Software Quality Assurance

CHAPTER 3

SOFTWARE QUALITY ASSURANCE PLAN

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Outline

Definition

Steps to Develop and Implement a SQA Plan

- ◦ **Step 1:** Document the Plan
- ◦ **Step 2:** Obtain Management Acceptance
- ◦ **Step 3:** Obtain Development Acceptance
- ◦ **Step 4:** Plan for Implementation of the SQA Plan
- ◦ **Step 5:** Execute the SQA Plan

Definition

The software quality assurance (SQA) plan is an outline of quality measures to ensure quality levels within a software development effort.

The plan is used as a baseline to compare the actual levels of quality during development with the planned levels of quality.

Definition

Provides a road map for instituting software quality assurance in an organization

Developed by the SQA group to serve as a template for SQA activities that are instituted for each software project in an organization

Definition

If the levels of quality are not within the planned quality levels, management will respond appropriately as documented within the plan.

The plan provides the framework and guidelines for development of understandable and maintainable code.

These ingredients help ensure the quality required in a software project

Steps to Develop and Implement a SQA Plan

Step 1: *Document the Plan*

Step 2: *Obtain Management Acceptance*

Step 3: *Obtain Development Acceptance*

Step 4: *Plan for Implementation of the SQA Plan*

Step 5: *Execute the SQA Plan*

Step 1: Document the Plan

The software quality assurance plan should include the following sections

SQA Plan Sections

1. Purpose
2. Reference Document
   2.1 The MIS Standard
   2.2 MIS Software Guidelines
   2.3 The Software Requirements Specification
   2.4 The Generic Project Plan
   2.5 The Generic Software Test Plan
   2.6 The Software Configuration Management Plan
3. Management
   3.1 The Organizational Structure
   3.2 Tasks and Responsibilities
      3.2.1 Project Leader (Lead Software Engineer)
      3.2.2 Software Development Groups
      3.2.3 The Testing Subcommittee
4. Documentation
   4.1 The Software Requirements Specification
   4.2 System User Guide
   4.3 The Installation Guide
   4.4 Test Results Summary

SQA Plan Sections

4.5 Software Unit Documentation
    4.5.1 The Preliminary Design Document
    4.5.2 Detailed Design Document
    4.5.3 Other Documents
4.6 Translator Software Units

5. Standards, Practices, and Conventions
6. Reviews and Inspections
7. Software Configuration Management
8. Problem Reporting and Corrective Action
9. Tools, Techniques, and Methodologies
10. Code Control
11. Media Control
12. Supplier Control
13. Records Collection, Maintenance, and Retention
14. Testing Methodology

1- *Purpose Section*

Purpose Section—*This section explains the specific purpose and scope of the* particular SQA plan.

It should list the names of the software items covered by the SQA plan and the intended use of the software.

It states the portion of the software life cycle covered by the SQA plan.

1- *Purpose Section-Example*

Software Quality Assurance Plan 1.0

Airline Reservation System

1- *Purpose Section-Example*

This Software Quality Assurance Plan (SQAP) sets forth the process, methods, standards, and procedures that will be used to perform the Software Quality Assurance function for the Smith Jones Rapid Transit (SJ-RT) project.

1- *Purpose Section-Example*

1. PURPOSE

The main purpose of the Software Quality Assurance plan is to ensure production of high quality end software product according to the specific requirements stated. The Software Quality Assurance plan of the Airline Reservation System establishes the goals, processes and responsibilities required to ensure high quality and on-time delivery of the project.

1- *Purpose Section-Example*

The results of the reviews and audits conducted in the Software Quality Assurance plan would be provided to the appropriate management of the project, so that they can track and assess the progress being made on the project.

The plan will be use which will be used throughout the software life cycle.

2- Reference Document Section

2- Reference Document Section

This section provides a complete list of documents referenced elsewhere in the text of the SQA plan.

2- Reference Document Section- example

2. REFERENCE DOCUMENTS

- IEEE standard for Software Quality Assurance Planning
- IEEE guide for Software Quality Assurance Planning
- Project Plan document for the Airline Reservation System
- Book: Software quality assurance / Daniel Galin

3- Management Section

Management Section

This section describes the project's organizational structure, tasks, and responsibilities.

3- Management Section

3.1 Organization

This paragraph shall <mark>depict</mark> the organizational structure that influences and controls the quality of the software.

3- Management Section-Example

3. MANAGEMENT

3.1 ORGANIZATION

The organization consists of

◦ QA Manager: V. Domenico from DOE Software Mgmt.

◦ SQA Team: M. Leijten, S.C.H. Bego and I. Van from DOE Software Mgmt.

◦ System Owner: M. Raffaello from HR-XXX Company

◦ QA Consultant: G. Garibaldi from DOE Software Mgmt.

◦ Project Manager: A. Michelangelo from DOE Software Mgmt.

3- Management Section

3.2 Tasks

This paragraph shall describe

a) That portion of the software life cycle covered by the SQAP;

b) The tasks to be performed with special emphasis on software quality assurance activities

3- Management Section - Example

In general SQA team will do the following tasks:

Prepare SQA plan for the project.

Participate in the development of the project's software process description.

Review software engineering activities to verify compliance with the defined software process.

Audit designated software work products to verify compliance with those defined as part of the software process.

Ensure that any deviations in software or work products are documented and handled according to a documented procedure.

Record any evidence of noncompliance and reports them to management.

3- Management Section - Example

The following detail tasks will be conducted

1) Requirements (Software Requirements Specification):

The Requirements Specification document is reviewed and approved by the assign reviewer(s).

The Requirements Specification document if supplied by the customer is also reviewed by the designated reviewer(s) and any issues or gaps between the requirements stipulated in the contract and those covered in the document are resolved.

The reviewed document is presented to the customer for acceptance, as stipulated in the Contract

3- Management Section - Example

2) Design and Construction (SDD)

- The Design phase is carried out using an appropriate system design methodology, standards and guidelines, taking into account the design experience from past projects.

- The design output is documented in a design document and is reviewed by the Reviewer to ensure that:
  - The requirements including the legal and regulatory requirements as stated in the Requirements Specification document, are satisfied
  - The acceptance criteria are met
  - Appropriate information for service provision (in the form of user manuals, operating manuals, as appropriate) is provided.

- The Design Document forms the baseline for the Construction phase.

3- Management Section - Example

3) Construction (Code)

-The Project Team constructs the software product to be delivered to meet the design specifications, using:

- Suitable techniques, methodology, standards and guidelines
- Reusable software components, generative tools, etc. as appropriate
- Appropriate validation and verification techniques as identified in the Project Plan.

3- Management Section - Example

4) Testing and Inspection

-Before delivery of the product, ensures that all tests, reviews, approvals and acceptances as stipulated in the Project Plan have been completed and documented.

- No product is delivered without these verifications.

3- Management Section - Example

5) Acceptance (Final Software):

- The customer generally reviews and tests the final product. The customer may also review or test intermediate deliveries as stipulated in the contract.

- The Project Team assists the customer in planning and conducting the Acceptance

3- Management Section

3.3 Responsibilities

This paragraph shall identify the specific organizational elements responsible for each task.

3- Management Section- Example

3.2 RESPONSIBILITIES

QA Manager

Manages the Quality Assurance and lead SQA team

SQA team

Conduct Software Quality Assurance activities.

System Owner

Helps define product quality expectations. Represents procurement users. Determines final acceptance

3- Management Section- Example

QA Consultant

Audits and approves project deliverables from QA perspective. Reviews plans and deliverables for compliance with applicable standards. Provides guidance and assistance on process matters.

Project Manager

Monitors implementation of quality activites. Receives reports on SJ-RT quality efforts. Resolves conflict across organizations.

4- Documentation Section

Documentation Section—*This section identifies the documentation governing the development, verification and validation, use, and maintenance of the software. It also states how the documents are to be checked for* <mark>adequacy</mark>.

4- Documentation Section-example

Minimum documentation requirements

Software Requirements Document (SRS)

Software specification review is to be used to check for adequacy and completeness of this documentation. The Software Requirements Document, which defines all the functional requirements, quality attributes requirements and constraints on the project.

4- Documentation Section-example

Software Architecture and Design (ADD) or Software Design Document (SDD)

Software Architecture and Design review and detailed design review are to be used for adequacy and completeness of this documentation. This document provides the quality attributes on the project and also various architectural decisions the team took meet the quality attributes.

4- Documentation Section-example

Software Verification and Validation Plan (SVVP)

Software verification and validation plan review is to be used for adequacy and completeness of this documentation. This document although still does not exist presently with the team but would cater to providing the steps for verification and validation of the created work product.

4- Documentation Section-example

Software Verification and Validation Report (SVVR)

This documentation which still does not exist, should include the following information basically pertaining to the tasks results of SVVP:

Summary of all life cycle V & V tasks and the results of these activities

Suggestions whether the software is, or is not, ready for operational use

4- Documentation Section-example

User Documentation

This is to be included in the Software Project Management document. This document is not presently made by the team. This provides all the information on the successful software execution and operation of the software to the end user.

4- Documentation Section-example

Software Project Management Plan (SPMP)

SPMP should identify the following items. These should be reviewed and assessed by all the team members in the team. The items and their corresponding checks include

Items	Check
Full description of software development activity as defined in the SPMP	
Software development and management organizations responsibilities as defined in SPMP	
Process for managing the software development as defined in SPMP	
Technical methods, tools, and techniques to be used in support of the software development as defined in the SPMP	
Assignment of responsibilities for each activity as defined in the SPMP	
Schedule and interrelationships among activities as defined in SPMP	
Process improvement activities as defined in SPMP	
Goals deployment activities as defined in SPMP	
A list of deliverables as defined in the SPMP	
Strategic quality planning efforts triggered by reviews as defined in the SPMP	

4- Documentation Section-example

Software Configuration Management Plan (SCMP) :

This documentation should describe the methods to be used for: Maintaining information on all the changes made to the software

5- *Standards, Practices, Conventions, and Metrics Section*

Standards, Practices, Conventions, and Metrics Section

This section identifies the standards, practices, conventions, and metrics to be applied, and also states how compliance with these items is to be monitored and assured.

5- *Standards, Practices, Conventions, and Metrics Section*

The subjects covered shall include the basic technical, design, and programming activities involved, such as documentation, variable and module naming, programming, inspection, and testing.

5- Standards, Practices, Conventions, and Metrics Section-Example

Documentation Standard

The IEEE standards are used as a guideline for all the documentation of the project.

Coding Standard

The project follows the guidelines in the C# coding standards and style guide.

5- Standards, Practices,Conventions, and Metrics Section-Example

Commentary Standard

Comments are used in the project to give a brief description of the code, which mainly focuses on the functionality and purpose of the commented areas.

Each block of statements will be well-commented. Each routine will also have a comment which will be placed above the specific routine.

5- Standards, Practices, Conventions, and Metrics Section-Example

Testing Standard

The IEEE standard for software test documentation will be used for the Airline Reservation System project.

Metrics

The basic COCOMO model will be used to estimate the project time and effort.

In addition, Error Indices and Error Density will be used.

6- Reviews and Inspections Section

Reviews and Inspections Section—

This section defines the technical and managerial reviews, walkthroughs, and inspections to be conducted.

It also states how the reviews, walkthroughs, and inspections are to be accomplished, including follow-up activities and approvals.

6- Reviews and Inspections Section-Example

1) Work Product Reviews

a) Formal Reviews:

One week prior to the release of document to the client, the SQA will review the document.

The SQA will ensure that the necessary revisions to the document have been made and that the document would be released by the stated date. In case there are any shortcomings then the same would be pointed to the software project management.

6- Reviews and Inspections Section-Example

b) Informal Reviews:

Design Walk- through

The SQA will invite design walk-through to encourage peer and management reviews of the design. The Software Project Management would ensure that all the reviews are done in a verifiable way and the results are recorded for easy reference. SQA will ensure that all the action items are addressed

6- Reviews and Inspections Section-Example

Code Walk-through

SQA will invite all the code walk-through to ensure that a peer review is conducted for the underlying code. The Software Project Management would ensure that the process is verifiable where as the SQA will ensure that all the items have been addressed.

6- *Reviews and Inspections Section-Example*

2) QUALITY ASSURANCE PROGRESS REVIEWS:

In order to remove defects from the work products early and efficiently and to develop a better understanding of causes of defects so that defects might be prevented, a methodical examination of software work products is conducted in projects in the following <u>framework</u>:

6- Reviews and Inspections Section-Example

- Reviews of Project Plans and all deliverables to the customer are carried out as stated in the Quality Plan of the project. A project may identify additional work products for review.

- Specialists and/or cross-functional teams as appropriate, carry out review of software work products to ensure proper depth and coverage of the review.

- Reviews emphasize on evaluating the ability of the intended product to meet customer requirements. The reviewer also checks whether the regulatory statutory and unstated requirements, if any, have been addressed.

6- Reviews and Inspections Section-Example

- Personnel independent of the activity being performed carry out the reviews.

- Reviews focus on the work product being reviewed and not on the developer. The result of the review in no way affects the performance evaluation of the developer.

- The defects identified in the reviews are tracked to closure. If a work product is required to be released without tracking the defects to closure, a risk analysis is carried out to assess the risk of proceeding further.

7- *Problem Reporting and Corrective Action Section*

Problem Reporting and Corrective Action Section—

⊙ Defines procedures for reporting, tracking, and resolving errors or defects, identifies organizational responsibilities for these activities

7- Problem Reporting and Corrective Action Section-Example

When a problem is detected, it has to be solved. There are several kinds of problems:

Document problems:

◦ Non compliance with other project documents.

◦ Non compliance with the standard .

◦ Non compliance with the house style

◦ Incompleteness.

◦ Errors.

7- Problem Reporting and Corrective Action Section-Example

Code problems:

◦ Lack of functionality.

◦ Wrong functionality.

◦ Non compliance with coding or commentary standards.

7- Problem Reporting and Corrective Action Section-Example

Problem reporting procedure

When a problem is detected, the person who discovered the error is responsible for reporting it to the Project Manager and QA Manager.

When a problem is discovered during a review, the member of the SQA team present is responsible.

7- Problem Reporting and Corrective Action Section-Example

Problem solving procedure:

The SQA team appoints the team leader of the corresponding team to solve the reported error. He is then responsible for solving the problem.

When the problem is solved the SQA team is notified to check whether the made changes solve the problem.

7- Problem Reporting and Corrective Action Section-Example

When the problem cannot be solved, or cannot be solved within a reasonable amount of time a meeting is set up with the Project Manager, the QA Manager and the team leader of the responsible team. During this meeting a decision will be made about further dealing with the problem.

8- Tools, Techniques, and Methodologies Section

Tools, Techniques, and Methodologies Section

This section identifies the special

software tools, techniques, and methodologies that support SQA, states their purposes, and describes their use.

8- Tools, Techniques, and Methodologies Section Example

TOOLS, TECHNIQUES AND METHODOLOGIES

The following are the tools that will be used for coding, testing and documentation:

• Microsoft Visual Studio .NET – for coding

• C# - for coding

• HTML – for coding

8- Tools, Techniques, and Methodologies Section Example

- JavaScript for coding

- IIS – for web server

- ASP.NET – for web forms

- SQL server– for database server

- MS WORD– for documentation

- XML – for coding

- NUnit – for unit testing

- JMeter for performance testing

- User Testing

9- Records Collection, Maintenance, and Retention

Records Collection, Maintenance, and Retention Section—

This section identifies the SQA documentation to be retained. It states the methods and facilities to assemble, safeguard, and maintain this documentation, and will designate the retention period. The implementation of the SQA plan involves the necessary approvals for the plan as well as development of a plan for execution.

9- Records Collection, Maintenance, and Retention-Example

RECORDS COLLECTION, MAINTENANCE AND RETENTION

SQ personnel will maintain records that document assessments performed on the project. Maintaining these records will provide objective evidence and traceability of assessments performed throughout the project's life cycle. There are two types of records that will be maintained: Hardcopy and Electronic. SQ personnel will maintain electronic or hard copies of all assessment reports and findings. SQ Project folders will contain hardcopies of the assessment work products such as completed checklists, supporting objective evidence, and notes.

9- Records Collection, Maintenance, and Retention-Example

The table below identifies the record types that will be collected, as well as the Record keeper and Retention period.

Record Title	Record Keeper	Record Retention
SQA Assessments	SQ Personnel	One Year
SQA Checklists	SQ Personnel	One Year
Deliverable Defects	SQ Personnel	One Year

10. DELIVERABLES

DELIVERABLES

Set of deliverables will be submitted at the end of each phase

10. DELIVERABLES- Example

Phase I
- Vision Document 1.0
- Project Plan 1.0
- Software Quality Assurance Plan

Phase II
- Action items identified during phase I
- Vision Document 2.0
- Project Plan 2.0
- Formal Requirement Specification
- Architecture Design
- Test Plan
- Formal Technical Inspection
- Executable Architecture Prototype

10. DELIVERABLES- Example

Phase III

◦ Action items identified during phase II

◦ User Manual

◦ Component Design

◦ Source Code

◦ Assessment Evaluation

◦ Project Evaluation

◦ Test Results

◦ References

◦ Formal Technical Inspection-

Step 2: Obtain Management Acceptance

Management participation is necessary for the successful implementation of an SQA plan. Management is responsible for both ensuring the quality of a software project and for providing the resources needed for software development.

Step 2: Obtain Management Acceptance

The level of management commitment required for implementing an SQA plan depends on the scope of the project. If a project spans organizational boundaries, approval should be obtained from all affected departments.

Step 3: Obtain Development Acceptance

Because the software development and maintenance personnel are the primary users of an SQA plan, their approval and cooperation in implementing the plan are essential. The software project team members must adhere to the project SQA plan; everyone must accept it and follow it.

Step 3: Obtain Development Acceptance

No SQA plan is successfully implemented without the involvement of the software team members and their managers in the development of the plan.

Step 4: Plan for Implementation of the SQA Plan

The process of planning, formulating, and drafting an SQA plan requires staff and word-processing resources. The individual responsible for implementing an SQA plan must have access to these resources. In addition, the commitment of resources requires management approval and, consequently, management support.

To facilitate resource allocation, management should be made aware of any project risks that may impede the implementation process (e.g., limited availability of staff or equipment). A schedule for drafting, reviewing, and approving the SQA plan should be developed.

Step 5: Execute the SQA Plan

Step 5: Execute the SQA Plan

The actual process of executing an SQA plan by the software development and maintenance team involves determining necessary audit points for monitoring it. The auditing function must be scheduled during the implementation phase of the software product so that improper monitoring of the software project will not hurt the SQA plan. Audit points should occur either periodically during development or at specific project milestones (e.g., at major reviews or when part of the project is delivered).