NANYANG TECHNOLOGICAL UNIVERSITY
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School of Computer Science and Engineering

CZ3002 Advanced Software Engineering

CMMI Level 2 Definition

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CMMI1.3 maturity level 2 definition

Table of Contents

Executive summary

Purpose

Capability Maturity Model Integration (CMMI) is a framework of good practices in an organisation. The purpose of CMMI is to provide guidance for setting up and improving an organisation's areas of processes. This ensures that work is carried out according to planned processes with all member's roles and responsibilities clearly defined, thus leading to organisational maturity.

Summary of definition

CMMI model consists of five maturity levels – Initial, Managed, Defined, Quantitatively Managed and Optimising. Each maturity level contains a predefined set of process areas. This document will focus on CMMI level 2 and provide descriptions on the key activities of each process area. At maturity level 2, it must be ensured that processes are planned and carried out in accordance with organisational policies and standards. The project is required to employ people with adequate resources and necessary skill sets to produce controlled outputs. The project also involves relevant stakeholders, and it is monitored, controlled, and evaluated for adherence to the respective process descriptions. The process discipline reflected in maturity level 2 helps to ensure that existing practices are retained during challenging periods. When these practices are in place, the project is performed and managed according to their documented plans.

Description

CMMI level 2 ensures that all work products are appropriately controlled, and processes are characterised for the project. The status of the work products is also visible to management at specific points of the project timeline, for example at major milestones or at the completion of major tasks. Connections are established among relevant stakeholders, which are constantly revised as required. As such, the work products and services can satisfy their specified process descriptions, standards, and procedures.

Level 2 KPAs

Below are the descriptions of Key Process Areas of CMMI1.3 at maturity level 2.

Requirement Management (REQM)

The purpose of Requirements Management is to manage requirements of the project's products and product components, thus ensuring that there is alignment between the requirements and the project's plan and work products.

Project Planning (PP)

The purpose of Project Planning (PP) is to establish and maintain plans that define project activities, which involves the following events:

- Developing the project plan
- Appropriate interaction with the relevant stakeholders
- Ensuring commitment to the proposed plan
- Maintaining the plan

Project Monitoring and Control (PMC)

The purpose of Project Monitoring and Control (PMC) is to provide an understanding of the project's progress, thus when the project's performance deviates significantly from the proposed plan, appropriate corrective actions can be taken to correct them.

Process and Product Quality Assurance (PPQA)

The purpose of Process and Product Quality Assurance (PPQA) is to allow staff and management to gain feedback and objective insights on the processes and associated work products, and involves the following events:

- Objectively monitoring and reviewing performed processes and work products according to applicable processes standards and policies
- Identifying and documenting noncompliance cases
- Ensuring that noncompliance issues are strictly addressed

Configuration Management (CM)

The purpose of Configuration Management (CM) is to establish and ensure the integrity of work products based on configuration identification, configuration control, configuration status accounting, and configuration audits.

Measurement and Analysis (MA)

The purpose of Measurement and Analysis (MA) is to develop and maintain a measurement capability that can be used to support management information requirements.

Supplier Agreement Management (SAM)

The purpose of Supplier Agreement Management (SAM) is to manage the acquisition of products and services from suppliers. SAM involves the following events:

- Determining the acquisition type and selecting the right suppliers
- Establishing and maintaining agreements with suppliers
- Executing supplier agreements and accepting delivery of acquired products
- Ensuring successful transaction of acquired products without any issues

Generic goals and practices

Below we define possible generic practices for each of the five common features:

Commitment to perform

- Establish organizational-wide policy
- Providing senior management sponsorships

Ability to perform

- Providing adequate resources for work
- Organising training programs to allow workers to upgrade skill sets
- Ensuring stable organisational structure for easier information relay

Activities to perform

- Ensuring activities and processes are performed in accordance to plans and procedures
- Performing the work by members
- Traceability of work done
- Taking corrective actions if necessary

Measurements

- Providing measures that can be used to determine status and effectiveness of the features and activities performed

Verify

- Carrying out reviews and audits by Project Management and Software Quality Assurance teams

Specific goals and practices

For each key process area identified and explained in the section of “Level 2 KPAs”, we will define specific goals and the corresponding key practices.

Requirement Management

Specific goal

To define procedures and establish a requirement documentation based on the common understanding between customer and project personnel on the customer’s requirements.

Specific practices

1. Obtaining requirements
    a. Perform requirement elicitation by interviewing the customer to understand requirements and proposed requirements are established with a relevant provider, or else it will be rejected. The requirements are reviewed based on the following metrics: Clearness, Completeness, Consistency, Verifiability, Traceability, Identifiable Uniqueness. Following which, a Software Requirement Specifications will be written up based on compiled requirements and a prototype can also be developed to check if the requirements are tangible to the customers.

    b. To ensure commitment to requirements, if there is a new requirement or changes to an existing requirement, the project team should assess and evaluate the impact on the project progress and customers. Prior to any changes, it is important to note down any discrepancies and negotiation among members. As such, the System Requirements Specification (SRS) will be revised based on the new requirements.

2. Managing requirements

    a. Manage requirements changes and document all relevant requirement changes and reasons for changes in the change history document. This is to ensure that new changes are traceable.

    b. Bidirectional traceability of requirements can be established when the requirements are managed appropriately. This is to ensure that source requirements are completely documented, and its lower-level requirements can be traced back to the source.

    c. Ensure alignment by constantly reviewing the project work and requirements to ensure the consistency. If there are any inconsistencies, the source and rationale will need to be identified and

corrective actions to amend the inconsistencies will need to be initiated when necessary.

Project Planning

Specific goal

To establish and maintain reasonable plans based on project estimates that define project activities.

Specific practices

1. Establish estimates
    a. Estimate the project scope by creating a Work Breakdown Structure (WBS) for different components of the project. Identify the respective work packages and product components that are required.

    b. Establish estimates of work product and task attributes, which should be consistent with the project requirements to determine the overall cost, effort and time required to complete the project. This can be done by collecting and analysing valid historical data.

    c. Define project life cycle phases based on the scope of requirements and calculated estimates of the project resources.

2. Development of Project Plan
    a. Estimate the project budget and schedule based on milestones, constraints, assumptions and task dependencies.

    b. Identifying project risks to determine the probability of occurrence and potential impacts on the project development. The risks should be documented in the Risk Management Plan and reviewed with the relevant team members and stakeholders to determine the correctness of risks.

    c. Establish proper and strict procedures to ensure the security and privacy of data so that only authorised users have access to it. This also ensures traceability.

    d. Identify and obtain required resources, knowledge and skill sets that are needed for the execution of the project to ensure smooth and efficient operations.

    e. Plan stakeholder involvements who are able to contribute to the software development with their expertise.

f. Establish and document the Project Plan that addresses all relevant planning items to ensure that there is mutual understanding before executing the plans.

3. Commitment to Project Plan
    a. Reconcile the differences between estimated and available resources. If there are any discrepancies, plan out methods to increase productivity such as outsourcing other resource providers.

    b. Discuss commitments with the relevant stakeholders, which are documented to ensure a consistent understanding between stakeholders.

Project Monitoring and Control

Specific goal

To establish adequate visibility and understanding of progress so that management teams can take effective actions when the project's performance deviates significantly from the plans.

Specific practices

1. Monitor project in accordance to the Project Plan
    a. Periodically review the progress of the project and check if the project plan parameters and requirements are satisfied (ie. Costs, Schedule, Commitments, Risks, Data Management, Stakeholder involvements). If there are any issues faced, perform corrective measures that are required and document the changes made.

    b. Conduct progress and milestone reviews to monitor the plan, status and risks of the project and document any significant changes and decisions. If there are issues, rectify them and document the course of actions as well. It is also important to regularly communicate with relevant stakeholders about the status and progress of work after conducting the reviews.

2. Manage and take corrective actions
    a. Analyse information collected on issues from the reviews and determine the necessary corrective measures to address and rectify the issues. inform relevant stakeholders about the actions and obtain approval before proceeding with the changes, which are then documented.

Process and Product Quality Assurance

Specific goal

To allow staff and management to gain feedback and objective insights on the processes used by the software project and associated work products that are built.

Specific practices

1. Objectively evaluate processes and work products
    a. Boost employee participation and encourage reporting of progress. It is also necessary to establish clear rules for evaluation of processes against standards and procedures.

    b. Establish the work products to be reviewed and evaluate them during milestones to ensure that they are in adherence to process descriptions, standards and procedures.

3. Provide objective insights
    a. Communicate and resolve any noncompliance issues with the team members. Document noncompliance issues when they cannot be resolved within the project and report them to the appropriate level of management. Resolve the noncompliance issues by changing the process descriptions, standards, or procedures if necessary.

    b. Establish and maintain records of the quality assurance activities such as quality assurance reports and evaluation backlogs.

Configuration Management

Specific goal

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

Specific practices

1. Establish baselines
    a. Develope a Configuration Management System that is able to store, update and retrieve configuration items (ie. source code, SRS, Project Plan, use cases, test data). Configuration Management reports can be documented for traceability and auditing purposes.

    b. Create or release baselines from configuration items.

2. Establish integrity
    a. Record any configuration management actions in detail in the revision history of configuration items, status and change log to ensure traceability.

    b. Perform audits to verify that configuration management records are up-to-date and accurately identify the corresponding configuration items. If there are any discrepancies, appropriate rectification methods are taken.

3. Track and control changes
    a. Analyse the impact of requested changes to ensure that the new changes are consistent with project requirements. Record the changes in the change request database.

    b. Obtain appropriate authorisation from managers before carrying out any changes to the configuration items to maintain correctness and integrity.

Measurement and Analysis

Specific goal

To develop and maintain a measurement capability that can be used to support management information requirements and integrated into individual projects or other organizational functions

Specific practices

1. Establish analysis methodologies
    a. Specifying measures and analysis techniques for data collection, data storage, reporting, and feedback, which can be Implemented the measures and after approval.

    b. Measurement activities should support information needs at multiple levels, including the business, organizational unit, and project to minimize re-work as the organization matures. This can be done by providing objective results that can be beneficial in making sound decisions and taking appropriate corrective actions if there are any issues raised.

    c. Measurement and analysis of product components is essential for effective management of the quality and costs of the project. With careful management of supplier agreements, it is possible to derive insights into data that support supplier performance analysis.

Supplier Agreement Management

Specific goal

To effectively manage the acquisition of products and services from suppliers that can be delivered to the project's customer or included in a product or service system.

Specific practices

1. Establish Subcontract Agreements
    a. Determine the type of acquisition (ie. purchasing commercial off-the-shelf products (COTS)), from an in-house vendor or through contractual agreements.

    b. Select suppliers based on their capability to meet the specified requirements of the project and when selecting COTS products, it is important to evaluate them based on the cost of the COTS products, security requirements and the benefits.

    c. Establish supplier agreements and ensure that all suppliers and stakeholders understand the agreement and acknowledge all requirements.

2. Satisfy supplier agreements
    a. Execute the supplier agreement and monitor the supplier's progress and performance, followed by conducting reviews with the suppliers to provide feedback on how to improve the performance and future relations.

    b. Verify and accept the acquired products that satisfy their requirements based on project requirements, before integrating the products into the project.

Approvals

The SCAMPI Appraisals are used to determine your organization's level of process performance using the Standard CMMI Appraisal Method for Process Improvement (SCAMPI), and comprise of SCAMPI A, SCAMPI B and SCAMPI C Appraisals. . SCAMPI Appraisals are a collaborative set of events that include participation by our team, an executive sponsor, an appraisal team, a licensed CMMI Institute Partner, and a CMMI Institute Certified SCAMPI Lead Appraiser.

SCAMPI A is a required event for organizations wishing to be appraised at a CMMI Maturity or Capability Level, in our case at Level 2, and helps to verify that our organization and project is performing at that level. Planning for your SCAMPI A appraisal usually starts months prior to the actual event and is intended to help meet the performance goals established by the team while reducing any potential risks. A

SCAMPI A Appraisal is often preceded by a SCAMPI B or SCAMPI C Appraisal in order to mitigate risk, and obtain successful outcomes.

CMMI audit checklist

A official CMMI checklist will be provided along with this document. The checklist helps to evaluate the model and its structure, and checks for any inconsistencies between model specification and deployment packages. The goal is to analyse if specified model elements are presented correctly in the model's structure as well as in the processes utilised.

CMMI interview affirmation questions

We have provided the interview questions that can help define the CMMI Level 2 to ensure that there is a common understanding of the terms and document.

1. Are there services available to help me adopt CMMI?
2. Tell me what a Partner is?
3. Should we try to obtain a maturity level or capability levels?
4. How long does it take to establish a process improvement program? How soon will I see results?
5. How to find a Partner that specializes in what we need?
6. Are there tools available for us to use while we are getting started?
7. Explain What are Maturity Levels in Staged Representation?
8. What is Level2 Managed?
9. Can you please explain the different Process Area in CMMI Level 2?
10. Explain What is the importance of PII in SCAMPI?
11. What is the SCAMPI Process?
12. What are the five common features in CMMI?
13. Do you know how Appraisal is done in CMMI?
14. Can you please explain what CMMI is?
15. Can you please explain the purpose of CMMI?
16. Can you please explain the advantages of implementing CMMI?
17. Can you please explain what the SCAMPI process is?