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Drawdiculous

CMMI1.3 Maturity Level 2 Definition

Version 1.0

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Executive Summary

The Capability Maturity Model Integration (CMMI) is a process and behavioral model that helps organizations streamline process improvement and encourage productive and efficient behaviours that decrease risks in software development. CMMI has been explicitly designed to be understandable, accessible, and flexible to a broad variety of businesses and types of work. The CMMI model breaks down organizational maturity into five levels as shown:

- Maturity level 1 - Initial
- Maturity level 2 - Managed
- Maturity Level 3 - Defined
- Maturity Level 4 - Quantitatively managed
- Maturity Level 5 - Optimizing

The CMMI facilitates faster, easier and successful improvement to address the following:

- Increasing performance
- Industry-specific needs
- Market drivers, such as:
 - Business and industry trends
 - Regulatory requirements
 - New or changing technologies

This document specifically focuses on CMMI Maturity Level 2 (Managed). At Maturity Level 2, the project will ensure that processes are planned and executed in accordance with policy. It will employ skilled people with adequate resources to produce controlled outputs and involve relevant stakeholders. Work products will be monitored, controlled, and reviewed, and evaluated for adherence to their process descriptions. The process discipline reflected by Maturity Level 2 helps to ensure that existing practices are retained during times of stress. When these practices are in place, the project will perform and manage according to its documented plans.

Description

At Maturity Level 2, the status of the work products is visible to management at defined points (e.g., at major milestones, at the completion of major tasks). Commitments are established among relevant stakeholders and are revised as needed. Work products are appropriately controlled. The work products and services satisfy their specified process descriptions, standards, and procedures.

Level 2 KPAs

Requirements Management (REQM)

Purpose

The purpose of REQM is to manage the requirements of the project's products and product components and to identify inconsistencies between those requirements and the project's plans and work products.

Implementation

1. Requirement Gathering

- **Obtain an Understanding of Requirements**

Requirements are gathered from stakeholders and users. The gathered requirements are analyzed and organized into the Software Requirements Specification.

- **Obtain Commitment to Requirements**

The impact on the project participants should be evaluated when the requirements change or at the start of a new requirement. Changes to existing commitments should be negotiated before project participants commit to a new requirement or requirement change.

2. Requirement Managing

- **Manage Requirements Changes**

- Document all requirements and requirements changes that are given to or generated by the project.
- Maintain requirements to change history including the rationale for changes.
- Evaluate the impact of requirement changes from the standpoint of relevant stakeholders.
- Make requirements and change data available to the project.

- **Maintain Bidirectional Traceability of Requirements**

- Maintain requirements traceability to ensure that the source of lower-level requirements is well documented.
- Maintain requirements traceability when a requirement is derived to its derived requirements and allocation to work products.

- **Identify Inconsistencies Between Project Work and Requirements**

- Review project plans, activities, and work products to check their consistency with the requirements and changes made to them.
- If there is any inconsistency, identify the source of inconsistency.
- Identify the changes that should be made to the documentation and products due to the change in requirements baseline.
- Initiate any necessary corrective actions.

Project Planning (PP)

Purpose

The purpose of project planning is to estimate the attributes of work products and tasks, determine the resources needed, negotiate commitments, produce a schedule, and identify and analyze project risks. Iteration through these activities is necessary to establish the project plan. The project plan provides the basis for performing and controlling project activities that address commitments with the project's customers.

Implementation

1. Establish Estimates

- Estimate the Scope of the Project
 - Come up with a Work Breakdown Structure.
 - Define the work packages in detail so that the estimates of project tasks, responsibilities, and schedules can be specified.
 - Identify products and product components to be externally acquired.
 - Identify work products to be reused.
- Establish Estimates of Work Product and Task Attributes
 - Determine the technical approach for the project.
 - Use appropriate methods to decide the attributes of the work products to be used to estimate resource requirements.
 - Estimate the attributes of work products and tasks.
- Define Project Life Cycle
- Determine Estimates of Effort and Cost
 - Estimate labor hours and costs using historical data and models.
 - Include supporting infrastructures, such as the resources needed from a development perspective, when estimating effort and cost.

2. Develop a Project Plan

- Establish the Budget and Schedule
 - Identify schedule assumptions.
 - Identify task dependencies and constraints.
 - Establish corrective action criteria.
- Identify Project Risks
 - Document the identified risks.
 - Review and achieve consensus with stakeholders on the documented risks.
 - Revise the risks.
- Plan for Data Management
 - Establish requirements and procedures to ensure privacy and security of data.
 - Determine the requirements for the distribution of data to the stakeholders.
 - Decide version control strategies and configuration controls.

- Plan for Project Resources
 - Determine the requirements (process requirements, communication requirements, staffing requirements, etc.)
 - Plan for Needed Knowledge and Skills
 - Identify the knowledge and skills required for the project.
 - Decide the mechanisms used to obtain employees with the required knowledge and skills.
 - Plan the execution of the selected mechanism.
 - Plan Stakeholder Involvement
 - Determine the communication channel with stakeholders.
 - Determine the roles and responsibilities of relevant stakeholders.
 - Determine the relationship among the stakeholders.
 - Establish the Project Plan
 - Write the software project plan.
3. Obtain Commitment to the Plan
- Review Plans that Affect the Project
 - Record the reviews of plans that affect the project.
 - Reconcile Work and Resource Levels
 - Revise methods used and estimation parameters used for estimation.
 - Revise to find ways to increase productivity.
 - Revise all plans that affect the project and schedules.
 - Obtain Plan Commitment
 - Identify needed support and negotiate commitments with relevant stakeholders.
 - Identify commitments regarding interfaces between project elements and other projects and organizational units so that these commitments can be monitored.

Project Monitoring and Control (PMC)

Purpose

The purpose of PMC is to provide an understanding of the project's process so that appropriate corrective actions can be taken when the project's performance deviates significantly from the plan.

Implementation

1. Monitor Project Against Plan

- Monitor Project Planning Parameters
 - Monitor progress against the schedule.
 - Monitor the project's resources and costs against the project plan.
 - Monitor the knowledge and skills of project employees.
- Monitor Commitments
 - Review the commitments regularly
 - Identify and review the commitments that have not been satisfied or at risk.
 - Document all results of the reviews.
- Monitor Project Risks
 - Review the risk documentation regularly.
 - Update the risk documentation when necessary.
 - Communicate the risk updates and status with the relevant stakeholders.
- Monitor Data Management
 - Periodically review data management activities against their description in the project plan.
 - Document the result of the data management activities.
- Monitor Stakeholder Involvement
 - Periodically review the status of stakeholder involvement.
 - Adjust the stakeholder involvement plan in the project plan when necessary.
- Conduct Progress Reviews
 - Communicate with relevant stakeholders on the progress.
 - Review the progress of the project.
 - Document all review results.
- Conduct Milestone Reviews
 - Conduct milestone reviews with relevant stakeholders when necessary (such as the completion of a phase)
 - Review the plans and risks of the project.

2. Manage Corrective Action to Closure

- Analyze Issues
 - Gather the issues for analysis.
 - Analyze the issues to determine the actions to solve the issues.

- Take Corrective Action
 - Determine and document the appropriate actions needed to address the specified issues.
 - Review and discuss with the relevant stakeholders to achieve consensus in the corrective actions.
- Manage Corrective Action
 - Monitor the corrective actions when they are executed.
 - Analyze the result of executing the corrective actions.
 - Document and determine if further actions are needed.

Process and Product Quality Assurance (PPQA)

Purpose

The purpose of PPQA is to provide staff and management with objective insight into processes and associated work products.

Implementation

1. Objectively Evaluate Processes and Work Products
 - Objectively Evaluate Processes
 - Promote an environment that encourages employee participation in identifying and reporting quality issues.
 - Identify each noncompliance found during the evaluation.
 - Identify lessons learned to improve the process.
 - Objectively Evaluate Work Products and Services
 - Select the work products to be evaluated.
 - Establish and maintain clearly stated criteria for the evaluation of selected work products.
 - Identify each of the non-compliance found during the evaluation.
 - Identify lessons learned.
2. Provide Objective Insight
 - Communicate and Ensure Resolution of Noncompliance Issues
 - Resolve each noncompliance with the appropriate members of the employee if possible.
 - Document noncompliance issues when they cannot be resolved in the project.
 - Analyze noncompliance issues to see if there are quality trends that can be identified and addressed.
 - Track all non-compliance issues to resolution.
 - Establish Records
 - Record process and product quality assurance activities in sufficient detail so that status and results are known.
 - Revise the status and history of quality assurance activities as necessary.

Configuration Management (CM)

Purpose

The purpose of CM is to establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits.

Implementation

1. Establish Baselines
 - Identify Configuration Items
 - Select configuration items and work products that compose them based on documented criteria.
 - Assign unique identifiers to configuration items.
 - Identify the owner responsible for each configuration item.
 - Establish a Configuration Management System
 - Establish a mechanism to manage multiple levels of control.
 - Create configuration management reports from the configuration management system.
 - Create or Release Baselines
 - Create or release baselines only from configuration items in the configuration management system.
 - Document the set of configuration items that are contained in a baseline.
 - Make the current set of baselines readily available.
2. Track and Control Changes
 - Track Change Requests
 - Initiate and record change requests.
 - Categorize and prioritize change requests.
 - Track the status of change requests to closure.
 - Control Configuration Items
 - Control changes to configuration items throughout the life of the product.
 - Perform reviews to ensure that changes have not caused unintended effects on the baselines.
3. Establish Integrity
 - Establish Configuration Management Records
 - Record configuration management actions in sufficient detail so the content and status of each configuration item is known and previous versions can be recovered.
 - Ensure that relevant stakeholders have access to and knowledge of the configuration status of configuration items.
 - Set the latest version of baselines.
 - Perform Configuration Audits

- Assess the integrity of the baselines.
- Confirm that configuration management records correctly identify configuration items.
- Track action items from the audit to closure.

Measurement and Analysis (MA)

Purpose

The purpose of MA is to develop and sustain a measurement capability that is used to support management information needs.

Implementation

1. Align Measurement and Analysis Activities

- Establish Measurement Objectives
 - Document information needs and objectives
 - Document, review, and update measurement objectives.
 - Maintain traceability of measurement objectives to identify information needs and objectives.
- Specify Measures
 - Identify candidate measures based on documented measurement objectives.
 - Maintain traceability of measures to measurement objectives.
 - Prioritize, review, and update measures.
- Specify Data Collection and Storage Procedures
 - Identify existing sources of data that are generated from current work products, processes, or transactions.
 - Identify measures for which data are needed but are not currently available.
 - Specify how to collect and store the data for each required measure.
 - Create data collection mechanisms and process guidance.
- Specify Analysis Procedures
 - Specify and prioritize the analyses to be conducted and the reports to be prepared.
 - Specify administrative procedures for analyzing data and communicating results.
 - Update measures and measurement objectives as necessary.

2. Provide Measurement Results

- Collect Measurement Data
 - Obtain data for base measures.
 - Generate data for derived measures.
 - Perform data integrity checks as close to the source of data as possible.
- Analyze Measurement Data
 - Conduct initial analyses, interpret results, and draw preliminary conclusions.
 - Conduct additional measurement and analysis as necessary and prepare results for presentation.
 - Review initial results with relevant stakeholders.
- Store Data and Results

- Review data to ensure their completeness, integrity, accuracy, and currency.
- Store data according to data storage procedures.
- Communicate Results
 - Keep relevant stakeholders informed of measurement results in a timely manner.
 - Assist relevant stakeholders in understanding results.

Supplier Agreement Management (SAM)

Purpose

The purpose of SAM is to manage the acquisition of products from suppliers for which there exists a formal agreement.

Implementation

1. Establish Supplier Agreements
 - Determine Acquisition Type
 - List the acquisition types that will be used for all products and product components to be acquired.
 - Select Suppliers
 - Establish Supplier Agreements
2. Satisfy Supplier Agreements
 - Execute the Supplier Agreement
 - Monitor Selected Supplier Processes
 - Evaluate Selected Supplier Work Products
 - Accept the Acquired Product
 - Transition Products

Generic Goals and Practices

Generic goals and practices assist projects in maintaining consistency in the standards set in the organization. This ensures the standards have a well-defined goal to work towards and achieve. There are features which are discussed in detail:

Commitment to perform

This describes the actions the organization must take to ensure that the process is established and will endure. Commitment to Perform typically involves establishing organizational policies and senior management sponsorship.

Generic practices

1. Establish an organizational policy (Policy Document)
2. Plan the Process (Project Plan)
3. Provide Resources (Identifying infrastructure and human resources and set-up as a part of Project Plan)
4. Assign Responsibility (RACI Matrix)
5. Train People (Skillset enhancement and assessment – Skill Matrix and Training Plan)
6. Manage Configurations (Configuration Management Plan)
7. Identify and Involve Relevant Stakeholders (Stakeholders Responsibility Matrix, RACI)
8. Monitor and Control the Process (Project & Work product Monitoring and Audit mechanism as a part of Project Plan)
9. Objectively evaluate adherence (Measure project performance against relevance metrics. Include Metrics (SLAs, OLAs, UCs, KPIs) in Project Plan)
10. Review Status with Higher Level Management (SMR)
11. Establish a Defined Process (Process Document with a Flow Diagram of the work item)
12. Collect Improvement Information (Customer feedback mechanism as a part of Project Plan)

Ability to perform

Ability to Perform describes the preconditions that must exist in the project or organization to implement the software process competently. Ability to Perform typically involves resources, organizational structures, and training.

Resources

- Identify the resources needed to perform the process, develop the proposed software and provide the services necessary.
- Ensure the resources required are available throughout the project.

Organizational structures

- Identify and form the organizational structures that can be easily managed and suit the implementation of the software process.
- Ensure organizational structure is stable and maintainable throughout the project.

Training

- Train relevant employees based on their responsibilities.
- Ensure employees are capable and knowledgeable in the process that they are required to perform.

Activities to perform

Activities to Perform describes the roles and procedures necessary to implement a key process area. Activities Performed typically involve establishing plans and procedures, performing and tracking the work, and taking corrective actions as necessary.

Establish plans and procedures

- The organization should have standard procedures and practices for performing similar activities.
- Plans and procedures decided should take requirements and constraints into consideration.
- Plans should include error prevention and corrective actions.

Perform and track the work

- Activities should be performed by trained and capable employees.
- All activities should be well documented for easy reference in the future.

Take corrective actions

- Take careful actions when necessary by following established plans.
- Corrective actions must be documented and tracked for future review and references.

Measurements

Measurement describes the need to measure the process and analyze the measurements. It typically includes examples of the measurements that could be taken to determine the status and effectiveness of the Activities Performed.

Verify

Verify describes the steps to ensure that the activities are performed in compliance with the process that has been established. Verification typically encompasses reviews and audits by management and software quality assurance.

Software quality assurance

- Establish the goals, processes, and responsibilities required to implement effective quality assurance functions for the project.

Specific Goals and Practices

Requirement Management

Specific goal

To manage requirements of the project's products and product components and to ensure alignment between those requirements and the project's plans and work products.

Specific practices

- Understand Requirements (signed SOW/Contract)
- Obtain Commitment to Requirements (customer sign-off on requirements and delivery acceptance criteria as a part of SOW/Contract)
- Manage Requirements Changes (Change Control Procedure & Register)
- Maintain Bidirectional Traceability of Requirements (Bidirectional Traceability Matrix)
- Ensure Alignment Between Project Work and Requirements (Requirements Elicitation Checklist and customer sign-off)

Project Planning

Specific goal

To establish and maintain plans that define project activities.

Specific practice

- Estimate the Scope of the Project
- Establish Estimates of Work Product and Task Attributes
- Define Project Lifecycle Phases
- Estimate Effort and Cost
- Establish the Budget and Schedule
- Identify Project Risks (Risk Register)
- Plan Data Management (Tool to manage the project data and work activities)
- Plan the Project's Resources (Infrastructure and Human)
- Plan Needed Knowledge and Skills (Skill Matrix & Training Plan)
- Plan Stakeholder Involvement (Stakeholders Responsibility Matrix & RACI)
- Establish the Project Plan
- Review Plans that Affect the Project
- Reconcile Work and Resource Levels
- Obtain Plan Commitment (customer sign-off on Project Plan)

Project Monitoring and Control

Specific goal

To provide an understanding of the project's progress so that appropriate corrective actions can be taken when the project's performance deviates significantly from the plan.

Specific practices

- Monitor Project Planning Parameters
- Monitor Commitments (Contract Commitment Tracker)
- Monitor Project Risks (Risk Register)
- Monitor Data Management (Tool to monitor the project data and work activities)
- Monitor Stakeholder Involvement
- Conduct Progress Reviews (Work Product Audit)
- Conduct Milestone Reviews (Review and customer sign-off on milestones)
- Analyze Issues (RCA with CAPA)
- Take Corrective Action
- Manage Corrective Actions

Process and Product Quality Assurance

Specific goal

To provide staff and management with objective insight into processes and associated work products.

Specific practices

- Objectively Evaluate Processes (Internal Audit Process)
- Objectively Evaluate Work Products (Work product Audit Process)
- Communicate and Resolve Noncompliance Issues
- Establish Records

Configuration Management

Specific goal

To establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits.

Specific practices

- Identify Configuration Items (CI List as a part of Configuration Management Plan)
- Establish a Configuration Management System (CMDB)
- Create or Release Baselines (Baseline Records)
- Track Change Requests (Change Control Register)
- Control Configuration Items
- Establish Configuration Management Records
- Perform Configuration Audits

Measurement and Analysis

Specific goal

To develop and sustain a measurement capability used to support management information needs.

Specific practices

- Establish Measurement Objectives
- Specify Measures
- Specify Data Collection and Storage Procedures
- Specify Analysis Procedures
- Obtain Measurement Data
- Analyze Measurement Data
- Store Data and Results
- Communicate Results (Project Metrics Report)

Supplier Agreement Management

Specific goal

To manage the acquisition of products from suppliers.

Specific practices

- Determine Acquisition Type
- Select Suppliers
- Establish Supplier Agreements
- Execute the Supplier Agreement
- Accept the Acquired Product
- Ensure Transition of Products (Transition Plan)

Approvals

Version No.	Date	Author	Status	Reviewer
1.0	25 October 2021	Renganathan Ramasamy	Approved	He Yinan

CMMI Audit Checklist

Areas	Audit Questionnaires for Level 2
REQM	Are technical and non technical requirements documented? Are these requirements reviewed with relevant stakeholders and baselined?
	Are these requirements including acceptance criteria signed-off with client in line with agreed project scope?
	Are Change Requests documented, analyzed for impact and handled as per Change Management process defined in Project Plan? Is the applicable change approval process followed (internal and client)?
	Is bi-directional traceability matrix established and updated as project progress?
	Are requirements elicited by using one or more formal techniques?
	Are system requirements including hardware and software requirements captured? Does client requirements captured at subsystem and module level clearly?
	Are non functional requirements like performance, security, accuracy, regulatory of client and end user documented?
	Are requirements evaluated with respect to effort, cost, schedule and risk?
	Are the project plan, schedule, effort and other work products consistent with agreed requirements?
PP	Is the Plan document (Project Plan, Maintenance plan, Test Plan) available?
	Does the Plan document contain CM Plan, Resource Plan, Risk Plan, Deliverables Plan, Training Plan, Metrics & Defect Prevention Plan and detailed schedule?
	Have affected groups / stakeholders and individuals been identified and communicated on the commitments made in the Plan document?
	Is transition related activities planned?
	Has the Project Plan (PP) been reviewed and approved? Are the evidences available?
PMC	Are Status Reports prepared (Project Data and Metrics Report, Project Monitoring Report)?
	Are weekly status reports provided to the client as agreed in SOW?
	Are Project Monitoring Reviews includes planned activities like Risk, Training, Schedule, Effort, Reviews, DP activities, RCAs, Metrics and Cost?
	Has proper root causal analysis conducted and appropriate corrective actions are taken when actual status deviates significantly from expected values?
	Is Transition activities are tracked as per plan ?
PPQA	Are the PPQA activities like audits, ERT and Quality reviews, testing, coding standard documented in the Project Plan?
	Has the project undergone internal/external audits at least once?
	Are reported non compliances and observations acted upon and tracked to closure in audit tool?
	Are exceptional issues reviewed in Project Progress Reviews? Action plan is updated and tracked to closure?
CM	Are all necessary Configuration Items, components and related work products, identified as per the project scope?
	Is the naming convention for CIs documented in the CM plan?
	Is the Configuration Management System established for the project? Is the appropriate level of access control mechanism established for CM System? Is the back up of the CM system taken periodically as per policy?
	Is baseline for identified CIs created as per plan and communicated to affected groups?
	Are changes to baseline items carried out as per change control process? Is the evidence available?
	Are Configuration audits conducted as per plan and the findings tracked to closure ?
MA	Are the records of configuration management i.e. revision history, change requests, baselines, approvals, access control register, CM audit reports available?
	Are measurement objectives and related metrics covering process and product quality needs documented in project plan? Are these objectives aligned with organization and project specific needs?
MA	Is analysis of data carried out and corrective actions identified based on the analysis? Are metrics, which are significantly deviates the organization norms presented?
SAM	Is procurement team involved from the identification of need to purchase / outsource and Supplier empanelment process defined and is followed and maintained?



Audit Checklist 1.xls

CMMI Interview Affirmation Questions

Questions
What is Capability Level 2: Managed?
What are Contractual Commitments?
What is Change Control Register?
What is a Traceability Matrix?
What is a Requirement Tracker?
How to ensure high Requirements Stability?
What is a Project Plan and its major components?
What is a RCACI Matrix?
What is a Transition Plan and its major components?
How to maintain customer satisfaction at regular intervals?
How to ensure project monitoring and reviews?
What are the major components of a good RCA?
What is MoM, Action Plans and why they are required?
What is the difference between an internal and a work product audit?
What is the difference between an risk and issue?
What is Risk and Issue Register?
What is a Configuration Management Plan and its major components?
What is baselining of records?
What is Critical To Quality and how to ensure meeting them?
What are SLAs, OLAs, Ucs and KPIs and how should they be measured?
What is Senior Management Review?



Interview
Questions.xls