School of Computer Science and Engineering

Advanced Software Engineering

Software Quality Assurance (SQA) Plan

Website Portal: HouseHunt

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By Team 5:

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0.3.1	Defined 14. SQA Plan Change Procedure and History	Tang Kai Wen, Alvin	11/09/21
1.0.0	Final Revision of Quality Plan	Tang Kai Wen, Alvin	13/09/21

Contents

1. Purpose and Scope

1.1. Purpose

The purpose of this Software Quality Assurance (SQA) Plan is to establish the goals, processes, and responsibilities required to implement effective quality assurance functions for the Team 5 project.

The Software Quality Assurance Plan provides the framework necessary to ensure a consistent approach to software quality assurance throughout the project life cycle. It defines the approach that will be used by the QAM and Software Quality (SQ) personnel to monitor and assess software development processes and products to provide objective insight into the maturity and quality of the software. The systematic monitoring of products, processes, and services will be evaluated to ensure they meet requirements and comply with policies, standards, and procedures, as well as applicable Institute of Electrical and Electronic Engineers (IEEE) and ISO standards.

1.2. Scope

The purpose of SQA is to ensure that the software developed does not deviate from the original intended product. SQA is also concerned with identifying any errors, omissions, inconsistencies, and alternatives, enhancements or improvements that can be made at any stage of development.

HouseHunt is to provide a platform for young adults to not only identify their ideal Housing and Development Board (HDB) resale flat but also to be able to visualize the massive data with regards to HDB's sales data to make a more informed choice.

2. Reference Documents

- IEEE STD 730-2002, IEEE Standard for Software Quality Assurance Plans (http://standards.ieee.org/reading/ieee/std_public/description/se/730-2002_desc.html)

- ISO IEC 90003:2004 Software Standard

  (http://praxiom.com/iso-90003.htm)

- Project Plan

- System Requirement Specifications

3.   Management

This section describes the management organizational structure, its roles and responsibilities, and the software quality tasks to be performed.

3.1.   Management Organisation

The implementation of quality assurance system is the responsibility of the Quality Assurance Manager (QAM).

3.1.1. Project Management

The Project Manager will be responsible for approving:-

●   The system requirement specification document

●   The overall time scale for the project

●   The choice of system development life cycle

●   The choice of software development tools and techniques utilised

●   The selection of project teams

●   The training of project teams

3.1.2. Assurance Management

The QAM provides Project Management with visibility into the processes being used by the software development teams and the quality of the products being built. The QAM maintains a level of independence from the project and the software developers.

In support of software quality assurance activities, the QAM has assigned and secured Software Quality personnel from the pool of available SQ trainees to coordinate and conduct the SQ activities for the project and report back results and issues.

3.2.   Tasks

This section summarizes the tasks (product and process assessments) to be performed during the development of software. These tasks are selected based on the developer's Project Plan and planned deliverables and identified reviews.

3.2.1. Product Assessments

The following product assessments will be conducted by SQ personnel:

●   Prototype by 9th October 2021 10pm (Thursday)
●   Subsequent Prototypes
●   Review and Analysis
●   End Product

3.2.2. Process Assessments

The following process assessments will be conducted by SQ personnel:

- Project Proposal
- Use Case Model
- System Requirement Specification
- Quality Plan
- Project plan
- Risk Management
- Prototype
- Design report on software maintainability
- Change management plan
- Release plan
- Requirements Management plan
- Configuration Management plan
- Test Plan
- Test Cases and Requirements Test Coverage report
- CMMI level 2 definition

3.3.   Roles and Responsibilities

This section describes the roles and responsibilities for each assurance person assigned to the Project.

3.3.1. QAM

Responsibilities include, but are not limited to:

- Secure and manage SQ personnel resource levels
- Ensure that SQ personnel have office space and the appropriate tools to conduct SQ activities
- Provide general guidance and direction to the SQ personnel responsible for conducting software quality activities and assessments
- Assist SQ personnel in the resolution of any issues/concerns and/or risks identified as a result of software quality activities
- Escalate any issues/concerns/risks to project management

3.3.2. Software Quality Personnel

Responsibilities include, but are not limited to:

- Develop and maintain the project software quality assurance plan
- Generate and maintain a schedule of software quality assurance activities
- Conduct process and product assessments, as described within this plan
- Identify/report findings, observations, and risks from all software assurance related activities to the QAM

4. Documents

4.1. Purpose

This section identifies the minimum documentation governing the requirements, development, verification, validation, and maintenance of software that falls within the scope of this software quality plan. Each document below shall be assessed (reviewed) by SQ personnel.

4.2. Minimum Document Requirements

4.2.1. Software Requirements Specification (SRS)

The SRS is a description of the software system in which the functional and non-functional requirements, use cases that describe the user interaction and the constraints for the application are stated. It comprises several items such as the class diagram, sequence diagrams, dialog maps which are illustrated as a form of standards for the application. Generally, this document provides a clear and thorough understanding of the application, which provides a detailed understanding for developers to correctly implement the application.

4.2.2. Software Design Description (SDD)

The SDD is developed to setup the architecture for the application. The system architecture, data design, component design and the human interface design of the application are explained in this document.

This document is drafted in two phases. In the first phase, a preliminary design whereby the overall system and data architecture will be defined. The second phase involves more detailed data structures and algorithms that are to be developed for the architecture, which was defined in the first phase.

4.2.3. Software Verification and Validation Plan (SVVP)

The SVVP is developed to ensure that the HouseHunt application is correctly verified and validated to ensure quality of the project. It outlines all verification and validation processes to be conducted by the team at each phase of the software lifecycle. It covers content for review and audits, defect tracking and test techniques.

4.2.4. Software Verification and Validation Report (SVVR)

The SVVR is developed to describe the results after executing the verification and validation processes as stated in the SVVP.

4.2.5. User Documentation (UD)

The User Documentation is developed to provide assistance to the users of this application. It lists and describes the necessary items to execute the application successfully such as the required data, inputs and outputs control, and program limitations. As the HouseHunt application aims to be user-friendly and easily understood by users, developing this document will further enhance their knowledge on the behaviour of the application.

4.2.6. Software Configuration Management Plan (SCMP)

The SCMP is developed to maintain the integrity of the work in the project, identify and control the major changes in the product. It specifies the configuration identification rules, configuration control and configuration support activities which are to be implemented and performed by the team. This document serves as a reference to ensure integrity of the application as well as determining that the application satisfies the requirements.

4.3. Roles and Responsibilities of Documentation Review

The documents mentioned above are reviewed and audited at different phases of the project by the team. It is the responsibility of all team members to ensure that documentations are accurately represented and developed in accordance to the IEEE standards.

5. Standards, Practices, Conventions and Metrics

5.1. Purpose

This section highlights the standards, practices, quality requirements, and metrics to be applied to ensure a successful software quality program.

5.2. Software Quality Programme

These practices and conventions are tools used to ensure a consistent approach to software quality for all programs/projects.

Some of the most important qualities for this product include:

- **Usability**: The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions.
- **Simplicity**: The ease of use and learnability which a software can be used by specified consumers to achieve quantified objectives with effectiveness, efficiency, and satisfaction in a quantified context of use.
- **Ease of understanding**: The attributes of software concerning the user's efforts for recognizing the logical concept and its applicability.
- **Maintainability**: The capability of the software product to be modified. Modifications may include corrections, improvements or adaptations of the software to changes to the environment and in the requirements and functional specifications.

5.2.1. Standard Metrics

The following standard metrics are the minimum planned metrics that will be collected, reported, and maintained in the area of software quality assurance:

- Fan-in/Fan-out
- Length of code
- Cyclomatic complexity
- Length of identifiers
- Depth of conditional nesting
- Fog index

6.   Software Reviews

6.1. Purpose

This section identifies the number and type of system/subsystem reviews and engineering peer reviews that will be supported by the SQ Personnel. The project milestone chart, and the SQ Personnel resource levels determine the reviews that are supported.

6.2. Minimum Software Reviews

For each review, SQ will assess the review products to assure that review packages are being developed according to the specified criteria, the review content is complete, accurate, and of sufficient detail, and Requests for Action are captured, reviewed, and tracked to closure. In addition, SQ will assess the processes used to conduct the reviews to determine if appropriate personnel are in attendance, correct information is presented, entry and exit criteria are met, and appropriate documents are identified for update.

The following software reviews will be assessed by SQ:

●   Project Plan Review

●   Requirements Analysis Review

●   Software Design Review

●   Test Plan Review

●   Acceptance Review

6.3. Technical Reviews

Technical reviews include both walkthrough and inspection. Walkthroughs are conducted by the author who wrote the code to be reviewed, so that both the author and reviewers can come to a common understanding and to gather feedback. Inspections are used to identify any discrepancies from approved specs and standards, and to remove defects efficiently.

●   **Walkthrough**

Informal walkthroughs will be conducted whenever a milestone is reached during development, which will be attended by the project manager and at least one other developer. The author of the code will explain the code step by step, so that the reviewers will be able to understand it easily and suggest possible better alternatives or identify any problems currently proposed.

● **Inspection**

A formal inspection will be held once the product is finished. There will be five inspection roles in a formal inspection.

1. Reader: Presents material
2. Author: Corrects misconceptions
3. Inspectors: Identify errors
4. Recorder: Completes the inspection minutes/log
5. Moderator: Enforces procedures and keeps meeting on track

The author must prepare briefing documents for the inspectors to go through before the actual inspection, so that they can prepare beforehand. The inspectors will raise any issues found during the actual inspection, issues can be things such as defects and discrepancies between the work product and the approved specs and standards. All issues raised will be documented, so that future projects can learn from it.

6.4 Management Reviews

The Management Review involves important stakeholders which include the Project Manager, Project Team and Sponsors. The formal meeting usually revolves around defined agendas listed below:

● **Requirements Analysis Review**

The Requirement Analysis Review should be done after the Requirements Elicitation process. The requirements should be documented, actionable, measurable, testable, traceable and defined to a level of detail sufficient for system design. If any issue arises, Requirements Elicitation should be recorded and brought to the stakeholder's attention.

● **Software Design Review**

The QA Manager, based on organizational procedures and standards, has to prepare guidelines and checklists applicable to the HouseHunt Project. This is to ensure that all the goals and constraints identified in Software Requirements Specifications are met. QA personnel should record down any criteria that are not met and report them to the implementation team.

- **Test Plan Review**

QA personnel must prepare the test plan for the HouseHunt application according to the procedures and standards. The test plan will include:

○   Scope
○   Approach
○   Resources
○   Schedule of testing activities
○   Items and features that need to be tested
○   Responsibility of each personnel that is testing the task
○   The risk associated to the test plan

- **Project Plan Review**

ISO IEC 25025:2021 will be used in our project. QA personnel must use a checklist that is based on the elements and definitions in the ISO/IEC TS25025:2021: Information Technology - Systems and software Quality Requirements and Evaluation (SQuaRE) – Measurement of IT service quality to review the SQA project plan. References such as the U.S. Environmental Protection Agency (EPA) Requirements for Quality Assurance (QA) Project Plans (EPA QA/R-5) (EPA, 2001) can also be used as it provides suggestions on preparing, reviewing and implementing QA Project Plans.

- **Acceptance Review**

Acceptance reviews will be performed by users to check if their expectations of the applications are met. QA personnel will be able to find what are the main issues with user dissatisfaction through the reviews. Issues that are identified will be recorded and worked on.

7. Test

SQ personnel will assure that the test management processes and products are being implemented per Test Plan. This includes all types of testing of software system components as described in the test plan, specifically during integration testing (verification) and acceptance testing (validation). SQ personnel will monitor testing efforts to assure that test schedules are adhered to and maintained to reflect an accurate progression of the testing activities. SQ will assure that tests are conducted using approved test procedures and appropriate test tools, and that test anomalies are identified, documented, addressed, and tracked to closure. In addition, SQ will assure that assumptions, constraints, and test results are accurately recorded to substantiate the requirements verification/validation status. SQ personnel will review post-test execution related artifacts including test reports, test results, problem reports, updated requirements verification matrices, etc.

On top of these, unit testing using Python can be used for the backend of the application. Black box and white box testing techniques can also be applied in the process. SQ personnel would likely be responsible for running tests and tracking what is passing, failing, and yet to be implemented.

8. Problem Reporting and Corrective Action

SQ personnel generate, track, and trend assessment findings and observations in a centralized Reporting and Corrective Action System. The system will be located on the team's MediaWiki, with the use of an EXCEL spreadsheet.

8.1. Problem Reporting

Regular team meetings will be held weekly to discuss and review documentation. All reported problems should be resolved within a specified time frame.

8.2. Problem Tracking

Reported problems will be documented on the aforementioned EXCEL spreadsheet that will be uploaded to the MediaWiki page. Details of the problem will be recorded for a cohesive summary . These details will include a summary of current problem status, date of detection, deadline for problem resolution, as well as the team assigned to resolve the problem.

8.3. Problem Resolution

Problems will be assigned to teams as they are reported. The team assigned to a problem will be responsible for generating solutions, and these solutions

will be evaluated by a separate team to assess their feasibility from an objective standpoint. After a successful evaluation, the team assigned to the problem will proceed to resolve the issue.

8.4. Team Roles

Different roles are assigned to team members to ensure rapid corrective action for each problem that is reported. The Project Manager is tasked with initiating team meetings to review and discuss problems, and with facilitating problem reporting and tracking.

The QA Manager/Engineer will be responsible for updating the EXCEL spreadsheet and keeping track of problem resolution deadlines to ensure that teams generate solutions in a timely manner.

The development team will work on resolving reported problems using the procedure detailed above.

9. Tools, Techniques and Methodologies

SQ personnel will require access to the following:

9.1. Software Quality Tools

- Microsoft Office tools (i.e., Word, Excel, and PowerPoint)
- GitHub (central code repository)
- Google tools (eg Google Drive, Google Sheets, Google Docs)
- SVN
- MediaWiki

10. Media Control

SQ deliverables will be documented in one of the following Google software applications: Google Docs, Google Sheets or Google Slides. Deliverables will be in soft copy, with the exception of completed checklists from process and product assessments. Google Docs can be used to track the document history and version changes. Software Quality personnel will also request space on the project's MediaWiki for SQ records. This MediaWiki is password protected and account creation is restricted.

11. Record Collection, Maintenance, and Retention

SQ personnel will maintain and keep track of the records that document assessments performed on the project. Maintaining these records will serve as an objective evidence and traceability of assessments made throughout the project's life cycle. Hardcopy and Electronic are the 2 types of documents that are being maintained. All assessment reports and findings will be maintained using electronic or hardcopy by the SQ Personnel. SQ Project folders will contain hardcopies of the assessment work products such as completed checklists, supporting objective evidence, and notes.

The table below illustrate the types of record that will be collected, as well as the Record Custodian and Retention period

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

12. Training

SQ personnel have fundamental knowledge in the following areas through prior experience, training, or certification in methodologies, processes, and standards:

· Audits and Reviews (Assessments)

· Risk Management

· Software Assurance

· Configuration Management

· Software Engineering

· ISO 9001, ISO 9000-3

· CMMI

· Verification and Validation

13.   Risk Management

SQ personnel will assess the project's risk management process and participate in weekly risk management meetings and report any software risks to the QAM and the project manager.

Risk Type	Risk Description	Probability	Effects	Strategy
Technical	Codes do not run optimally or correctly.	Moderate	**Serious** Deadline may be pushed back further	The development team will have to fix the error and test the solution as soon as possible.
Operational/ Human	Slow decision making where there are more than one way of doing said tasks	Moderate	**Serious** Delay of submitting the deliverables	Each member who proposes the solution will be given 15 mins to prepare the reasons for recommending the solution, When the time is up based on what is given the project manager and the lead will decide on which solution to pick. Time will be shorter or longer based on the task's priority or risks

Human	Miscommunication	High	**Serious** Conflicts between members Disbandment of team Delay of deliverable	To avoid miscommunication, Tasks are reviewed and explain before members are to do the said tasks
Human	Stress and unable to cope with the tasks being assigned to them	High	**Serious** Morale might be lower Unable to produce work	Members are asking about their tasks and their stress before being assigned new tasks
Operational/ Time Management	Tasks are not completed on time based on the schedule given	High	**Serious** The whole development will be pushed back, and tasks will snowball	Members are aware of the deadline being given. Both the project manager as well as the leader of each team will ask for updates upon nearing the deadline

Risk Management Strategy

14.   SQA Plan Change Procedure and History

SQ personnel are responsible for the maintenance of this plan. It is expected that this plan will be updated throughout the life cycle to reflect any changes in support levels and SQ activities. Proposed changes shall be submitted to the Quality Assurance Manager (QAM), along with supportive material justifying the proposed change.