

The Defined Process for Auditing Software Process Implementation

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Abstract—The process definition is important to get efficient product. If organizations have a good process definition and audit their implementation then, work products produced from the process will have good quality. So they must focus on both defining of good process and auditing the software process implementation in the right way. Currently, there are many tools which assist in defining process but audit functions have not been usefully integrated. So, this paper proposes a method which helps organizations define software process and audit their software process implementation as needed.

Index Terms—Audit, Check list, Process definition, Quality Assurance

I. INTRODUCTION

Process is a group of related activities to achieve the objective [1]. Thus process definition is an important work in software development. Capability Maturity Model Integration (CMMI) is a process improvement approach. It focuses on the process definition divided into 22 process groups. Each process proposes an approach for organizations to apply the process definition before their use. The process definition which is appropriate can upgrade the product quality as well.

Currently, there are many tools helping the organizations define a software process. For example, a paper that presented a process definition to support a software development process via Software Process Lines [2]. Organizations that need to improve software process can apply similar defined processes in their organization. Another paper proposes a tool to define electronic process guideline in a small software company [3]. It defined basic process for the company by preparing technical conference and gathering the opinion of specialists. The research mentioned above emphasizes some tools to support some process definition only. It does not include the functions for auditing if the defined process has been implemented.

An audit process is an important part of the “PPQA” area or the process and product quality assurance based on CMMI framework. The goal is to audit processes and

products if they are compliant with the organization’s policy related to deliver quality product to customers. The responsibility for quality assurance belongs to a group of auditor who needs experience in Quality Assurance for assessing processes and products accurately. There are various activities for assessing the processes and products. If an auditor is incapable to assess the process, it causes mistakes in assessment or doesn’t meet the expected goals although the organization has a standard for assessment the processes and products [4].

This paper aims to facilitate auditors and software engineering process group (SEPG). Thus we propose a process definition for developing a tool that simplifies and facilitates for auditing software process and products. In addition, we also present that the audit process and products can help us decrease the time in audit.

The remainder of this paper is organized as follows: Section 2 describes a background of CMMI. Section 3 presents related work. Section 4 describes an approach to develop tool (The Definition process for auditing software process implementation). Finally, conclusion and future work are shown in section 5.

II. BACKGROUND

This section, we describe CMMI [1] which was developed by Software Engineering Institute (SEI) at Carnegie Mellon University. It is a process improvement approach that provides organization with the best practices. It is divided into 22 process areas and each process area consists of 7 following main topics.

- 1) Propose Statement
- 2) Introductory Notes
- 3) Related Process Areas
- 4) Specific Goals
- 5) Specific Practices
- 6) Generic Goals
- 7) Generic Practices

This paper, we focus on two process areas following CMMI version 1.3, Organizational Process Define (OPD) and Process and Product Quality Assurance (PPQA). We realize the importance of defining process and auditing software process implementation. We need to track the defined processes to see if they meet their goal or not and find non-compliance issues that can occur in the process implementation.

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III. RELATED WORK

In this section, we describe several related tools and research that support the process definition.

A. Supporting the Definition of Software Process at a Consulting Organization via Software Process Line [2].

This research was developed by Ahilton Barreto and groups [2], they proposed a tool that supports the organizations to define, deploy, and develop their software process. They present a reuse-based software process definition approach via Software Process Lines for other organizations to ease in process definition. This tool can guide user to define process definition but it cannot audit the process implement.

B. A Proposed Quality Assurance System to support Quality Analysts for Process and Products Verifications

This research was developed by Armoogum Sheeba and et.al [4]. They present a tool to resolve the problems in some software companies, such as missing data, lacking quality record, incomplete forms, and etc. They proposed modules for solving each problem.

C. An Intelligent PPQA Web Services for CMMI Assessment

This research was developed by Mei-Hui Wang and Chang-Shine Lee [5], they propose the intelligent Process

and Product Quality Assurance (PPQA) Web Services that implemented by following the specific goals of Process PPQA process area of CMMI. This tool supports the assessment of PPQA in CMMI. In addition, this tool can create reports to stakeholder.

Following the previous works, we found that the existing tools just guide and define only process definition but they do not mention audit process. Therefore, we aim at suggesting the process definition and the audit process relating to some activities in PPQA of CMMI. We also propose a framework of a tool that can support auditing software process implementation leading to improve their software development process.

IV. PROCESS DEFINITION AND THE APPROACH DEVELOPMENT

We propose a process for developing a tool for auditing software process implementation as shown in figure1.

The tool can be described in Fig 1. Tool requires SEPG and auditors to import data such as process definition data, templates, and generic checklist.

The stakeholder can import data or establish the process definition then select some interesting data to develop the report.

Then, the tool generates a checklist of the processes and work products by extracting data of the process definition and work product type, in order to guide auditors to audit a process. After that, tool will check the list of work products in the storage if they meet the work product.

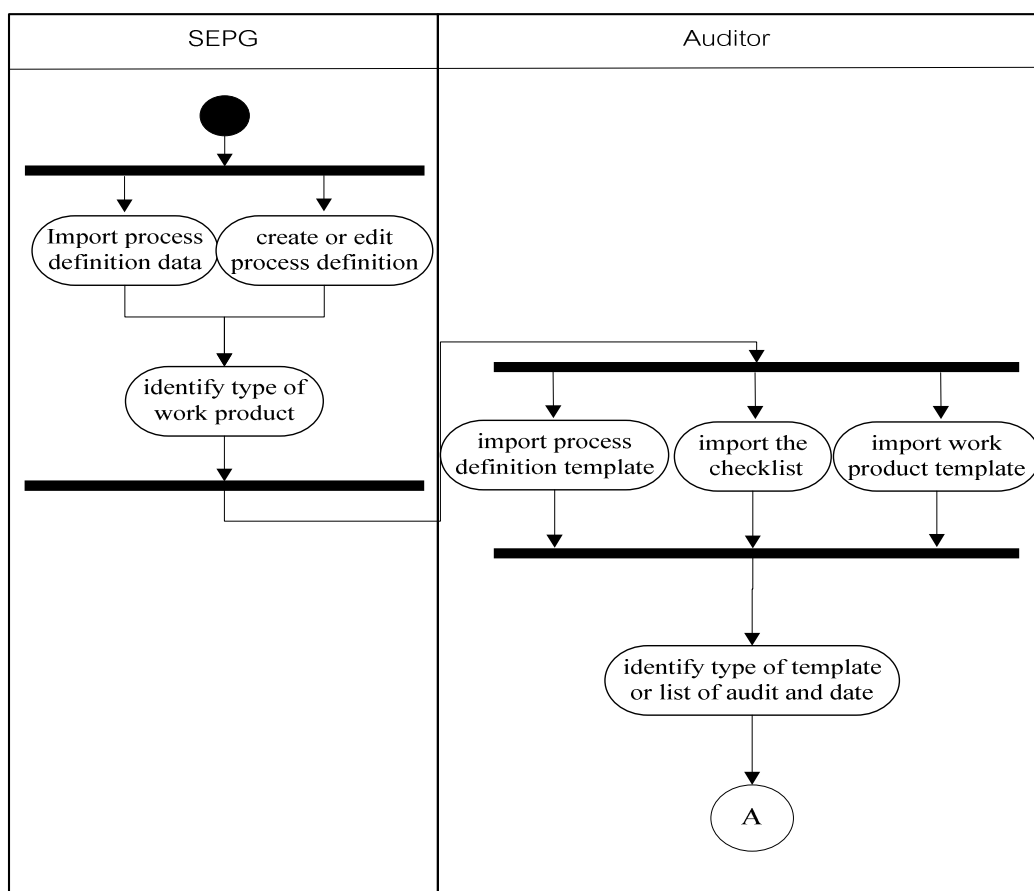


Fig 1 A workflow of Tool

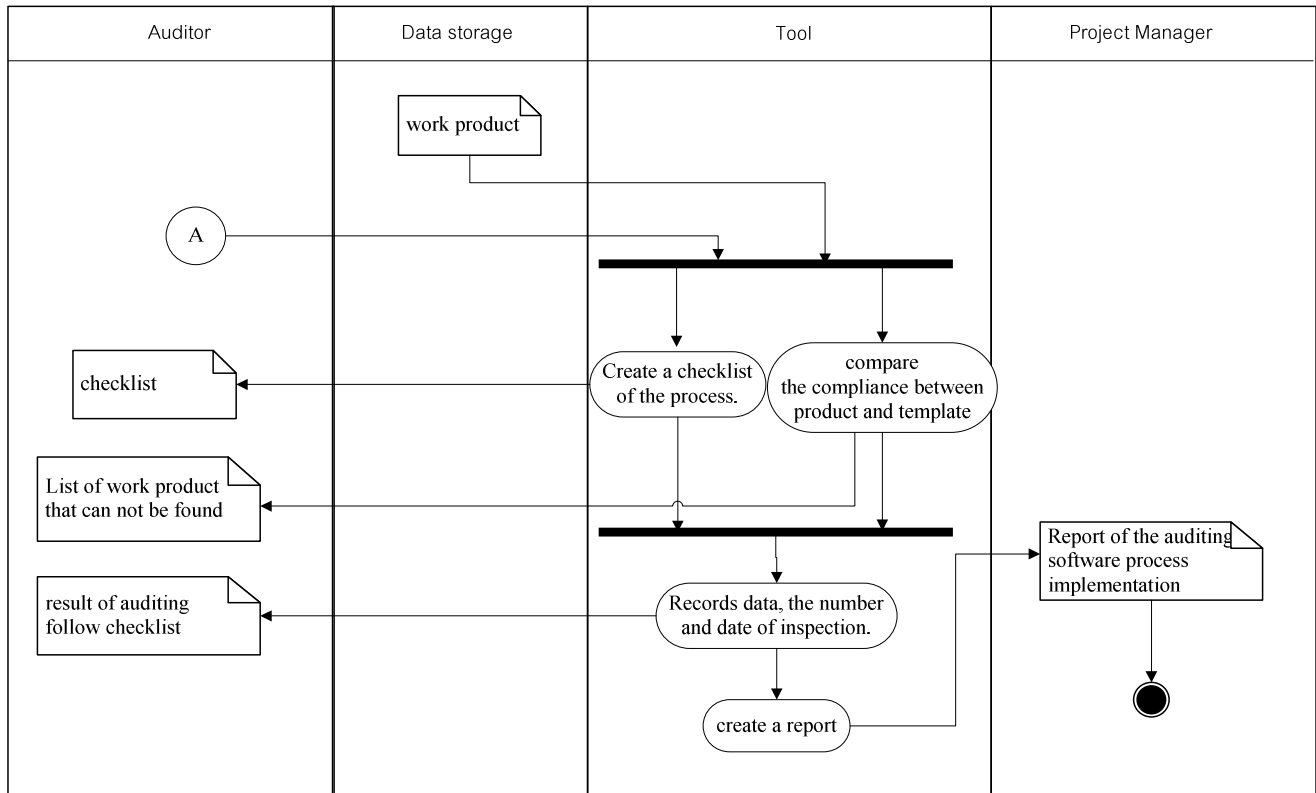


Fig 1 A workflow of Tool (Continue)

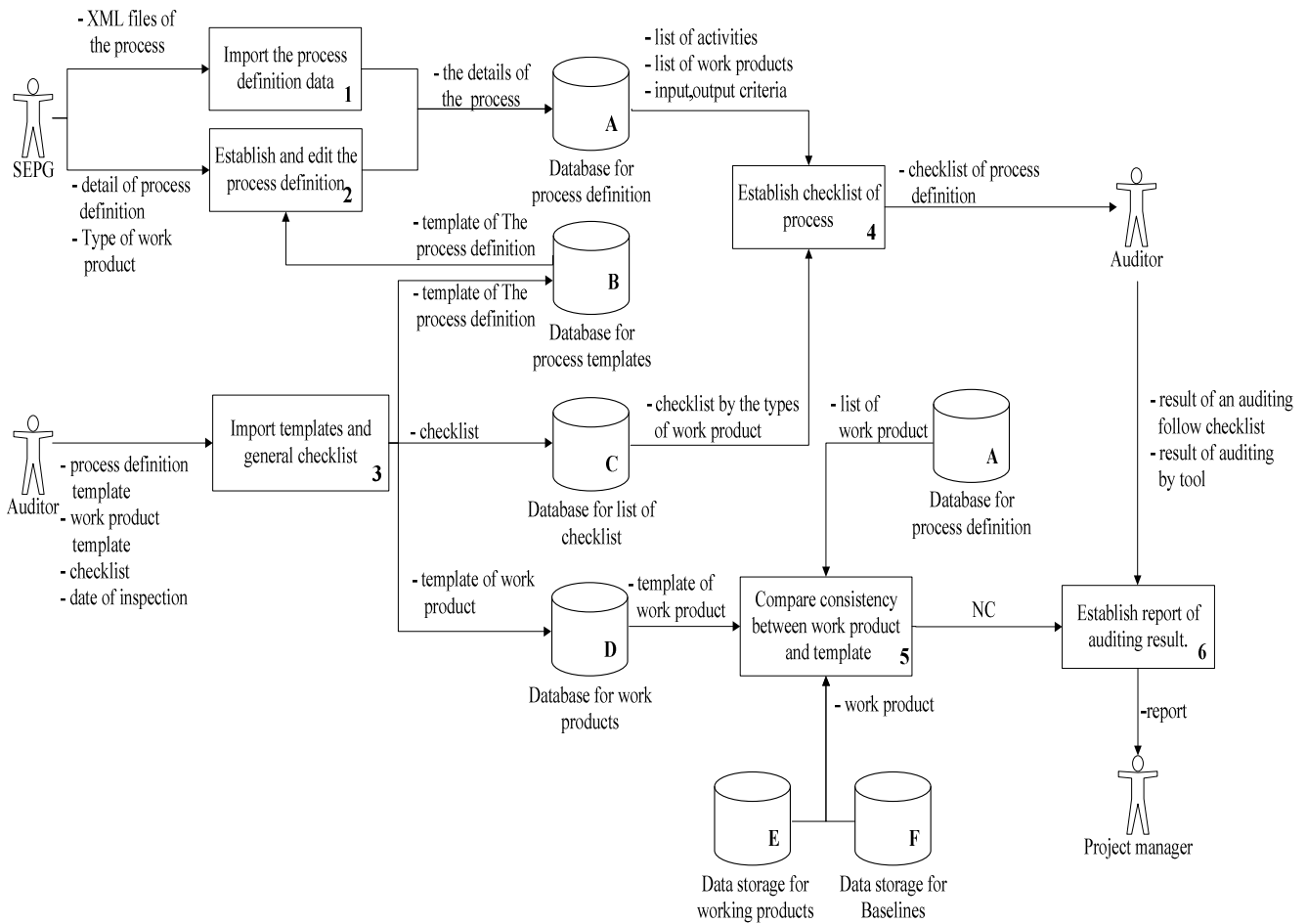


Fig 2 Framework of the tool

If the work product is not found in the storage as defined process then we will call this situation as a non-compliant status. But if the work product is found, then the tool will compare the product with the defined templates to analyze the status if that the work product follows.

The tool creates reports by comparison between the work products and the templates with the same type. Reports are delivered to the project manager.

We explain a detailed framework of the supporting tool for auditing software process implementation as presented in fig 2.

A. Import the process definition data

The data of process definition is imported by SEPG. Then, the data is analyzed and stored in database for process definition of the project (A) to establish a checklist in next step.

Database (A) stores the process definition data, such as process ID, process name, list of activities, and list of work products.

B. Establish and edit the process definition

Not only SEPG import data to system but also can establish and edit it via user interface as well. The tool can support SEPG to establish or define the process definition by using existing template of process definition in storage as default. Then the tool will record the data of process definition that is defined into the database (A).

C. Import templates and general checklist

Templates and general checklist are imported by an auditor such as template of processes, template of work products, and checklist for work products. In addition, an auditor can edit template via this tool as well. Then, the tool will generate and record data in the database.

D. Establish checklist of process

The checklist of process is an information related process definition such as process ID, process name, list of activities list of work product, and generic checklist. It guides an

auditor to audit software process implementation. An auditor imports the result data of auditing, non-compliance issue for developing the audit reports to deliver to project manager.

E. Compare consistency between work product and template

The tool can reduce auditor's work by auditing the work product with stored data if it meets the list of work products in a process.

We describe an approach for auditing work product with templates as shown in fig 3.

- If work products are stored in database, the tool will send a list of required work products to the auditors.

- If work products are stored in database, the tool will compare the work products with templates that have the same type as product. Results of the comparison and non-compliance issues will be stored in database (A). The approach to compare work product and template is as follows:

- 1) Compare the work product outline with templates such as the work product has subtopic as defined in template or not, or the work product has defined version following the template or not.
- 2) Audit completeness of the work product, such as data has filled in every subtopic or not.

However, an auditor must also verify work products that tool cannot audit.

F. Establish report of auditing result.

Establishing audit report is a summary of auditing software process implementation if it has been implemented as defined. It shows the results of comparing a work product with related template, and non-compliance issues occurred to project manager. We divide non-compliance issues into 4 following groups.

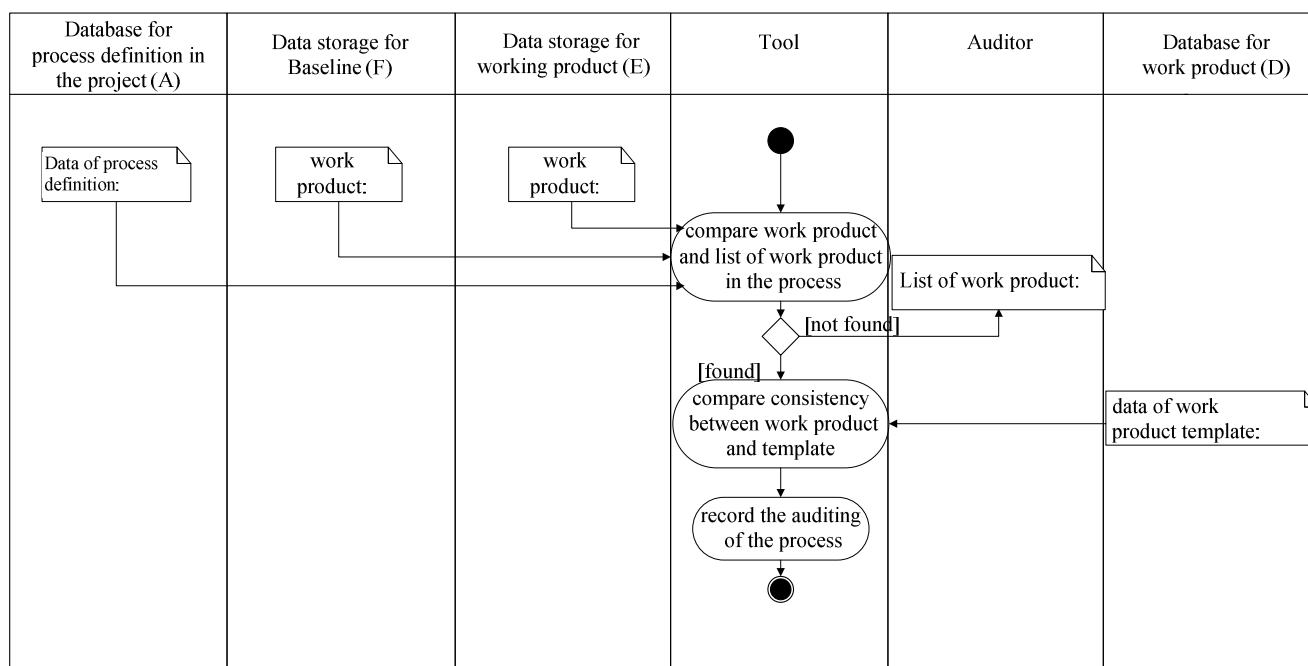


Fig 3 An example of comparison work product with template

- NC0 = no implement
- NC1 = Implement inconsistent with established plan/goal
- NC2 = Implement by different role
- NC3 = Implement by different template

An example of the report of auditing process and work product for project manager is shown in table I.

Table I An audit report

Summary report for peer review					Project ID: PPR_01	
Auditor : Mr. Chuchai			Date: 03/04/2012		Time of audit: 1	
No.	Auditing Process	round 1		round 2		Summary list of
		Number of items	Number of invalid items	Number of items	Number of invalid items	
1	Preparation of schedules and responsibilities.	8	3	0	0	0
Number of items						8
Number of valid items						5
Number of invalid items						3

G. Database

1) Database for process definition (A)

This database records process definition data such as process ID, process name, list of work product, type of work product to be used for creating reports and comparing with work products stored in the database.

2) Database for process templates (B)

This database records data that is analyzed or edited by users as a guide for creating and editing the process definition. We show an example of a template of process definition in table II.

Table II Template of process definition

Process Definition	
Process ID	
Process Name	
Objectives	
Responsibility	
Reference Document	
Entry Criteria	
Inputs	
Outputs	
Exit Criteria	
Procedure	

3) Database for list of checklist (C)

This database records data that is analyzed or edited by user. Examples of the checklist are as follows:

- Is the work product used the latest version of template?
- Does the work product have subtopics as the defined template?
- Is the work product filled in every subtopic of the document?
- Is the work product misspelled?

4) Database for work products (D)

This database records data that is calculated by established default relating to product templates to find non-compliance issues.

5) Data storage for working products (E)

The storage of the work products in a project occurs during process implementation for reviewer to approve.

6) Data storage for Baselines (F)

The storage of the work products in a project that are reviewed and approved by reviewers.

V. CONCLUSION AND FUTURE WORK

In this paper, we propose the defined process for auditing software process implementation, and a framework of a tool. The tool supports to input the existing process definition and templates. The user can create and edit the imported process definition. Moreover, it helps the auditor to audit software process implementation in comparing work product from process with work products which exist in the database. The result of comparison reflects to completeness of implementing the software process. This tool will help organizations to define the process definition and auditor to reduce time spent in auditing the software process definition.

In the future, we will implement the tool following by the proposed framework and test its efficiency with various organizations to confirm expected goals.

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