Software Quality (pt2)

Topics

- What is Software?
- Software Error, Fault and Failure
- Classification of the causes of software errors
- Software Quality
- Software Quality Assurance
- Quality Control
- The objectives of SQA activities

2.3 The 9 causes of software errors

1. Faulty requirements definition
2. Client–developer communication failures
3. Deliberate deviations from software requirements
4. Logical design errors
5. Coding errors
6. Non-compliance with documentation and coding instructions
7. Shortcomings of the testing process
8. Procedure errors
9. Documentation errors

Software quality

- IEEE definition
  - The **degree** to which a system, component, or process **meets** specified requirements. (Philip B. Crosby)
  - The **degree** to which a system, component, or process **meets** customer or user needs or expectations. (Joseph M. Juran)

Software quality

- Software quality– Pressman's definition
  - Conformance to explicitly stated functional and performance requirements, explicitly documented development standards, and implicit characteristics that are expected of all professionally developed software.

Pressman's definition suggests three requirements for quality assurance.

1. **Specific functional requirements**, which refer mainly to the outputs of the software system.
2. The **software quality standards** mentioned in the contract.
3. **Good Software Engineering Practices** (GSEP), reflecting state-of-the-art professional practices, to be met by the developer even though not explicitly mentioned in the contract.

Software Quality Control

- Quality control is defined as
  "a set of activities designed to evaluate the quality of a developed or manufactured product"

Software Quality Assurance

- IEEE. Definition (IEEE Glossary, 1991)
  - A planned and systematic pattern of all actions necessary to provide adequate confidence that an item or product conforms to established technical requirements.
  - A set of activities designed to evaluate the process by which the products are developed or manufactured.

Expanded SQA. definition

- Software quality assurance is:
  - A systematic, planned set of actions necessary to provide adequate confidence that the software development process or the maintenance process of a software system product conforms to established functional technical requirements as well as with the managerial requirements of keeping the schedule and operating within the budgetary confines.

Expanded SQA. definition

- The IEEE SQA definition
- The relevant ISO 9000-3 sections
- CMM requirements.

*) ISO 9000-3, 1997
**) Capacity Maturity Model (CMM) for software (Paulk et al., 1993; Tingey, 1997)

Example of expanded SQA Definition

SQA Expanded definition	IEEE SQA definition	Relevant Sections from ISO9000-3	Relevant SEI-CMM Requirement
Systematic, planned actions are required	+	Management responsibilities(4.1) Quality system (4.2) Contract review (4.3)	-Software quality management -Requirement management -Software project planning -Software tracking and oversight

Table 2.2, p.27-28, Quality Systems in IT

Control vs Assurance

- Quality control inspection and other activities take place as the development or manufacturing of the product is completed yet before the product is shipped to the client.
- Quality assurance minimize the cost of guaranteeing quality by a variety of activities performed throughout the development and manufacturing processes/stages.

The objectives of SQA activities

- **Software Development(process-oriented):**

1. Assuring an acceptable level of confidence that the software will conform to functional technical requirements.

2. Assuring an acceptable level of confidence that the software will conform to managerial scheduling and budgetary requirements.

3. Initiating and managing of activities for the improvement and greater efficiency of software development and SQA activities.

The objectives of SQA activities

- **Software maintenance(Product-oriented):**
  1. Assuring with an acceptable level of confidence that the software maintenance activities will conform to the functional technical requirements.
  2. Assuring with an acceptable level of confidence that the software maintenance activities will conform to managerial scheduling and budgetary requirements.
  3. Initiating and managing activities to improve and increase the efficiency of software maintenance and SQA activities. This involves improving the prospects of achieving functional and managerial requirements while reducing costs.

Software Engineering

- **Definition:** The application of a systematic, disciplined, quantifiable approach to the development, operation and maintenance of software; that is, the application of engineering to software.
- Software engineering environment is a good infrastructure for achieving SQA objectives.

Summary

- Definition of software, software quality and software quality assurance
- Distinguish between software {errors, fault, failure}
- Identify various causes of software errors
- Difference between quality control vs quality assurance
- Relationship between SQA vs SE

Exercise 2.2

- Pressman's definition of quality requires the client to specify the software requirements because only documented requirements are binding for the developer. Any omissions or errors made by the client are considered as his or her fault, and not listed among the developer's errors.
- (1) In what ways can the developer support the client in this matter?
- (2) Suggest pro and con arguments to Pressman's definition of the client's responsibility.