Software Quality Assurance (SQA) Plan

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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 SportZ 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.

SportZ is an engaging, interactive 2D endless running game that captures the different popular sports in Singapore and portrays it in the form of a game. SportZ aims to provide more interactive encounters with sporting elements via the visual elements involved in the game, in hope of raising awareness of sports amongst the youths in Singapore.

SportZ will be conducted on the WindowsOS and will involve a user account system. For simplicity and user-friendliness, the user-interface design will be simple and direct. The buttons shown on the homepage are well labelled, enhancing the user's experience while playing the game.

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 Proposal
- Project Plan
- System Requirement Specifications

3. Management

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

3.1. Management Organisation

The implementation of the 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 summarises 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:

- Game Environment:
  - Game User Interface
  - Player Controls
  - Interaction with game objects
- Logic for gaming controls and avatar

3.2.2. Process Assessments

The following process assessments will be conducted by SQ personnel:

- Software Requirement Specification
- Quality Plan
- Project Plan
- Risk Management
- Test Plan
- Test Cases and Requirements Test Coverage Report
- CMMI level 2 definition
- Design report on software maintainability
- Configuration Management Plan
- Change Management Plan
- Release Plan

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 because 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

The following are the documents that will be reviewed:

- System Requirement Specifications
- Use Case Model
- Project Plan
- Test Plan
- Risk Management
- Release Plan
- Change Management
- Configuration Management Plan
- Design Report on Software Maintainability
- CMMI level 2 definition

5. Standards, Practises, Conventions and Metrics

5.1. Purpose

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

5.2. Software Quality Programme

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

The four qualities that we utilise in SportZ are mainly functionality, usability, simplicity, and reliability.

Functionality of the system or one of its subsystems refers to the function requirements of the project. This supports user goals, tasks, or activities. Complete workflows performed by the system and how the system will fulfil applicable regulatory and compliance needs should be documented here.

Usability of the software product tells us whether the software product is easy to understand and use by other users. It refers to the quality of a user's experience when interacting with our game. Instructions are simple and clear in SportZ, allowing players to pick the game up easily.

Simplicity is the capability of the software product to be able to work as intended and yet having a program that is as simple as possible. This is essential for SportZ since we intend to build a game that is highly maintainable, and at the same time being able to add in new features even after the game is released.

Reliability is the ability of a system to perform its required functions under static conditions for a specific period. For SportZ, it is the ability to fulfil its assigned task in each game environment for a predefined number of input cases, assuming that the hardware and the input are free of error.

5.2.1. Standard Metrics

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

Product Quality Metrics:
- Response Time

This is also known as the latency, where it measures the turnaround time from when an action is taken to when the actor receives feedback that the action is completed. Response time should be as short as possible.

- Throughput
Throughput measures how much load a system can handle. It could refer to data I/O bandwidth, transactions per time unit, number of concurrent users, etc. Typically, higher stress on a system will cause other performance metrics to degrade. The "sweet spot" to find is the maximum throughput value that does not unacceptably impact other performance aspects.
- Uptime
- Uptime refers to the total time a system is usable. Sportz should have near-perfect availability.
- Customer Satisfaction
Measuring customer satisfaction can be done through surveys, interviews, A/B testing etc. Ultimately, end users should find compelling value in our game over other alternatives.
- Application crash rate (ACR)
Application crash rate is calculated by dividing how many times an application fails (F) by how many times it is used (U).
$ACR = F/U$

Agile process metrics:
- Lead time
This quantifies how long it takes ideas to be developed and delivered as software. Lowering lead time can improve how responsive we are to the customers. This is crucial for Sportz as our deliverables have a strict deadline to meet.

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
- Quality Plan Review
- Risk Management Review
- Software Design Review
- Test Plan Review
- Acceptance Review

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.

8. Problem Reporting and Corrective Action

SQ personnel generate, track, and trend assessment findings and observations in a centralised. Reporting and Corrective Action System.

Specific details such as assessment data of these findings will be made available on the group's Google Drive Folder as well as GitHub repository, while progress of active correction action will be tracked on Microsoft Excel. The QAM and project manager will be notified upon any changes are made.

Upon identification of a bug, SQ personnel are required to produce a comprehensive report that includes a bug summary which clearly specifies steps required to reproduce the issue and state the expected outcome and solution. Screenshots should be included. Possible solutions should also be included to facilitate corrective actions.

In general, the corrective actions are as follows:

1. SQ Personnel highlights problems in the Reporting and Corrective Action System.
2. SQ Personnel inform the team to identify the root of the problem.
3. The team determines whether this problem is a one-off or a persistent problem.
4. The team will establish if this problem leads to any other repercussions.
5. SQ Personnel updates the findings of the investigation in the Google Drive Folder as well as uploading the document onto GitHub repository.
6. The team determines the action needed to eradicate the cause of the problem.
7. The QAM and Project Manager ensures the action is carried out and the problem is rectified.

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

- SVN
- MediaWiki
- Google Drive
- Microsoft Excel

10. Media Control

SQ deliverables will be documented in one of the following Microsoft software applications: Word, Excel, or PowerPoint. Deliverables will be in soft copy, except for completed checklists from process and product assessments. See Section 12 for additional details on the collection and retention of key records. Software Quality personnel will request space on the project's secured server for SQ records. This server is password protected and backed up nightly.

11. Record 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.

The table below identifies the record types 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 monthly risk management meetings and report any software risks to the QAM and the project manager.

Risk Category	Risk	Likelihood	Effects	Mitigation
Communications and decision making	Unreliable media	Low	Serious	The development team should consider having multiple forms of communication.
Communication and decision making	Inefficient Communication	Low	Serious	Project manager is required to have weekly team meetings to check on the progress of the development team.
External Risk	Changes in Covid-19 measures	Moderate	Serious	In the event of changes from working at the

				office to work from home, more meetings should be organised to ensure that the development team is on track in completing the project.
Scope and Requirements	Inconsistent requirements	Low	Serious	User requirements and product requirements are well discussed and planned out with the client and the project manager. Project manager has weekly meetings to ensure that the development team is speared towards the right direction.

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.