Software Quality Assurance

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Quality Assurance

All the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfill requirements for quality. (ISO 12207)

Note 1 - There are both internal and external purposes for quality assurance: a) Internal quality assurance: within an organization, quality assurance provides confidence to management; b) External quality assurance: in contractual situations, quality assurance provides confidence to the customer or others.

Note 2 - Some quality control and quality assurance actions are interrelated.

Note 3 - Unless requirements for quality fully reflect the needs of the user, quality assurance may not provide adequate confidence.

Assure vs Ensure

Assure is used when software assurance practitioners make certain that the specified software assurance, management, and engineering activities have been performed by others.

Ensure is used when software assurance practitioners themselves perform the specified software activities.

NASA Software Assurance Standard, NASA-STD-8739.8

Provides Visibility on Meeting Requirements

The value of SQA is that it provides an independent view of the project's activities, process, and product.

SQA serves as the "eyes and ears" of management.

SQA is not synonymous with testing.

Testing and QA

In common usage, QA includes testing and peer reviews.

- **a testing group may do the testing**
- **the developers do peer reviews**

QA may be a separate organization with a long-term perspective and objectivity.

Some make a distinction between quality assurance and quality control.

- **Quality Control → developers "build in" quality**
- **Quality Assurance → objective check**

Project Quality Management

Includes the processes required to ensure that the project will satisfy the needs for which it was undertaken.

- **PMBOK Guide 2000**

- **quality planning**
- **quality assurance**
- **quality control**

Quality – the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs.

Grade – a category or rank given to entities having the same functional use but different technical characteristics.

Good enough software???

Software CMM v1.1

Software Quality Assurance

The purpose of Software Quality Assurance is to provide management with appropriate visibility into the process being used by the software project and of the products being built.

Goals

- **Software quality assurance activities are planned.**
- **Adherence of software products and activities to the applicable standards, procedures, and requirements is verified objectively.**
- **Affected groups and individuals are informed of software quality assurance activities and results.**
- **Noncompliance issues that cannot be resolved within the software project are addressed by senior management.**

Product and Process Assurance

Product assurance – does the product meet all of its requirements?

- **typically addressed by V&V activities: testing, peer reviews, formal methods**

Process assurance – are the developers following the process (methodology) required?

- **may be mandated by the customer**
- **may be mandated by organizational standards**
- **may be mandated by regulatory bodies**
  - **e.g., DO-178 for commercial aircraft software**
- **may be selected by the project team from a set of possible processes**

Process & Product Quality Assurance

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

Specific Goals

1) **Objectively evaluate processes and work products.**
2) **Provide objective insight.**

Note that product quality assurance, as described in PPQA, is against applicable process descriptions, standards, and procedures. It is not against requirements. Practices in the Verification process area ensure that specified requirements are satisfied.

Resolving a Nonconformance

There are three possible ways for resolving a nonconformance

- **make the product or process satisfy the standard, procedure, or requirement**
- **change the standard or procedure to make it usable (correct)**
  - **a process improvement activity**
- **make an executive decision not to satisfy the standard, procedure, or requirement**
  - **grant a waiver**

SQA Implementation Questions

Should an independent SQA group be established?
- **How big should the SQA group be?**

How will Software QA coordinate with system QA?

What role, if any, does SQA have in quality control?
- **What is SQA's role in selecting and defining standards?**
- **What role, if any, does SQA have in process improvement?**

Should SQA sample?

Organizational Structure and Quality

Organizations may establish independent groups – responsible for different functions – to ensure objectivity.

Independent testing group

- **responsible for creating test cases and doing testing**
- **typically addresses integration and system testing (stress testing, load testing, operational profiles, etc.)**
- **developers typically do unit testing**

Independent QA group

- **assures that requirements are met, process is followed**

Independent V&V group

- **third-party V&V**
- **typically required (and paid for) by the customer**

Product vs Process Assurance

High maturity organizations typically have an independent SQA group and embed the SQA function in the process

- **process assurance performed by an independent SQA group**
- **product assurance embedded in process (e.g., a defined role in peer reviews, prerequisite for baselining)**

R. Craig, "Software Quality Assurance in a CMM Level 5 Organization," Crosstalk: The Journal of Defense Software Engineering, May 1999.

Summary – Things to Remember

QA is not testing

- **even if frequently implemented that way**

process assurance vs product assurance

three different ways to resolve a nonconformance

Questions and Answers