

# Definition of Validation Process to Achieve Specific Goals of CMMI Validation Process Area

Pitchayamon Pengubon, Taratip Suwannasart, and Apinporn Methawachananont

**Abstract**— Validation process aims at finding defects in a software product and evaluates its integrity to support the software development. Software development organizations that have good validation process can make sure that their developed software can be used as user needs. CMMI for development collected best practices for help organizations to improve their process and recommended the important specific practices for performing the validation process to help the organizations make sure that their performing achieves the goals of CMMI validation process. This research proposes a definition of validation process to achieve the specific goals of CMMI validation process area as a guide to apply CMMI validation process in the organizations and increase the reliability of the organizations.

**Index Terms**—CMMI, Process Definition, Specific Goals, Validation Process Area

## I. INTRODUCTION

Quality of service and product is affected from efficiency of development process. In other words, if a software product is made of quality processes, the product will have high quality as well.

One of important processes in software development is validation process. The validation process should establish confidence that the software is fit for its purpose and does what the user really requires [1]. Organizations should have standards and suitable process flow for their culture.

CMMI for development gives advice about applying the CMMI's best practices in organizations. It defines specific goals of each process that organizations should achieve to satisfy the process but doesn't define how to perform the process.

Validation process is one of 22 process areas in CMMI for development, version 1.3. The purpose of Validation (VAL) is to demonstrate that a product or product component fulfills its intended use when placed in its intended environment [2]. The purpose of this paper is to define performing of validation process to achieve specific goals of CMMI's validation process, so the process will be efficient and organizations can receive more reliability. The

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remainder of this paper is organized as follows: section 2 describes overview of CMMI validation process area, section 3 presents related works, section 4 presents definition of validation process for achieving the specific goals of CMMI validation process area. Finally conclusion and future work are expressed in section 5.

## II. CMMI VALIDATION PROCESS

CMMI or Capability Maturity Model Integration® was developed by Software Engineering Institute- SEI of Carnegie Mellon University. CMMI for development collected best practices and frameworks to help organizations develop and improve their product development processes by dividing the development processes into 22 different specific goal groups. Each specific goal has specific practices to achieve the goal.

This paper focuses on validation process area (VAL), the development related process area, which aims at demonstrating that a product or a product component fulfills its intended use when placed in its intended environment. The specific goals, specific practices and sub-practices of this process are shown in table 1.

**Table 1 The specific goals, specific practices and sub-practices of CMMI validation process [2]**

<b>SG1: Prepare for validation</b>	
<i>SP1.1</i>	<i>Select products for validation</i> <ol style="list-style-type: none"><li>1) Identify the key principles, features, and phases for product or product component validation throughout the life of the project.</li><li>2) Determine which categories of end user needs are to be validated.</li><li>3) Select product and product components to be validated.</li><li>4) Select the evaluation methods for each product or product component validation.</li><li>5) Review the validation selection, constraints, and methods with relevant stakeholders.</li></ol>
<i>SP1.2</i>	<i>Establish the validation environment</i> <ol style="list-style-type: none"><li>1) Identify requirement for the validation environment.</li><li>2) Identify customer supplied products.</li><li>3) Identify test equipment and tools.</li><li>4) Identify validation resources that are available for reuse and modification.</li><li>5) Plan the availability of resources in detail.</li></ol>
<i>SP1.3</i>	<i>Establish validation procedures and criteria</i> <ol style="list-style-type: none"><li>1) Review requirements of the product to ensure that the issues affecting validation of the product or product component have been found and resolved.</li></ol>

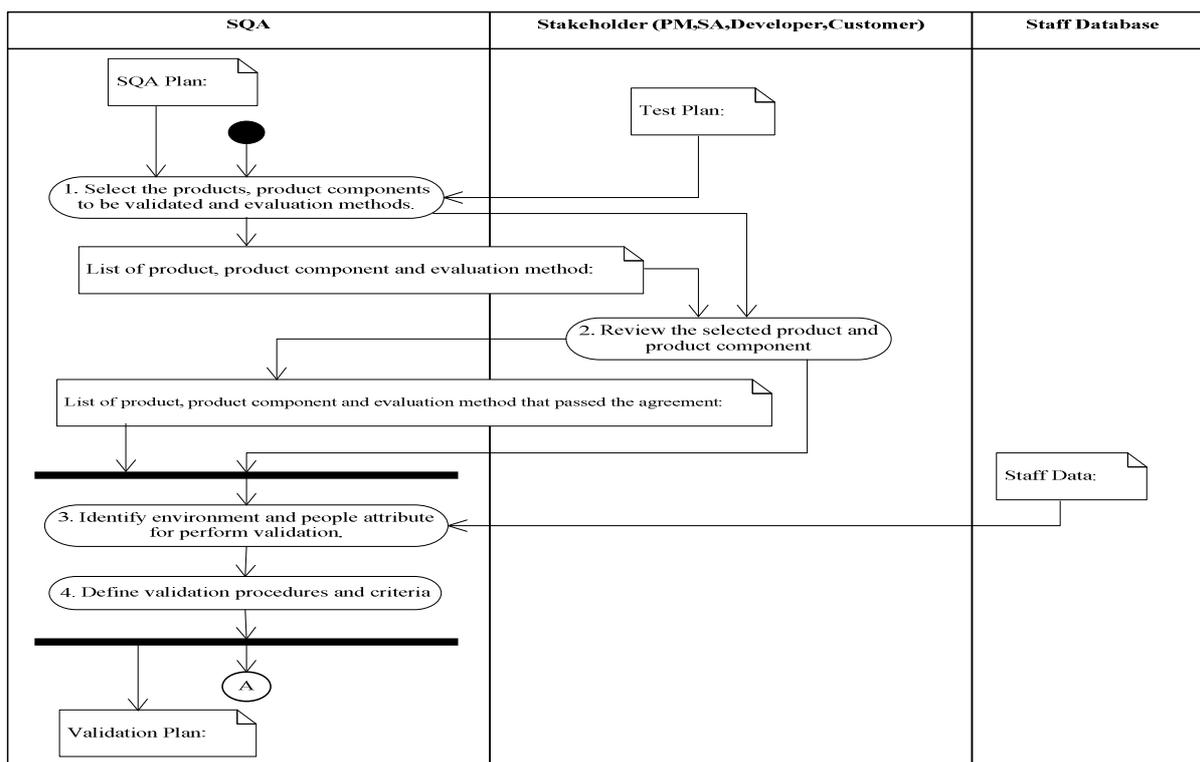
**Table 1 The specific goals, specific practices and sub-practices of CMMI validation process (Continue) [2]**

	2) Document the identified environment, procedure, input, output and criteria for the validation of selected product and product components. 3) Assess the design as it matures in the context of the validation environment to identify validation issues.
<b>SG2: Validate Product or Product Components</b>	
SP2.1	<b>Perform validation</b> Validation activities are performed according to the identified evaluation method and procedure. The as-run validation procedure and the deviations occurring during the execution should be documented.
SP2.2	<b>Analyze Validation Results</b> <ol style="list-style-type: none"> <li>1) Compare actual results to expected results based on the established validation criteria.</li> <li>2) Identify products and product components that do not perform suitably in their intended operating environments, or identify problems with methods, criteria, or the environment.</li> <li>3) Analyze the validation data for defects.</li> <li>4) Record the result of analysis and identify issues.</li> <li>5) Using the validation result to compare actual measurements and performance to the intended use or operational need.</li> <li>6) Collect information on how defects can be resolved and initiate corrective action.</li> </ol>

The authors realizes the importance of achieving the specific goals of validation process as if the organization has a process that can achieve the goals, organization can be confident that developed software products meet the user needs.

**III. RELATED WORK**

*A. SCM Workflow Model for CMM Organizations [3]*



**Figure 1 Definition of validation process**

Pornthep Seawlho et al. proposed a workflow model of SCM (Software Configuration Management) for CMM-based organizations and established a tool for supporting the proposed model. They defined a sequence of related practices that CMM-based organizations can follow to achieve the SCM key process area by analyzing the goals of this process then defined the sequence practices that could be satisfied the goals of SCM and developed the SCM activity supporting system.

The procedure of this research caused the idea to define an important process and to develop the activity supporting system to facilitate the working in organizations.

*B. Inception of Software Validation and Verification Practices within CMMI Level 2 [4]*

Paula Monteiro et al. proposed one approach to apply validation and verification practices with CMMI maturity level 2. They plan to apply validation and verification processes based on CMMI maturity level 2 that would lead to improve quality of the product.

Since this paper is a proposal, so they presented only the purpose and researching procedure but this paper caused the idea that defining validation process should consider to other process areas that relate to validation process to prevent the overlapping practices.

**IV. DEFINITION OF VALIDATION PROCESS**

Main strategy of defining the process is to satisfy the specific goals and specific practices of CMMI-based validation process area. This definition is defined by analyzing and applying the validation process to software development life cycle. The defined definition of validation process to achieve the specific goals of CMMI-based validation process area is shown in figure 1 and is described as follows.

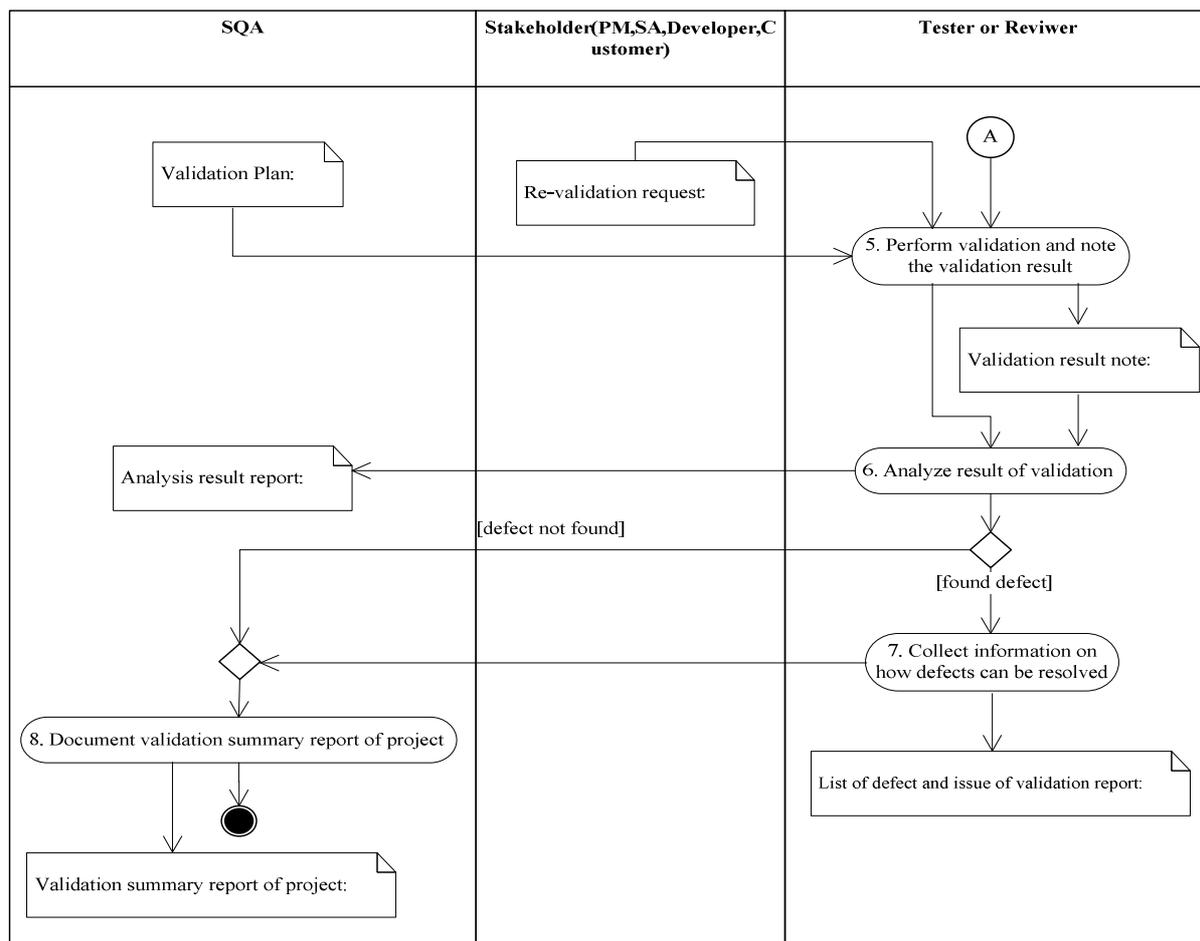


Figure 1 Definition of Validation Process (Continue)

1) Select the products and product components to be validated, and evaluation methods.

This activity is consistent with the specific practice 1.1., select products for validation. SQA selects the products and product components to validate from documents identifying a list of test items (such as SQA plan, test plan etc.) then select evaluation methods to validate each product and product component.

2) Review the selected products and product components

This activity is consistent with the specific practice 1.1., select products for validation. SQA reviews the validation selection, constraints, and methods with relevant stakeholders for agreement.

3) Identify environment and people attributes for perform validation.

This activity is consistent with the specific practice 1.2., establish the validation environment. SQA identifies needed environment to support validation. SQA should consider the needed environment of products and product components and evaluation method. After that, testers or reviewers should be assigned in a schedule to validate each product and product component.

4) Define validation procedures and criteria

This activity is consistent with the specific practice 1.3., establish validation procedures and criteria. SQA defines validation procedures and criteria for validation.

Test cases or procedures of the acceptance test could be determined. Table 2 shows an example of validation plan.

Table 2 An example of validation plan

Validation Plan			Version: 0.1	
<b>Project ID and name:</b>	PJ_TO1 Dormitory rent management supporting tool project			
<b>Document creator:</b>	Miss Ann Wills	Create date:	07/02/12	
		Validate id:	V0001	
<b>Product or Product component name:</b>	Product user manual	Categories of end user needs:	Support	
<b>Evaluation method:</b>	Reviews			
<b>Tester or Reviewer name:</b>	Miss lucky Spears	Start date/End date:	10/04/13	15/04/13
<b>Constraint:</b>	-			
<b>Environment:</b>	- Product user manual			
<b>Procedure:</b>	1. Ensure that product user manual is available for inspection or not. 2. Verify the using following detailed description in user manual. 3. Syntax checking and consistency of use of words in the document.			
<b>Criteria:</b>	Pass: 1. A detailed description is accurate and based on actual usage. 2. Not have grammatical errors and word usage errors.			

5) *Perform validation and note the validation result*

This activity is consistent with the specific practice 2.1., performs validation. Testers or reviewers perform validation according to the validation plan and when the re-validate request exists and note the validation result.

6) *Analyze result of validation*

This activity is consistent with the specific practice 2.2., analyze validation result. Testers or reviewers analyze the validation result and report it to SQA.

7) *Collect information on how defects can be resolved*

This activity is consistent with the specific practice 2.2., analyze validation result. How to resolve the defects is provided and applied. (Including validation methods, criteria, and validation environment)

8) *Document validation summary report of project*

SQA records the validation summary report of the project. Some topics of the report are as follows:

- List of validated products and product components
- Validated products and product components which the result is "Pass"
- Validated products and product components which the result is "Not Pass"
- List of defect and issue of validation

## V. CONCLUSION AND FUTURE WORK

This research proposes the definition of validation process for achieving the specific goals of CMMI validation process area for guiding to apply CMMI-based validation process in organization and raising reliability of the organizations. It supports organization to have efficient process and gets more reliability. Our future work will focus on developing a validation process supporting tool according to the above mentioned definition for better performance.

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