CMMI-SE/SW/IPPD Version 1.02 Abridged

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What is contained in this document?

During SITARA's SPIN addresses at Chennai (April 2002) and Hyderabad (May 2002), and in SITARA's public offerings of the Introduction to CMMI courses, a common request from the user community was if SITARA could provide a 'CMMI for Dummies' or 'CMMI in a Nutshell' summarizing the main ideas and themes contained in the rather voluminous CMMI model representations.

We therefore attempted to cull out the very essence of **'what you really need to know'** from the two CMMI representations and provide a ready reckoner within the 20 pages you are viewing in our May 2002 Technical Report.

What you don't see, of course is available in the 696 pages of the Continuous Representation and 688 pages of the Staged Representation! ☺

Quick Look

1. There are two representations of the CMMI – Staged and the Continuous.

2. Both models have the notion of organizing a group of related practices into a Process Area.

3. Since there is inherent variation and a potential to implement practices within permissible degree of freedom from one organization to another based on individual business goals the practices serve, CMMI introduces the concept of 'process capability' to answer 'how well are the practices executed?'

4. Hallmark of the Staged representation is in the notion of clusters of Process Areas which when accomplished yields organizational maturity. There are therefore 5 'maturity levels', 1 – Initial, 2 – Managed, 3 – Defined, 4 – Quantitatively Managed and 5 - Optimizing. **SITARA refers to this as the First Dimension of Process Improvement.**

5. Even while organizations may exhibit an overall organizational maturity, the permissible degree of freedom of implementation rigor is addressed using another measure – process capability. **SITARA refers to this as the Second Dimension of Process Improvement.**

6. In general, there are 6 capability levels (CLs) making up the second dimension. They are: 0 – Incomplete, 1 – Performed, 2 – Managed, 3 – Defined, 4 – Quantitatively Managed and 5 – Optimizing.

7. And, the permissible degree of freedom for a process area in the Staged Representation ranges between 2 (Managed) and 3 (Defined). The second dimension values of 0, 1, 4 and 5 are NOT explicit. Whereas, all 6 capability

levels are permissible for the second dimension, in the continuous representation.

8. Therefore the Continuous Representation uses 6 CLs (0 thru 5) and depicts 'process area capability' in a graphical representation known as Capability Profiles.

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9. Target Profile: In the continuous representations of CMMI models, it is a sequence of PAs and their corresponding capability levels that represent an objective.

10. Achievement Profile: It is the profile of the actual accomplishment or progress made on the PAs by the organization.

11. Target Staging: A sequence of target profiles that describes the path of the process improvement to be followed by the organization. It must meet the two requirements of- a) Monotone increase b) Admissible

12. PAs are grouped into MLs. Each PA has Specific and Generic Goals. Specific Goals have Specific Practices. Specific Practices are the "activities performed" part of the CMM. Generic Goals are organized by common features in the staged model; Commitment to Perform, Ability to Perform, Directing Implementation and Verifying Implementation.

13. CLs 0 thru 5 are determined by reviewing the org's ability to implement both the specific and generic practices and its achievement of specific and generic goals. The capability levels are- 0 – Incomplete, 1 – Performed, 2 – Managed, 3 – Defined, 4 - Quantitatively Managed and 5 – Optimizing

14. Specific Goals and Specific Practices apply to individual process areas. A process area is a group of related practices to achieve a set of objectives that are performed (specific practices), with the anticipated behavior (specific goals).

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15. Generic Goals and Generic practices as the name implies is applicable generally to all PAs. Organizations that Implement a CL 1 process for a PA, will fulfill all the specific goals and practices of the PA and have GG1 - "Achieve Specific Goals" fulfilled. In order to fulfill GL1 – Achieve Specific Goals, the corresponding GPs GP1.1 - Identify Work Scope and GP1.2- Perform Base Practices need to be fulfilled.

16. In the Staged Model, Process Areas belonging at the Level 2 maturity have only ONE Generic Goal, GG2 that states – "Institutionalize a Managed Process" and the Generic Practices associated with this Generic Goal are the same Generic Practices at Capability Level 2 on the Continuous Model ... EPPAT MIMOR.

17. In the Staged Model, Process Areas belonging at the Level 3 maturity have ONLY ONE Generic Goal, GG3 that states – "Institutionalize a Defined Process" and the corresponding Generic Practices associated with this Generic Goal are the same Generic Practices at Capability Level 2 on the Continuous Model ... EPPAT MIMOR, **IN ADDITION TO** ... GP3.1 – Establish a Defined Process and GP 3.2 – collect Improvement Information.

18. In the Staged Model, Process Areas belonging at the Level 4 maturity have ONLY ONE Generic Goal, GG3 (and NOT GG4) that states – "Institutionalize a Defined Process" ... and NOT "Institutionalize a Quantitatively Managed Process". And, the corresponding Generic Practices associated with this Generic Goal are the same Generic Practices at Capability Level 2 on the continuous model ... EPPAT MIMOR, **IN ADDITION TO GP 3.1 and GP 3.2. However, there is NO GP 4.1 and GP 4.2 in the Staged Model. The Process Areas at Level 4 on the Staged Model are Quantitative Project Management and Organizational Process Performance. The Specific Practices in these Process Areas "adequately address" the intent of GP 4.1 – Establish Quality Objectives and GP 4.2 – Stabilize Sub-Process performance.**

19. In the Staged Model, Process Areas belonging at the Level 5 maturity have ONLY ONE Generic Goal, GG3 that states – "Institutionalize a Defined Process" ... and NOT "Institutionalize an Optimizing Process". And, the corresponding Generic Practices associated with this Generic Goal are the same Generic Practices at Capability Level 2 on the continuous model ... EPPAT MIMOR, **IN ADDITION TO GP 3.1 and GP 3.2. However, there is NO GP 5.1 and GP 5.2 in the staged model. The Process Areas at Level 5 on the Staged Model are, Causal Analysis and Resolution and Organizational Innovation & Deployment. The Specific Practices in these Process Areas "adequately address" the intent of GP 5.1 – Ensure Continuous Process Improvement and GP 5.2 – Correct Common Cause of Problems.**

20. Specific Goals and Generic Goals are the "REQUIRED components" of the CMMI. They are considered "essential" to achieve process improvement in a given process area. To determine process area satisfaction ("what is being done", is determined by fulfilling SG and SPs) and the "extent to which it is performed" ("how well it is being done" is determined by Generic Goals and Generic Practices) the goal statement is used on an assessment.

21. Specific and Generic Practices are the "EXPECTED components" of the CMMI. Either the practice as described or an alternate practice must be present in the planned and implemented process of an organization.

22. Sub-practices, typical work products and examples, goal and practice titles, goal and practice notes, and references are the INFORMATIVE model components.

23. Hallmark of the continuous model is the notion of capability levels which we have identified as the Second Dimension, whereas the staged model uses maturity levels – the First Dimension.

24. The generic practices are organized into common features as follows. A few Generic Practices need whole process areas to enable effective implementation as identified below.

GP 1.1 - Identify Work Scope	
GP 1.2 - Perform Base Practices	
CO.1 GP 2.1 - Establish an organizational Policy	
AB.1 GP 2.2 - Plan the process	ENABLING PA: Project Planning
AB.2 GP 2.3 - Provide adequate Resources	ENABLING PA: Project Planning
AB.3 GP 2.4 - Assign Responsibility	
AB.4 GP 2.5 - Provide Training	ENABLING PA: Organization Training
DI.1 GP 2.6 - Manage Configurations	ENABLING PA: Configuration Mgmt
DI.2 GP 2.7 - Identify and Involve relevant Stakeholders	
DI.3 GP 2.8 - Monitor and Control the Process	ENABLING PA: Measurement & Anal.
VI.1 GP 2.9 - Objectively Evaluate Adherence	ENABLING PA: PPQA
VI.2 GP 2.10 - Review Status with Higher management	
[EPPAT MIMOR]	

GP 3.1 - Establish a Defined Process	ENABLING PA: Org. PD
GP 3.2 - Collect Improvement Information	ENABLING PA: Org. PD and PF
GP 4.1 - Establish Quality Objectives	ENABLING PA: Org. PP
GP 4.2 - Stabilize sub-process performance	ENABLING PA: Org. PP, QPM
GP 5.1 - Ensure Continuous Improvement	ENABLING PA: Org. Innv. & Depl.
GP 5.2 - Correct Common-causes of problems	ENABLING PA: CAR

25. In the continuous representation, process categories are – Engineering, Process Management, Project Management and Support.

26. **IMPORTANT OBSERVATION**: It is only in some of the Engineering PAs, that a Specific practice builds on top of a lower capability level practice. In such cases, in the continuous model, the practice statement is suffixed with a -CL#, indicating the capability level to which this specific practice relates. For ALL other process areas, specific practices accomplish a Capability LEVEL 1 rating ONLY.

Example: REQTS. DEVELOPMENT
SG 1 - Develop Customer Requirements
SP 1.1-1 Collect Stakeholder Needs
SP 1.1-2 Elicit Needs

Elicit Needs builds on top of Collect Stakeholder Needs and so, the –1 is replaced by –2.
In the Staged Model Collect Stakeholder needs is subsumed and appears ONLY as informative material after SP 1.1 Elicit Needs.

SG 3 – Analyze and Validate Requirements
SP 3.5-1 Validate Requirements
SP 3.5-2 Validate Requirements with Comprehensive Methods

Validate Requirements with Comprehensive Methods builds on top of Validate Requirements. And in the staged model, SP 3.5 is Validate Requirements with Comprehensive Methods, which subsumes Validate Requirements and appears only as informative material after SP 3.5 Validate Requirements with Comprehensive Methods.

In the continuous model, Specific Practices therefore have a profile. It could be either at a Level 1 rigor or Level 2 rigor or Level 3.

27. In the project management category, the following PAs exist - Risk Managem, Integrated Project Management, Supplier Agreement Management, Supplier Agreement Management, Quantitative Project Management, Integrated Teaming (IPPD PA), Project Planning, Project Monitoring and Control

28. In the Process Management Category, the following PAs exist - Organizational Process Focus, Organizational Process Defn, Organizational Process Perf., Organizational Training, Organizational Innovation and Deployment

29. In the Engineering Category, the following PAs exist - Requirements Management, Requirements Development, Product Integration, Technical Solution, Verification, Validation

30. In the Support Category, the following PAs exist - Configuration Management, Process & Product Quality Assurance, Organizational Environment for Integration (IPPD), Measurement and Analysis, Decision Analysis & Resolution, Causal Analysis & Resolution

31. In the Staged Representation, Level 2 PAs are - Requirements Management, Config. Management, Process & Product QA, Supplier Agreement Management, Measurement & Analysis, Project Planning, Project Monitoring and Control.

32. Level 3 PAs are – Organizational Process Focus, Organizational Process Definition, Organizational Training Program, Requirements Development, Product Integration, Technical Solution, Verification, Validation, Decision Analysis & Resolution, Risk Mgmt, Integrated Project Management, Org. Env. For Integration (IPPD), Integrated Teaming (IPPD)

33. Level 4 PAs are – Quantitative Project Management, Organizational Process Performance

34. Level 5 PAs are- Org. Innovation and Deployment, Causal Analysis & Resolution

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Specific Goals - Maturity Level 2

Requirements Management

SG 1 - Manage Requirements (TS, RD)
- SP 1.1 – Obtain Understanding of requirements
- SP 1.2 - Obtain commitment (PMC)
- SP 1.3 - Manage changes to reqts. (CM)
- SP 1.4 - Maintain bi-directional traceability of Requirements
- SP 1.5 - Identify inconsistencies (PMC)

Project Planning

SG 1 - Establish Estimates
- SP 1.1 Estimate the scope of the project
- SP 1.2 Establish estimates of project attributes
- SP 1.3 Define Project Life Cycle
- SP 1.4 Determine estimates of effort and cost

SG 2 - Develop a Project Plan
- SP 2.1 Establish Budget and schedule
- SP 2.2 Identify project risks
- SP 2.3 Plan for Data management
- SP 2.4 Plan for project resources
- SP 2.5 Plan for needed K & S
- SP 2.6 Plan stakeholder involvement
- SP 2.7 Establish project plan

SG 3 - Obtain commitment
- SP 3.1 Review subordinate plans
- SP 3.2 Reconcile work and Resource Levels
- SP 3.3 Obtain plan commitment

Project Monitoring and Control

SG 1 - Monitor Project against Plan
- SP 1.1 - Monitor Project Planning Parameters
- SP 1.2 - Monitor Commitments
- SP 1.3 - Monitor Risks
- SP 1.4 - Monitor Data Management
- SP 1.5 - Monitor Stakeholder Involvement
- SP 1.6 - Conduct Progress Reviews
- SP 1.7 - Conduct Milestone Reviews

SG 2 - Manage Corrective Actions to Closure
- SP 2.1 - Analyze Issues
- SP 2.2 - Take corrective actions
- SP 2.3 - Manage Corrective Action

Supplier Agreement Management

SG 1 - Establish Supplier Agreements
- SP 1.1 - Analyze Needs and requirements determined by the project
- SP 1.2 - Select Suppliers
- SP 1.3 - Establish Supplier Agreements

SG 2 - Satisfy Supplier Agreements
- SP 2.1 - Acquire COTS products

SP 2.2 - Execute the supplier agreements
SP 2.3 - Conduct Acceptance Testing
SP 2.4 - Transition Products

Measurement and Analysis

SG 1 - Align measurement and analysis activities
SP 1.1 - Establish measurement objectives
SP 1.2 - Specify Measures
SP 1.3 - Specify data collection and storage procedures
SP 1.4 - Specify Analysis procedures

SG 2 - Provide measurement results
SP 2.1 - Collect Measurement Data
SP 2.2 - Analyze Measurement data
SP 2.3 - Store Measurement Data
SP 2.4 - Communicate Measurement results

Process & Product Quality Assurance

SG 1 - Objectively evaluate Processes and work products
SP 1.1 - Objectively evaluate processes
SP 1.2 - Objectively evaluate work products and services

SG 2 - Provide Objective Insight
SP 2.1 - Communicate and ensure resolution of noncompliance issues
SP 2.2 - Establish records

Configuration Management

SG 1 - Establish Baselines
- SP 1.1 - Identify config items
- SP 1.2 - Establish a config. mgmt system
- SP 1.3 - Create or release baselines

SG 2 - Track and control Changes
- SP 2.1 - Track changes
- SP 2.2 - Control Changes

SG 3 - Establish Integrity
- SP 3.1 - Est. configuration management records
- SP 3.2 - Perform Config. Audits

Specific Goals - Maturity Level 3

Requirements Development

SG 1 - Develop Customer Requirements
- SP 1.1 - Elicit Needs
- SP 1.2 - Transform needs into expectations

SG 2 - Develop Product Requirements
- SP 2.1 - Est. product and product component requirements
- SP 2.2 - Allocate product component requirements
- SP 2.3 - Identify interface requirements

SG 3 - Analyze and validate requirements
- SP 3.1 - Est. operational concepts and scenarios
- SP 3.2 - Est. a definition of required functionality

Sp 3.3 - Analyze requirements
SP 3.4 - Evaluate product cost schedule and risks
SP 3.5 - Validate requirements with comprehensive methods

Technical Solution

SG 1 - Select product component solutions
- SP 1.1 - Develop detailed alternative solutions and selection criteria
- SP 1.2 - Evolve operational concepts and scenarios
- SP 1.3 - Select Product Component Solutions

SG 2 - Develop the Design
- SP 2.1 - Use effective design methods
- SP 2.2 - Establish a complete technical data package
- SP 2.3 - Design a comprehensive Interface
- SP 2.4 - Perform make, buy reuse analyses

SG 3 - Implement the product design
- SP 3.1 - Implement the design
- SP 3.2 - Est. product support documentation

Product Integration

SG 1 - Prepare for product integration
- SP 1.1 - Establish a product integration strategy
- SP 1.2 - Establish product integration environment
- SP 1.3 - Define detailed product integration procedures

SG 2 - Ensure interface compatibility
- SP 2.1 - Review interface descriptions for completeness
- SP 2.2 - Manage interfaces

SG 3 - Assemble product components and deliver the product
- SP 3.1 - Confirm readiness of product components for integration
- SP 3.2 - Assemble product components
- SP 3.3 - Checkout assembled product components
- SP 3.4 - Package and deliver product components

Verification

SG 1 - Prepare for verification
- SP 1.1 - Establish a verification strategy
- SP 1.2 - Establish a verification environment
- SP 1.3 - Establish detailed verification plans

SG 2 - Perform Peer Reviews
- SP 2.1 - Prepare for peer reviews
- SP 2.2 - Conduct Peer Reviews
- Sp 2.3 - Analyze peer review data

SG 3 - Verify selected work products
- SP 3.1 - Perform verification
- SP 3.2 - Analyze verification results and identify corrective actions
- Sp 3.3 - Perform re-validation

Validation

SG 1 - Prepare for Validation
- SP 1.1 - Est. a validation strategy
- SP 1.2 - Est. the validation environment
- SP 1.3 - Define detailed validation procedures

SG 2 - Validate Product or product components
- SP 2.1 - Perform Validation
- SP 2.2 - Capture and Analyze Validation results

Org. Process Focus

SG 1 - Determine process improvement opportunities
- SP 1.1 - Est. org. process needs
- SP 1.2 - Assess the org's processes
- SP 1.3 - Identify the org.'s process improvements

SG 2 - Plan and implement process improvement activities
- SP 2.1 - Est. process action plans
- SP 2.2 - Implement Process Action Plans
- SP 2.3 - Deploy process and related Process Assets
- SP 2.4 - Incorporate into process assets

Org. Process Definition

SG 1 - Create Org.al process assets
- SP 1.1 - Est. standard processes
- SP 1.2 - Est. life-cycle model descriptions
- SP 1.3 - Est. tailoring criteria and guidelines

SG 2 - Make Supporting Process assets available
- SP 2.1 - Est. an org. mmt repo
- SP 2.2 - Est. an org. process asset library

Org. training

SG 1 - Identify Training Needs and make training available
- SP 1.1 - Est. strategic trg. needs
- SP 1.2 - Determine which trg. needs are the responsibility of the org.
- SP 1.3 - Est. org. training tactical plan
- SP 1.4 - Est. training capability

SG 2 - Provide Necessary Training
- SP 2.1 - Deliver training
- SP 2.2 - Est. training records
- SP 2.3 - Assess training effectiveness

Integrated Project Management

SG 1 - Use the projects defined process
SG 2 - Coordinate and collaborate with relevant stakeholders

Risk Management

SG 1 - Prepare for risk management
SG 2 - Identify and analyze risks
SG 3 - Mitigate Risks

Decision Analysis and Resolution

SG 1 - Evaluate Alternatives
- SP 1.1 - Establish and use guidelines for DA
- SP 1.2 - Select evaluation Techniques
- SP 1.3 - Establish evaluation criteria
- SP 1.4 - Identify proposed alternatives

SP 1.5 - Evaluate Alternatives
SP 1.6 - Select Solutions

Organizational Environment for Integration

SG 1 - Provide IPPD Infrastructure
SP1.1-1 - Establish the Organization's shared vision
SP1.2-1 - Establish an integrated Work Env.
SP1.3-1 - Identify IPPD-Unique Skill Requirements

SG 2 - Manage People for Integration
SP2.1-1 - Establish Leadership Mechanisms
SP2.2-1 - Establish Incentives for Integration
SP2.3-1 - Establish Mech. to Balance Team and Home Org. Responsibilities

Specific Practices - Maturity Level 4

Quantitative Project Management

SG 1 - Quantitatively Manage the project
SP 1.1 - Est. the project's objectives
SP 1.2 - Compose the defined process
SP 1.3 - Select the sub processes to be managed
SP 1.4 - Manage project performance

SG 2 - Statistically manage sub process performance
SP 2.1 - Select measures and analytical techniques
SP 2.2 - Apply statistical methods to understand variation
SP 2.3 - Monitor performance of selected sub processes
SP 2.4 - Record statistical measurement data

Organizational Process Performance

SG 1 - Establish performance baselines and models
- SP 1.1 - Select Processes
- SP 1.2 - Est. process performance measures
- SP 1.3 - Est. quality and process performance objectives
- SP 1.4 - Est. process performance baselines
- SP 1.5 - Est. process performance models

Specific Practices - Maturity Level 5

Causal Analysis & Resolution

SG 1 - Determine Causes of Defects
- SP 1.1 - Select Defect Data for Analysis
- SP 1.2 - Analyze Causes

SG 2 - Address causes of defects
- SP 2.1 - Implement the action proposals
- SP 2.2 - Evaluate effects of changes
- SP 2.3 - Record Data

Organizational Innovation and Deployment

SG 1 - Select improvements
- SP 1.1 - Collect and analyze improvement proposals
- SP 1.2 - Identify Innovations
- SP 1.3 - Pilot improvements
- SP 1.4 - Select improvements for deployment

SG 2 - Deploy Improvements

SP 2.1 - Plan the deployment
SP 2.2 - Manage the deployment
SP 2.3 - Measure improvement effects

NOTE: Specific Practices may have “discipline specific amplifications” – which are informative components of the CMMI.

NOTE: Generic Practices have “Elaborations” – which are informative components of the CMMI.

DID THIS DOCUMENT MEET YOUR EXPECTATIONS?

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THANK YOU!