International Journal of Information Technology and Management Information System
Volume 1 • Issue 1 • May 2010 •pp. 1 - 11
http://www.iaeme.com/ijitmis.html

I J I T M I S
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Software Process and Product Quality Assurance in Software Organizations

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Abstract

The objective of Process and Product Quality Assurance (PPQA) is to objectively evaluate the processes and associated work-products and provide management with the details of current strength and weakness of the process and work products, which aid for the continual process improvement. The purpose of Process and Product Quality Assurance is to provide staff and management with objective insight into processes and associated work products

Keywords: Capability Maturity Model Integration (CMMI), Process and Product Quality Assurance (PPQA) and Software Quality Analyst (SQA)

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I. INTRODUCTION

The Process and Product Quality Assurance process area involves the following activities

- Objectively evaluating performed processes, work products, and services against the applicable process descriptions, standards, and procedures
- Identifying and documenting noncompliance issues
- Providing feedback to project staff and managers on the results of quality assurance activities
- Ensuring that noncompliance issues are addressed

The Process and Product Quality Assurance process area supports the delivery of high-quality products and services by providing the project staff and managers at all levels with appropriate visibility into, and feedback on, processes and associated work products throughout the life of the project. The practices in the Process and Product Quality Assurance process area ensure that planned processes are implemented, while the practices in the Verification process area ensure that the specified requirements are satisfied. These two process areas may on occasion address the same work product but from different perspectives. Projects should take advantage of the overlap in order to minimize duplication of effort while taking care to maintain the separate perspectives.

Objectivity in process and product quality assurance evaluations is critical to the success of the project. (See the definition of “objectively evaluate” in the glossary.) Objectivity is achieved by both independence and the use of criteria. A combination of methods providing evaluations against criteria by those not producing the work product is often used. Less formal methods can be used to provide broad day-to-day coverage. More formal methods can be used periodically to assure objectivity.

Examples of ways to perform objective evaluations include the following:

- Formal audits by organizationally separate quality assurance organizations
- Peer reviews which may be performed at various levels of formality
- In-depth review of work at the place it is performed (i.e., desk audits)
- Distributed review and comment of work products

Traditionally, a quality assurance group that is independent of the project provides this objectivity. It may be appropriate in some organizations, however, to implement the process and product quality assurance role without that kind of independence. For example, in an organization with an open, quality-oriented culture, the process and product quality assurance role may be performed, partially or completely, by peers; and the quality assurance function may be embedded in the process. For small organizations, this might be the most feasible approach. If quality assurance is embedded in the process, several issues must be addressed to ensure objectivity. Everyone performing quality assurance activities should be trained in quality assurance. Those performing quality assurance activities for a work product should be separate from those directly involved in developing or maintaining the work product. An independent reporting channel to the appropriate level of organizational management must be available so that noncompliance issues can be escalated as necessary.

For example, in implementing peer reviews as an objective evaluation method:

- Members are trained and roles are assigned for people attending the peer reviews.
- A member of the peer review who did not produce this work product is assigned to perform the role of QA.
- Checklists are available to support the QA activity.

- Defects are recorded as part of the peer review report and are tracked and escalated outside the project when necessary.

Quality assurance should begin in the early phases of a project to establish plans, processes, standards, and procedures that will add value to the project and satisfy the requirements of the project and the organizational policies. Those performing quality assurance participate in establishing the plans, processes, standards, and procedures to ensure that they fit the project's needs and that they will be useable for performing quality assurance evaluations. In addition, the specific processes and associated work products that will be evaluated during the project are designated. This designation may be based on sampling or on objective criteria that are consistent with organizational policies and project requirements and needs.

When noncompliance issues are identified, they are first addressed within the project and resolved there if possible. Any noncompliance issues that cannot be resolved within the project are escalated to an appropriate level of management for resolution.

This process area applies primarily to evaluations of the activities and work products of a project, but it also applies to evaluations of nonproject activities and work products such as training activities. For these activities and work products, the term "project" should be appropriately interpreted.

II. PPQA PROCEDURE

The CMMI Requirements Development process area describes three types of requirements:- customer requirements, product requirements, and product-component requirements. SQA role to observe (audit) that documented standards, processes, and procedures are followed. SQA would also establish software metrics in order to measure the effectiveness of this process. A common metric for measuring the Requirements process would be the number of errors (found

during system testing) that could be traced to inaccurate or ambiguous requirements (note: SQC would perform the actual system testing but SQA would collect the metrics for monitoring and continuous improvement).

SQC role SQC takes an active role with Verification. Verification of the requirements would involve inspection (reading) and looking for clarity and completeness.

SQC would also verify that any documentated requirement standards are followed. Note there is a subtle difference between SQA and SQC with regard to standards, SQC's role is in verifying the output of this process (that is the Requirement document itself) while SQA's role is to make sure the process is followed correctly. SQA is more of an audit role here, and may sample actual Requirements whereas SQC is involved in the Verification of all Requirements. The type of requirement need not be just the functional aspect (or customer\user facing requirements) they could also include product and\or component requirements.

Input	Tasks	Output
Project plan Process assets Organizational Repository SQA Checklist Work-Product audit Checklist	1. Prepare Process and Product Quality Assurance Plan 2. Provide necessary process training 3. Objectively evaluate the processes 4. Objectively evaluate the	PPQA Plan QA status Report PPQA reports Nonconformance Reports
Entry Criteria		**Exit Criteria**

Contract Preliminary project plan		Approved PPQA plan
1.1 Verification		
1.2 Review of PPQA plan		
1.3 Review of PQA report and NCR		

ROLES

Abbreviation	Name
PM	Project manager
SM- QA	Sr.Manager – Quality Assurance
QA-R	Quality Assurance Representative
MI	Metrics Incharge

1. Prepare Process and Product Quality Assurance plan.

a. Understand the scope of the project by attending Project kick-off meeting, reviewing Preliminary project plan. (SM-QA)
b. Allocate the QA representative for the project. (SM-QA)
c. Assist the project manager in identifying life cycle model, Project defined processes based on the following. (SM-QA)

- Type and Scope of the project
- Size of the project
- Deliverables produced by the project
- Lessons learned from the Similar completed projects

d. Facilitate the project for the following tasks completion. (QA-R)

- Allocation of resources for the project which includes hardware, software, tools and HR
- Project directory structure creation
- Identification of Configuration controller for the project
- Review of organisation repository for incorporation of best practices, lessons learned, reusable components etc

e. Develop Process and product Quality Assurance plan for the project based on project schedule, deliverables produced and project defined processes by mentioning the following. (QA-R)

- Processes to be evaluated
- Work-products to be evaluated
- Criteria for evaluation
- Evaluation method
- Evaluation Schedule
- Responsibility of evaluation

f. Get process and product quality assurance plan reviewed by the PM (QA-R)
g. Get approval for the process and Product quality assurance plan from SM-QA (QA-R)

2. Provide necessary Process Training.

a. Identify the process training needs for the project team based on employee role / employee's training completion records (PM / QA-R)
b. Conduct necessary process training programs. (QA-R)
c. Collect feedback from the participants for process improvement / training function improvement. (QA-R)

d. Update employee's training completion records. (QA-R)

3 Objectively evaluate the processes

a. Select the work product to be evaluated based on the PPQA plan. (QA-R)
b. Objectively evaluate the processes that produced the work product based on the criteria for evaluation [Existence of work product does not provide assurance that the specified process was followed to produce the output. Execution of process leaves auditable quality records like review comments, MOM, checklist which needs to be evaluated] (QA-R)
c. Collect best practices and lessons learned that could improve the process and include them in the organizational repository (QA-R)
d. Identify the non-conformances found during evaluation (QA-R)

4. Objectively evaluate the work products and services

a. Select the work product to be evaluated based on the PPQA plan (QA-R)
b. Objectively evaluate the work product (including intermediate and final) to ensure conformance to standards and requirements as set forth by the project manager and the customer (QA-R)
c. Identify the non-conformances found during evaluation [QA-R]

5. Prepare Evaluation report

a. Prepare Non-Conformance Report based on the Non Conformities observed during evaluation of process and work product. (QA-R)
b. Classify the NC as Major or minor based on the following guidelines (QA)

- **Major:** if the severity of the NC leads to a change in QMS or project defined process.
- **Minor**: if the severity of the NC leads to document control and typographical changes in the project documents

c. Collect evaluation findings (observations, good practices and Non-Conformities) and prepare evaluation report. (QA-R)
d. Circulate the evaluation report to all relevant stake holders (QA-R)
e. Follow-up on for corrective action and track the NCs to closure (QA-R)

6. Initiate Post evaluation activities.

f. Consolidate the NCs and create NC database (QA-R)
g. Analyse the NC data base and prepare NC trend charts (MI)
h. Based on the NC analysis identify the process improvement opportunities and include them in Process Action Plan (SM-QA)
i. Consolidate the good practices captured and contribute it to organizational repository (QA-R)

a. Identify the good practices to be incorporated into QMS and include them in process action plan (SM-QA)
b. Escalate open issues to the SM-QA. (QA-R)

7. Approve the work product / final product for release

a. Ensure that all processes are complied with. (QA-R)
b. In case of open NC/ finding, obtain the approval of SBU head for deviation.
c. Ensure that there is specific action plan to resolve it. (SM-QA / QA-R)
d. Approve the work product / final product for release (SM-QA / QA-R)

8. Provide the QA Status Report to Management

a. Collect Project status details from all the projects (SM-QA/ QA-R)
b. Analyze the gathered project status details and plan for mitigation / project coaching for the risks identified in the project (SM-QA / QA-R)
c. Prepare QA status report, by consolidating details gathered from the projects on milestone review and audits. (SM-QA)
d. Appraise the management on the QA status (SM-QA)
e. Where issues are un-resolved at the SM-QA level, escalate to the Management through the QA status report. (SM-QA)

REFERENCES

1. *Azuma, M.: Evaluation of Software Quality. INSTAC Research Report, Tokio, 1991*
2. *Kuhrau, I.: Software quality assurance (German). Study, CAP debis Curadata, Technical University of Magdeburg, 1993*
3. *Pohn, E.: A metric-based quality management system for software development process. Proc. of the CONQUEST98, Nurenberg, Sept. 28/29, 1998, pp. 62-71*
4. *Lehman, M.M.; Parry, D.E.; Ramil, J.F.: On Evidence Supporting the FEAST Hypothesis and the Laws of Software Evolution. Proc. of the Fifth International Software Metrics Symposium, November 20-21, 1998, Bethesda, Maryland, pp. 84-88*
5. *Azuma, M.: SQuaRE: The next generation of the ISO/IEC 9126 and 14598 international standards series on software product quality. Proc. of the ESCOM 2001, April 2001, London, pp. 337-346*
6. *Elek, A.; Jedrzejowicz, P.: Assessment and Selection of Software Products. Proc. of the FESMA'99, Amsterdam, Netherlands, October 1999, pp. 477-486*

7. *Hausen, H.L.: Generic Modelling of Software Quality. in: Kitchenham;Littlewood: Measurement for Software Control and Assurance. Elsevier Science Publisher Ltd, 1989, pp. 201-242*
8. *Dumke, R. R.; Wille, C.: A New Metrics-Based Approach for the Evaluation of Customer Satisfaction in the IT Area. In: Dumke/Abran: New Approaches in Software Measurement, LNCS 2006, Springer Publ., 2001, pp. 183-195*