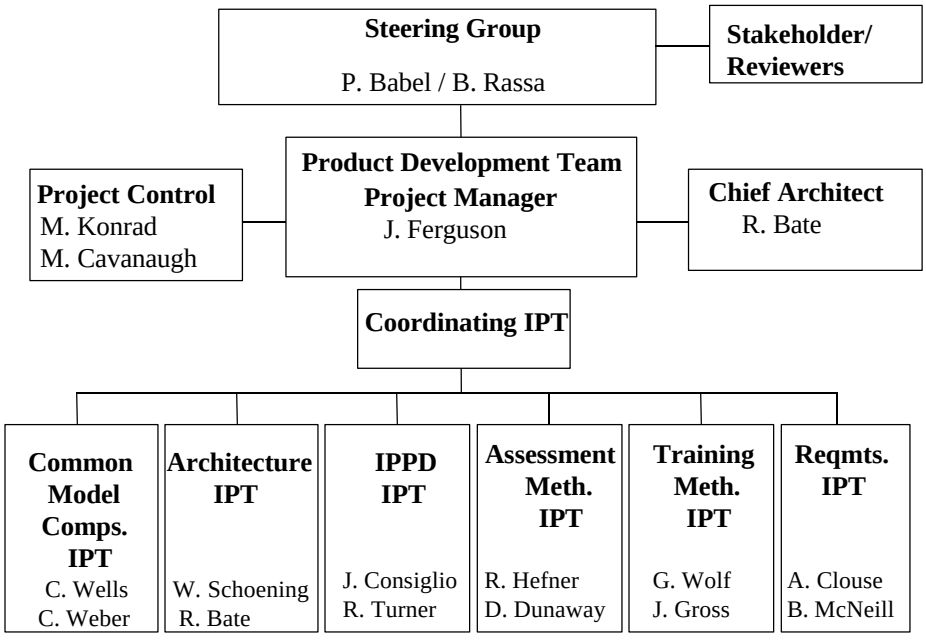
CMM Integration Project



Steering Group Members

• Phil Babel	US Air Force (Co-Chair)
• Bob Rassa	Raytheon (Co-Chair)
• Clyde Chittister	SEI
• David E. McConnell	US Navy
• Michael Devine	US Army
• Linda Ibrahim	FAA
• Bob Lentz	General Dynamics
• Mike Phillips	SEI
• Joan Weszka	Lockheed Martin
• Hal Wilson	Litton PRC
• Mike Zsak	OUSD (A&T)
• Joe Farinello	Support from OUSD (A&T)
• Brenda Zettervall	Support from OUSD (A&T)

Product Development Team Common Model Components IPT

• Curt Wells	Lockheed Martin (Co-lead)
• Charlie Weber	SEI (Co-lead)
• Linda Brown	Comarco
• Chris Cheetham	NSA
• Barb Denny	Rockwell Collins
• Mike Konrad	SEI
• Larry LaBruyere	TRW
• Frank McVey	Boeing
• Dave Zubrow	SEI

Product Development Team Architecture IPT

• Bill Schoening	Boeing (Co-lead)
• Roger Bate	SEI (Co-lead)
• Mark Cavanaugh	SEI
• Joe Graffius	Honeywell
• Craig Hollenbach	PRC
• Jane Moon	Raytheon

Product Development Team IPPD IPT

• John Consiglio	GD-Electric Boat (Co -lead)
• Rich Turner	FAA (Co-lead)
• John Kordik	USAF
• John Price	USAF

Product Development Team Assessment Methodology IPT

• Rick Hefner	TRW (Co-lead)
• Donna Dunaway	SEI (Co-Lead)
• Dennis Ahern	Northrop-Grumman
• Don Barber	Honeywell
• Dennis Goldenson	SEI
• Dave Kitson	SEI
• Guy Taylor	USN
• Karen Womack	CSC

Product Development Team Training Methodology IPT

• Gary Wolf	Raytheon (Co-lead)
• Jon Gross	SEI (Co-lead)
• Bruce Allgood	USAF
• Peter Capell	SEI
• Larry Jones	SEI

Product Development Team Requirements IPT

• Aaron Clouse	Raytheon (Co-lead)
• Bob McNeill	IBM/SEI (Co-lead)
• Jack Ferguson	SEI
• Lt Col Joe Jarzombek	USAF
• Sandy Shrum	SEI

The Current Situation

Explosion of CMMs and CMM-like models

Multiple models within an organization

Multiple assessments

Multiple training

Multiple expenses

Why is this a problem?

Similar process improvement concepts, but...

- Different model representations (e.g. staged, continuous, questionnaire, hybrid)
- Different terminology
- Different content
- Different conclusions
- Different appraisal methods

Key Concept in Model-based Process Improvement

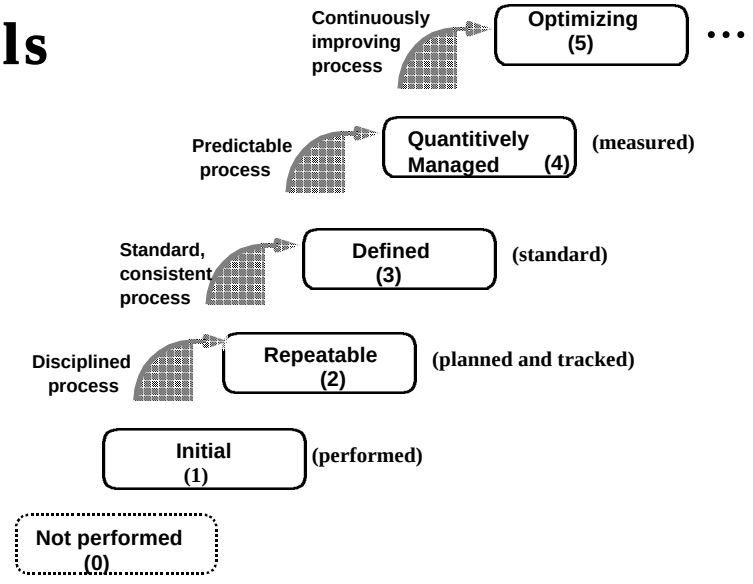
Improvement in any discipline is a function of performing:

- *implementing practices* that reflect the fundamentals of a particular topic (e.g. configuration management)
- *institutionalizing practices* that lead to sustainment and improvement of an implementation

Thus all CMMI source models contain:

- *Implementing practices* grouped by affinity
- *institutionalizing practices* that vary from model to model, however all models specify
  - *levels* that describe increasing capability to perform

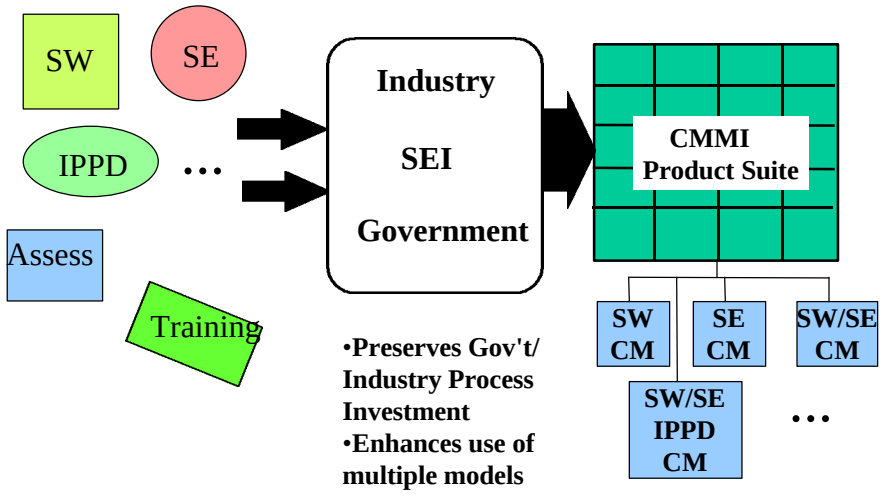
Improvement Levels



CMMI Design Approach

Requirements

CMMI Requirements



- **Preserves Gov't/ Industry Process Investment**
- **Enhances use of multiple models**

Design Goals

Eliminate inconsistencies,

Reduce duplication,

Reduce the cost of implementing model-based process improvement,

Increase clarity and understanding, by using:

- Common terminology
- Consistent style
- Uniform construction rules
- Common components…, with

Minimal impact on legacy efforts

Benefits

Efficient, effective assessment and improvement across multiple process disciplines in an organization

Reduced training and assessment costs

A common, integrated vision of improvement for all elements of an organization

A means of representing new discipline-specific information in a standard, proven process improvement context

CMMI Design Approach

Inputs

Source Models

Capability Maturity Model for Software V2, draft C

EIA Interim Standard 731, System Engineering Capability Model

Integrated Product Development Capability Maturity Model, draft V0.98

SW-CMM V2 Key Process Areas

- Requirements Management
- Software Project Planning
- Software Project Control
- Software Acquisition Management
- Software Quality Assurance
- Software Configuration Management
- Organization Process Focus
- Organization Process Definition
- Integrated Software Management
- Organization Training Program
- Software Product Engineering
- Project Interface Coordination
- Peer Reviews
- Organization Software Asset Commonality
- Organization Process Performance
- Statistical Process Management
- Defect Prevention
- Organization Process & Technology Innovation
- Organization Improvement Deployment

SECM Focus Areas

- Define Stakeholder and System Level Requirements
- Define Technical Problem
- Define Solution
- Assess and Select
- Integrate System
- Verify System
- Validate System
- Plan and Organize
- Monitor and Control
- Integrate Disciplines
- Coordinate with Suppliers
- Manage Risk
- Manage Data
- Manage Configurations
- Ensure Quality
- Define and Improve the Systems Engineering Process
- Manage Competency
- Manage Technology
- Manage Systems Engineering Support Environment

IPD-CMM Process Areas

- Product Selection
- Product Life Cycle Definition
- Product Requirements Evolution
- Product Solution
- Product Build, Verification & Test
- Product Support & Retirement
- Process Planning
- Configuration Management
- Ensuring Quality
- Process Monitoring and Control
- Organization Training Program
- Organization Process Definition
- Organization Process Focus
- Quantitative Techniques
- Product Line Evolution
- Process Change Management
- Project Leadership
- leadership Mechanisms
- Work Environment
- Team Environment
- Shared Vision
- Organization Leadership
- Organizational Environment Adaptation

Example Map of Process Areas To Source Models

CMMI PA	SW-CMM V2.0C	EIA SECM V1.0	IPD-CMM V0.98
Requirements Management	X	X	
Supplier Agreement Management	X	X	X
Configuration Management	X	X	X
Data Management		X	
Training	X	X	X
Customer and Product Support	X		X

Staged Representations

Key Process Areas are grouped in the stages (levels) from 2 to 5

A Key Process Area contains specific practices (activities) to achieve the purpose of the process area.

For a Key Process Area at a given stage, institutionalization practices are integral to the process area.

Staged Model SW-CMM V2

Level	Focus	Key Process Areas
5 Optimizing	*Continuous process improvement*	Org Improvement Deployment Org Process and Tech Innovation Defect Prevention
4 Quantitatively Managed	*Quantitative management*	Organization Process Performance Statistical Process Management Org Software Asset Commonality
3 Defined	*Process Standardization*	Peer Reviews Project Interface Coordination Software Product Engineering Organization Training Program Organization Process Definition Organization Process Focus
2 Repeatable	*Basic Project Management*	Software Configuration Management Software Quality Assurance Software Acquisition Management Software Project Control Software Project Planning Requirements Management
1 Initial	*Competent people and heroics*	

Continuous Representations

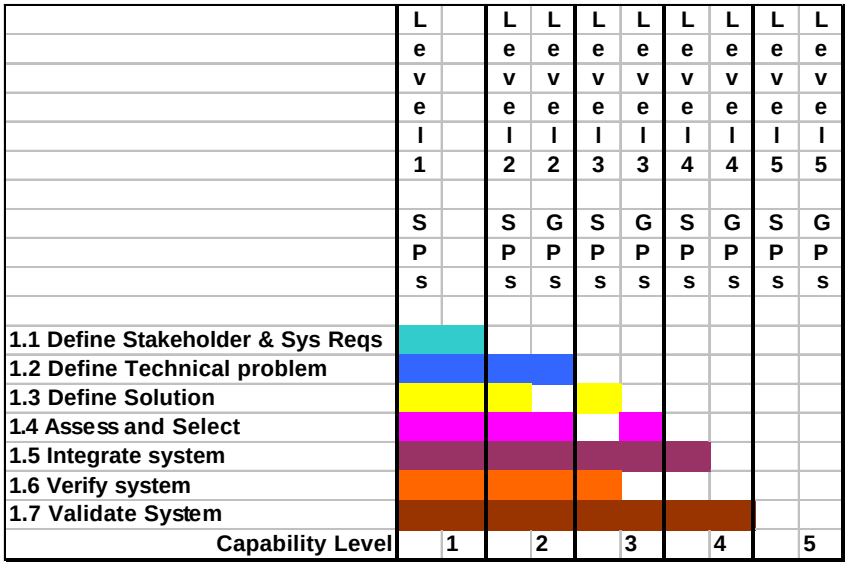
A process area contains specific practices to achieve the purpose of the process area.

Generic practices are grouped in Capability Levels

Generic practices are added to the specific practices of each process area to attain a capability level for the process area.

The order in which Process Areas are addressed can follow a recommended staging.

Continuous Model - SECM



Source Models

SW-CMM V2 Draft C	EIA IS 731 SECM	IPD-CMM V0.97
Staged	Continuous	Hybrid
Maturity Levels	Capability Levels Categories	Maturity and Capability Levels
Key Process Areas	Focus Areas	Process Areas
Key Process Area Goals	Themes	Capability and Process Area Goals
Activities Common Feature	Specific Practices	Base Practices
Common Features	Generic Practices	Generic Practices
	Generic Attributes	

The Challenge

Given the input models, extract the common and/or best features and provide users the ability to produce single or multiple discipline models, both continuous and staged, tailored to their organizations needs.

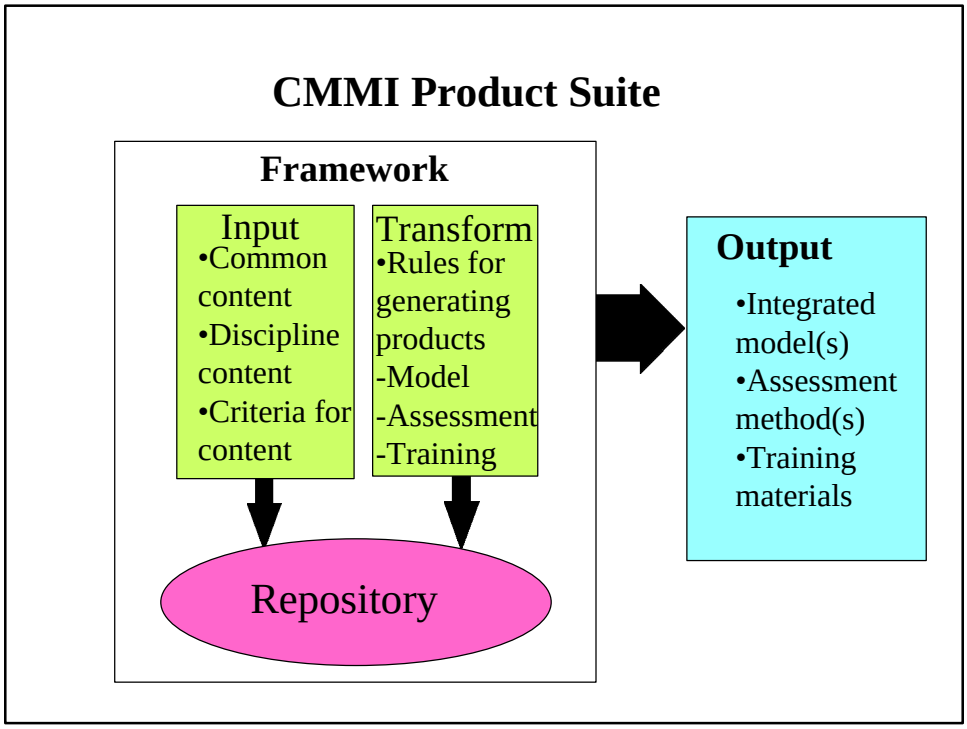
Provide users the ability to assess and train based on these output models.

CMMI Design Approach

Design

Our Solution

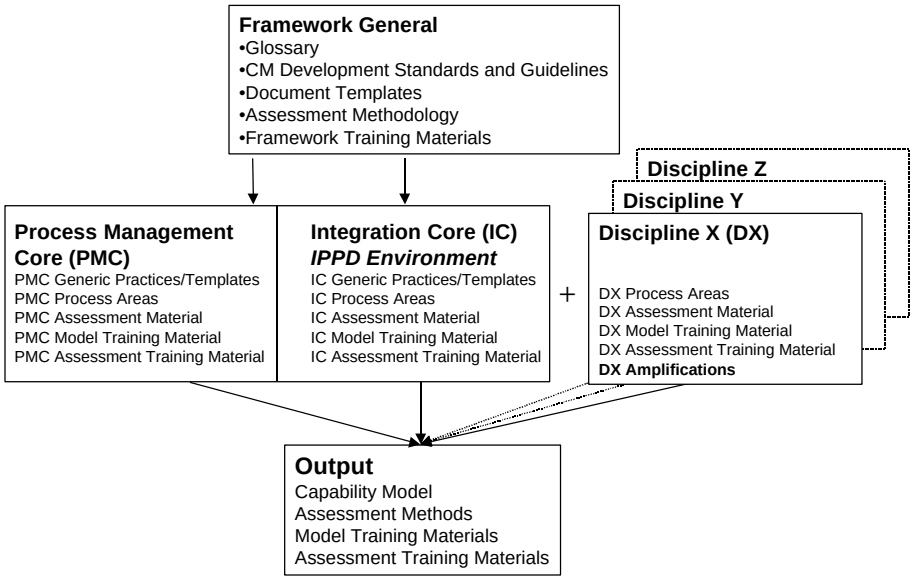
Develop a Product Suite consisting of a Framework from which the user can easily output tailored, integrated Capability Models and their associated assessment methods and training materials.



Framework

- Components of Capability Models
- Construction rules
- Conceptual architecture

The CMMI Framework Concept



Components of Capability Models

- Models
- Training materials
- Assessment materials

Models

- Process areas (PA) (focus areas, key process areas)
- Specific practices (base practices or activities)
- Generic practices (GPs or Common Features)
- Capability levels
- Stages
- Maturity levels
- Discipline-specific amplifications
- Descriptive material

Training Materials

- Introduction to Capability Model
  - Staged
  - Continuous
- Assessment team training
- Lead assessor training
- Use of framework training

Assessment Materials

- Assessment planning
- Data collection methods and tools
  - Staged
  - Continuous
- Analysis methods

Assessment Framework

- Assessment types to address customer needs
- Minimum (core) requirements for all assessment types
- Rules for generating assessment methods
- Compliance criteria
- Tailoring process, guidelines

CMMI Products

Capability Models

Staged and Continuous (with recommended staging) versions of:

- Software Engineering without IPPD
- Systems Engineering without IPPD
- Software+Systems Engineering w/o IPPD
- Software+Systems Engineering with IPPD

Assessment Material

- Assessment requirements
- Assessment methodology
- Assessment data collection methods and tools (e.g., questionnaires, interviews)
- Assessment Team qualifications

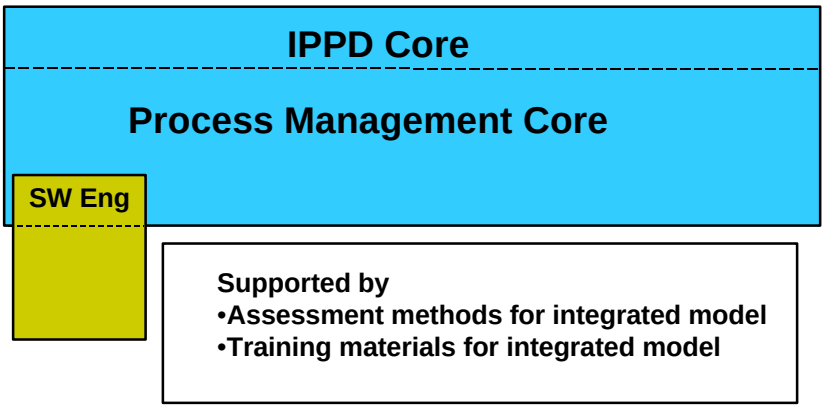
Training Material

- Capability Model Training
- Assessment Training
  - Team Training
  - Lead Assessor Training

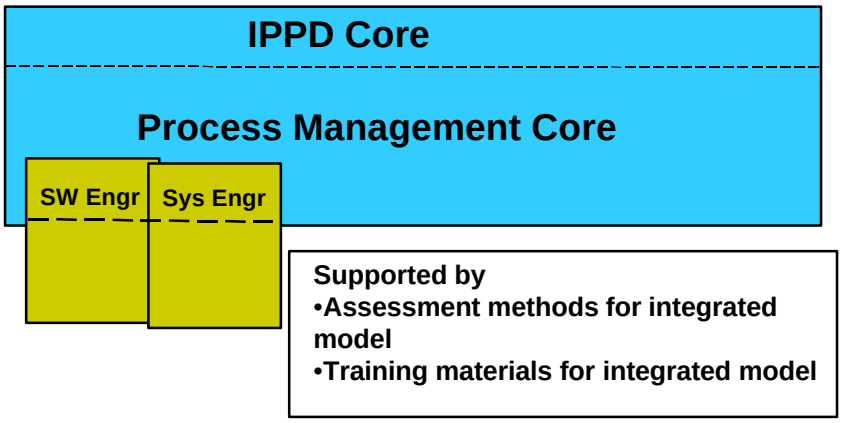
Developer Material

- Glossary
- Framework and model content criteria
- Framework Training

Example output of CMMI - Single Discipline



Example output of CMMI-Multiple Disciplines



Status

Concept Exploration (Feb-May)

- Started 5 Feb
- Examined inputs and designed architectures for
  - Framework
  - Resulting models, assessments and training

Product Development (May-Dec)

- Framework and model design
- Plan for models:
  - Draft SW for Stakeholder Review: 3-4Q '98
  - Draft SW for public review: 4Q '98
  - Pilot use of draft SW: 1Q '99
  - Other model drafts are planned to follow the SW model before the end of '98.
- Assessment and training methods for each

Conclusion

CMMI is a collaborative effort among industry, government and the SEI.

We have a development team and Steering Group, and an initial schedule.

We will report status on the SEI web site:

www.sei.cmu.edu

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