UECS3383 Software Quality Assurance

Jan 2019 Trimester

Assignment:

Project Quality Plan and Software Quality Assurance Plan

No	Student Name	ID	Presentation
1	**Chuan Chang Chyuan**	**1400230**	
2	**Chow Pui Yan**	**1505560**	
3	**Lee Kai Li**	**1503941**	
4	**Yong Wei Lun**	**1605763**	
5			

Question		**Marks**
SQA Start Up	**Part A (CO2)**	**/ 50 marks**
Software Quality Assurance Plan	**Part B (CO4)**	**/ 25 marks**
CD **Note: Five marks will be deducted for:** • **Submission without CD or** • **No label of Student name, Course Code and Course Name**	**Yes / No**	

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1. **SDLC vs PLC**

PLC vs SDLC	Software Change Control Management: Project Life Cycle(PLC) Activities					
		Initiation	planning	Execution	Implementation	Closing
Software Change Control Management: Software Development Life Cycle(SDLC) Activities	Planning	(1)Develop business case *Input: -* *Output : Business Case Draft*	(7)Develop project charter *Input: Signed Preliminary Project Charter* *Output: Project Charter*	(8) Project charter reviewed by development team leader. *Input: Project Charter* *Output: Reviewed project charter*		(37) Close project request Input: close project request by client *Output: Closing Agreement*
			(10) Develop scope statement document. *Input : Requirement Specification* *Output: Scope statement*			
		(3)Requirement	(11)Develop	(9) Signed off Project		(38) Develop project

		gathering *Input: Signed Business case* *Output : Preliminary Specification document*	work-breakdown structure *Input : Scope Statement* *Output: Work-Breakdown Structure*	Charter *Input: Reviewed Project Charter* *Output: Signed project charter*		closure report Input: *Output: Project Closure Report*
		(5) Develop preliminary Project Charter Input: *Requirement Review* *Output : Preliminary Project Charter*	(12)Develop Gantt Chart *Input: Work-Breakdown Structure* *Output: Gantt Chart*			
		(2) Signed off Business Case by Director *Input: Business case* *Output: Signed business case*	(13) Transform task in Work Breakdown Structure into Change Request Form *Input: Work-Breakdown Structure* *Output : Change*			

			Request Form			
		(6) Signed Off for preliminary Project Charter by Director *Input: Preliminary Project Charter* *Output: Signed preliminary project charter*	(14) Prepare test form which refer to change request form *Input : Scope Statement* *Output : Test Form* (15) Assign tester for each test form			
	Analysis	(4)Requirement Validation (included client, project team) *Input: Preliminary Specification document* *Output: Requirement Review*	(16) Analyse Change Request Form *Input: Change request form* *Output: Analysed change request form* (17) Review Change Request Form *Input: Analysed change request form* *Output: Reviewed change request form*	(26) UAT plan review by project manager Document: Input: Draft UAT Plan Output: UAT Plan		

			(18) Approve Change Request Form *Input: Reviewed change request form* *Output: Approved change request form* (19) Schedule and Budget Planning *Input : Scope Statement* *Output : Task Schedule* (20) Assign programmer for each change request form			
			(21)Develop Preliminary design document *Input : Scope Statement* *Output: Preliminary Design Document*	27) UAT plan sign off by client *Input: UAT plan* *Output: Signed UAT Plan*		
			(24) Construct test	(32) Test report		

			plan *Input: Software Programme Specification, Software Test Procedure* *Output: Test Plan*	reviewed by senior tester/ person that holding position at least one level upper than the tester *Input: Test report* *Output: Reviewed test report* (33) Signed off test report by senior tester/ person that holding position at least one level upper that the tester *Input: Reviewed test report* *Output: Signed test report*		
			(25) Construct draft UAT plan *Input : Scope Statement* *Output: Draft UAT Plan*			

	Design			(22) Develop design document *Input: Preliminary Design Document* *Output: Software programme specification, Software test procedure, software installation plan, software maintenance manual*		
				(23) Reviewed and signed off design document. *Input: Design document* *Output: Signed design document*		
	Development			(28) Develop Project Code *Input: Design Document, Scope Statement* *Output: Project Code,*		

				Source Code Documentation (29) Code Walkthrough (30) Code Review *Output: Reviewed code*		
				(31) Perform testing according to test form *Input: Test Plan, Test Procedure* *Output : Test Report*		
	Deployment			(34) Develop software manual *Input: Programme developed* *Output: User manual, installation guide*	(36) Software Maintenance *Input: Issue request* *Output: Modification / Change Control Request Form*	(39) Final Approval Signed off agreement between director and client

				(35) Software Released *Input: Programme develop, User Manual, Installation Guide, Scope Statement* *Output: Software Release Note*		(40) Review project completion *Document : Post-implementation evaluation* *Lesson Learnt Report*

SDLC vs PLC Description

1. Develop business case
    - *Input: -*
    - *Output : Business Case Draft*
2. Signed off Business Case by Director
    - *Input: Business case*
    - *Output: Signed business case*
3. Requirement gathering
    - *Input: Signed Business case*
    - *Output : Preliminary Specification document*
4. Requirement Validation (included client, project team)
    - *Input: Preliminary Specification document*
    - *Output: Requirement Review*
5. Develop preliminary Project Charter
    - Input: *Requirement Review*
    - *Output : Preliminary Project Charter*
6. Signed Off for preliminary Project Charter by Director
    - *Input: Preliminary Project Charter*
    - *Output: Signed preliminary project charter*
7. Develop project charter
    - *Input: Signed Preliminary Project Charter*
    - *Output: Project Charter*
8. Project charter reviewed by development team leader.
    - *Input: Project Charter*
    - *Output: Reviewed project charter*
9. Signed off Project Charter
    - *Input: Reviewed Project Charter*
    - *Output: Signed project charter*
10. Develop scope statement document.
    - *Input : Requirement Specification*
    - *Output: Scope statement*
11. Develop work-breakdown structure
    - *Input : Scope Statement*
    - *Output: Work-Breakdown Structure*
12. Develop Gantt Chart
    - *Input: Work-Breakdown Structure*
    - *Output: Gantt Chart*
13. Transform task in Work Breakdown Structure into Change Request Form
    - *Input: Work-Breakdown Structure*
    - *Output : Change Request Form*
14. Prepare test form which refer to change request form

- *Input : Scope Statement*
- *Output : Test Form*

15. Assign tester for each test form
16. Analyse Change Request Form
    - *Input: Change request form*
    - *Output: Analysed change request form*
17. Review Change Request Form
    - *Input: Analysed change request form*
    - *Output: Reviewed change request form*
18. Approve Change Request Form
    - *Input: Reviewed change request form*
    - *Output: Approved change request form*
19. Schedule and Budget Planning
    - *Input : Scope Statement*
    - *Output : Task Schedule*
20. Assign programmer for each change request form
21. Develop Preliminary design document
    - *Input : Scope Statement*
    - *Output:Preliminary Design Document*
22. Develop design document
    - *Input: Preliminary Design Document*
    - *Output: Software programme specification, Software test procedure, software installation plan, software maintenance manual*
23. Reviewed and signed off design document.
    - *Input: Design document*
    - *Output: Signed design document*
24. Construct test plan
    - *Input: Software Programme Specification, Software Test Procedure*
    - *Output: Test Plan*

25. Construct draft UAT plan
    - *Input : Scope Statement*
    - *Output: Draft UAT Plan*
26. UAT plan review by project manager
    - *Input: Draft UAT Plan*
    - *Output: UAT Plan*
27. UAT plan sign off by client
    - *Input: UAT plan*
    - *Output: Signed UAT Plan*
28. Develop Project Code
    - *Input: Design Document, Scope Statement*

- *Output: Project Code, Source Code Documentation*

29. Code Walkthrough
    - *Input*
    - *Output: Revised code among team*
30. Code Review
    - *Output: Reviewed code*
31. Perform testing according to test form
    - *Input: Test Plan, Test Procedure*
    - *Output : Test Report*
32. Test report reviewed by senior tester/ person that holding position at least one level upper than the tester
    - *Input: Test report*
    - *Output: Reviewed test report*
33. Signed off test report by senior tester/ person that holding position at least one level upper that the tester
    - *Input: Reviewed test report*
    - *Output: Signed test report*

34. Develop software manual
    - *Input: Programme developed*
    - *Output: User manual, installation guide*
35. Software Released
    - *Input: Programme develop, User Manual, Installation Guide, Scope Statement*
    - *Output: Software Release Note*
36. Software Maintenance
    - *Input: Issue request*
    - *Output: Modification / Change Control Request Form*
37. Close project request
    - Input: close project request by client
    - *Output: Closing Agreement*
38. Develop project closure report
    - *Input*:
    - *Output: Project Closure Report*
39. Final Approval Signed off agreement between director and client
40. Review project completion
    - *Output : Post-implementation evaluation, Lesson Learnt Report*

Relationship between control documents

Project charter links to scope statement

In project charter, the first step is to determine the visions and objectives of the project. The purposes of the project are important to determine to ensure the goals can be achieved at the end of the project. Besides objectives, scope is also important in this document. With the input of client's requirement, the scopes are defined briefly in the scope section whereas the detailed scopes will be further elaborated in the scope statement. After the scopes are defined, these scopes lead to the deliverables of the project which illustrates the expected output of the entire project. Then, the next step is to structure the organization of the project. Assignment of each role includes project manager and team members is important so that everyone involved in the project to understands their roles and responsibilities. Besides, the structure of organization in the project, the stakeholders of the project are also another vital role in the project. Hence, next action is to identify the stakeholders. After the stakeholders are identified, it is followed by determining the customer or end user. This section shows who is responsible to accept the final deliverables of this project. The third step is to break down the plans to implement the project. The first section is the implementation which lists the phases, activities and timeframes of the project's life cycle. The second section is the milestone of the project, it indicates the completion of key deliverables and other important events. The last section is the summarized resource plan. Each of every resource needs to be listed out in detail to illustrate how much resources to complete the project. The last step of developing project charter is to identify risks, issues and assumptions that might happen throughout the project life cycle.

Scope statement

The process of creating the scope statement begins with the information captured in the project charter, which contains high level scope as it was known. The scope statement defines the boundaries of the project. A poorly defined project statement can lead to project failures. If the scope statement is not actively defined and managed, the project will undoubtedly go behind schedule or over budget. In order to prevent unpleasant possibilities that result from a poorly defined project scope, project managers need to write out a good statement, which make it easy to gain acceptance of the project's scope by the project stakeholders. A good project scope statement includes with the following information:

- Overall description of the work: needs to be stated as this is the section that able to let stakeholders and project team members to gain understanding on what the project is.
- Deliverables: need to state that what will be produced by this project and the key features of the product.
- Justification for the project: this is the part that provide a complete understanding of the scope, as this section will tell about why the project was initiated in the first place.
- Constraints: When project faces any certain physical boundaries or challenges, this will provide an overall view about the sources of risk that the project will be faced such as

human resource, project quality, procurement.

- Assumptions: A project need to assumed certain conditions as part of their existence.
- Inclusion / Exclusion: This section needs to state about the items and things that need to be included or excluded from this project.

Stakeholder need to be engaged in the requirements elicitation process to make the scope become more defined and clearer.

Scope Statement relates to Work Breakdown Structure (WBS) and Change Request From (CRF)

Scope statement is directly related to WBS. When the scope statement is defined, it will break down into small and assignable task, which eventually produces WBS. The tasks that break down into WBS are directly related to scope statement. From the WBS, each team member will be assigned with different tasks with timeline. To ensure that the assigned tasks are documented, a CRF is created on every assignment of task. Each team members will hold several CRF, and the content of CRF will describe the tasks outcome with timeline. Each CRF has a reference number which will be linked to WBS that produced earlier to ensure the traceability.

UAT & Scope Statement

User acceptance test (UAT) plan is a document that describe the testing performed by the user or client with respect to the requirements and scopes that was agreed upon. UAT usually happens in the final phase of testing before the software goes to deployment phase. Scope statement must be included in the UAT plan so that the application will be test based on the scope to ensure customer satisfaction. Tester will refer to the scope statement to prepare the test plan by transforming the scopes and requirements. After the draft UAT plan is done, it will be reviewed by the project manager and client for document sign-off. If the client satisfaction is not met, modification and improvement on the UAT plan will be done until client agreed to the plan.

Software release notes relates to scope statement

Software release is tightly related to scope statement. During the software release, the project team member required to fill in a software release form. The content in the software release note is directly referring to the scope statement that defined earlier. The content includes the bugs fixed, features added and security patches.

Project Quality Plan

1.1 Introduction

This document discuss about the project quality plan for online website development. The document is a guideline for the project team to comply in order to deliver project with quality. All of the quality guidelines and and standards are stated briefly in the following section. The project quality plan is defined by the stakeholders and organisation. The objective of this document is to describe and state clearly regarding all the required information that needed to maintain or achieve project quality throughout the project life cycle. It breaks into different sections and explain briefly. The intended audience for this document are project team and other team that are in the support to carry out this plan.

1.1.1 Review and Approval

The quality plan is constantly reviewed and revised to cope the changes in project. It will be approved by Project Manager to ensure that all changes are valid, reasonable and achievable.

1.2 Abbreviations & Definitions

Term/ Abbreviation	**Description**
PQP	**Project Quality Plan**
QA	**Quality Assurance**
QC	**Quality Control**
CAPA	**Corrective action and Preventive action**
Figure of merit	**Figure of merit is a quantity measure to assess the efficiency, effectiveness and performance of a system**

1.3 References (project documents, standards, other standards if any)

1.3.1 Project Plan

Project Charter

Project Title: Online Construction Material Website

Project Start Date: February 5 ,2019

Budget Information:

RM300000 had been allocated for this project including the workmanship.

Project Manager: Yong Wei Lun

Contact:

Email: weilun@1utar.my

Objectives:

1. To provide an online platform to sell construction materials.
2. To allow suppliers to change their traditional selling technique to digitalise technique
3. To regulate the market price of construction materials.

Approach:

Distribution List:

Name	Role	Position	Email
Yong Wei Lun	Project Manager	Software Engineer	weilun@1utar.my
Chow Pui Yan	Team Leader	Software Engineer	puiyan@1utar.my
Chua Chang Chyuan	Tester	Software Engineer	chuacc@1utar.my
Lee Kai Li	UI/UX Manager	Software Engineer	kaili@1utar.my

Comments:

Project Scope Statement

Project Title: Date: **Prepared by**:
Project Aim & Purpose:
Project Objectives:
Project Scope:
Research of Previous/Existing Projects:
Out of Scope:
Deliverables:
Stakeholders:
Assumptions:
Constraints:
_____ Signed By: Position: Date:

1.4 Quality objective

This section comprises the quality policy, project quality objective and ISO Certification. Quality Policy is an overall intentions, objectives and directions of the organization as regard quality. The Quality policy expressess the top management commitment to the quality management system. The project quality objective is the quality result the company intends to achieve. ISO certification certifies the system has all the requirements for standardizations and quality assurance.

1.4.1 Quality Policy

Our company aims to provide a high security and quality in the web services. Our quality policy is strongly driven by the following management principles:

- Understanding the needs of customer to ensure long term success by building a mutual profitable relationship with customers.
- Maintaining customers' confidence at highest level and customer satisfaction by continually improving to deliver better quality products from time to time.
- **Opening new opportunities by implementing new technologies in production.[TO BE CONFIRMED]**
- Evaluate customer satisfactions and address the concerns that customers have.

Our company is committed to below strategies to achieve these goals:

- Complying Quality Management with ISO 9001
- Continual improvement through quality standards and international best practices
- Complying Customer Relationship Management to manage relationships between the organization, customers and potential customers

1.4.2 Project Quality Objective

The Quality Objectives of the Project are as below:

1. The uptime service of the system achieved 99%.
2. Provide customer survey to get feedback from customer and analyze the feedbacks to acquire customer satisfaction level towards the system.
3. Zero bugs in releasing the system.
4. Measure the quality of system by figure of merit.
5. Reduce non-conformance of the system by 80% to 90%
6. Increase number of customer using the system by 20% per annum.

1.4.3 ISO certification

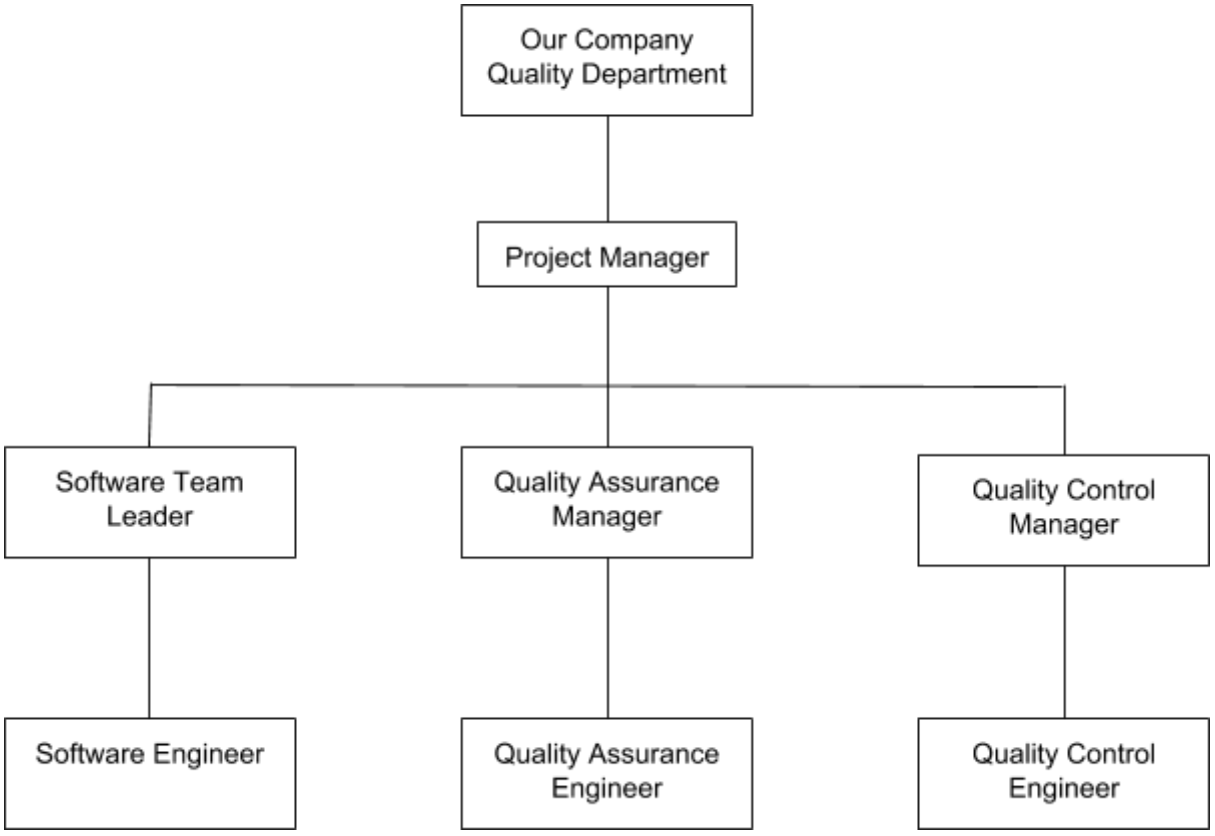
By ensuring compliance with ISO certification standard, system and project life cycle process efficiency is improved, customer satisfaction is increased and credibility in customers is boosted. (xtrf) stated that there are key activities in the quality management process that provide conformance with the ISO standard: CAPA, documentation requirements, client satisfaction survey and etc.

ISO 9001 provides guidance for organization to fulfill requirements and ensure customer satisfaction. As a organization that certified to ISO 9001, an auditor will be hired to perform on-site auditing to verify that the organization's operation is compliance with the requirement of the standard.

Employee involvement is also important in ISO 9001, employees are evaluated in the quality audit process for how they perform their work. When they are involved in an audit, employees become vested in quality program.

1.5 Roles and responsibilities

1.5.1 Quality Organization Chart



1.5.2 Roles and responsibilities

Project Manager

- Create activity and resource planning of the project.
- Estimating the cost and budget to develop the project.
- Applying change control and configuration management processes
- Decides on matters that will affect the implementation of the project
- Check and approve the testing approach and plans
- Review of testing results and defects to determine/assess impact to overall project plan and implementation schedule
- Provide formal sign-off on every phase of the project

Team Leader

- Monitor on team members' performance to ensure compliance to the company's policy and adhere to the project quality plan
- Provide appropriate training to any team members that need
- Communicate well and give clear instructions to all the team members.
- Listen to the feedbacks voiced by team members.

- Manage the work flows of the operations everyday
- Review and approve unit and integration test plans

Quality Assurance Manager

- Monitor all operations that will affect the project quality
- Review and manage every quality assurance events include planning, strategy, testing execution and tools
- Collaborate with the Project Manager and software team leader to come out with a project plan with quality assurance.
- Ensure that quality assurance process is documented and discussed to ensure agreed quality levels for the application
- Implement the Quality Management System based on the standards of ISO 9001:2015
- Manage document control activities on the document control system.
- Coordinates inspections and performance testing and ensures that performance standards are communicated and documented.
- Organize training for project members to ensure the understanding and compliance to the project quality plan.
- Assessing customer requirements and ensure that quality assurance are met.
- Produce a quality assurance reports periodically on any issues that will affect the project quality

Quality Control Manager

- Assist with the identification and development of required procedures and processes related to the Quality Management System.
- Oversee the quality control events of a project including the inspection schedules and the collection of quality records
- Monitor development process by project team members and quality control process by QC engineers.
- Ensure the product meets the client's requirement
- Ensure work done meets project's specification
- Prepare and maintain quality records for review of completeness and accuracy to meet both internal and external expectations.
- Oversee detailed inspections at various phases of development throughout the project life cycle.
- Ensure compliance with federal, state, local and company-specific regulations related to the quality of product and to the proper performance of day-to-day activities
- Conduct post release verification after product deployment

Quality Assurance and Quality Control Engineer

- Review project requirements, specifications and technical design documents to provide useful feedback
- Estimate, prioritize, plan and coordinate testing activities
- Convert requirements and design documents into a set of test cases and scripts to verify if the system meets client needs.
- Determine the priority of test activities and execute them
- Identify defects or bugs in the system by performing test cases.
- Check the records and documents carefully to track any loophole or bugs.

- Execute all test cases when changes were made to the system to discover potential defects
- Perform quality testing

Software Engineer

- Develop the system based on the requirements and specifications documents.
- Work with other software engineers to design and implement features.
- Report issues found, scope changes, risk and quality concerns to the team leader.
- Perform unit and integration testing
- Complete assigned task within allocated time, budget and quality expectation.
- Continuously learn from mistakes and improve technical skills.

1.6 Project Quality management system

Project quality management system is a framework for an organisation that provides structure to the processes, policies, procedures and resources to implement the quality management plan. It acts as a guideline that allows the organisation to coordinate and lead the project team the achieve requirements and maintain project quality.

1.6.1 Quality Management Strategy

The quality attributes in a project are defined by the organisation depending on the project. Project quality management must be measured throughout the project life cycle to ensure the project is fulfilling the quality.

Quality management involves 3 different phases, Quality Planning, Quality Assurance and Quality Control.

Phase	Activities
Quality Planning	Here is the creation of Quality plan. Every plan should have a desired goal and objectives that are defined by stakeholders and the organisation. This is to ensure that the level of standards have been worked out.
Quality Assurance	This is the activity that move along with the project throughout the whole project life cycle. It is to evaluating if the project is moving in the direction of delivering quality works. This phase also will ensure the corrective actions for any failure to comply to project quality.
Quality Control	This is the phase that operational techniques are used in order to ensure the project quality. Any issues that are related to quality, for example work executed not in desire manners, corrective actions should be effective. Quality Control also involve monitoring project deliverables to ensure the results are aligned with project quality.

Quality Tools for Quality Management

1. Pareto Diagram
2. Cause & Effect Diagram
3. Histogram
4. Control Charts
5. Scatter Diagram
6. Graphs
7. Check Sheets

1.6.2 Quality Management Process

Quality Management is involving in both Project Life Cycle and Software Development Life Cycle.

Project Life Cycle

1. Project Initiation

In this phase, the project objectives will be defined by stakeholders and organisation. The initial project plan will be developed which includes potential risks and quality standards. The quality standards will be reviewed and agreed by both parties.

2. Project Planning

In this phase, the project objectives will be finalised as well as the project plan. The risks will be defined by Quality Assurance and Quality Control procedures.

3. Project Executing

In this phase, the project will be monitored to ensure that it meets the quality defined earlier. The risk also will be monitored. The project will be executing under the guidance of quality plan.

4. Project Implementation

In this phase, the project will be monitored and accessed from time to time. Preventive and corrective actions will be taken to ensure that the project quality is met.

5. Project Closing

In this phase, the project will be undergo assessment. Lesson-learnt meeting will be conducted and actions will be taken in future implementation to ensure the quality is maintained. The project information will be archived and stored for reference.

Software Development Life Cycle

1. Planning

In this phase, the business requirements will be gathered to produce requirement specification.

2. Analysis

In this phase, the nature of the software will be defined as well as the potential implementation. The requirements will be refined to ensure that it can be done technically.

3. Design

In this phase, the system architecture and design will be defined as well as software specifications. Design documents will be produced for future reference in the next phase. Software development methodology will be chosen.

4. Development

In this phase, the software will be developed based on the selected methodology. Software quality review and audit will perform from time to time to ensure that the software is written in quality. Automated testing will be conducted from time to time to ensure that no introduction of breaking changes when making changes to the source code. Technical documentation will be produced for future reference.

5. Deployment

In this phase, the software will be released. Software release notes will be produced.

1.7 Documentation Management Plan

Document	PLC								
	Initiation	Planning	Execution						
			Planning	Analysis	Design	Development	Deployment	Implementation	Closing
Business Case Draft	✔		✔						
Preliminary Specification Document	✔		✔	✔					
Requirement Review	✔		✔	✔					
Preliminary Project Charter	✔		✔						
Business Cases	✔		✔						
Project Charter	✔	✔	✔						
Requirement Specification		✔	✔						
Scope Statement		✔	✔	✔		✔	✔		
Work-Breakdown Structure		✔	✔						
Gantt Chart		✔	✔						
Change Request Form		✔	✔	✔				✔	
Test Form		✔	✔	✔					
Task Schedule		✔		✔					
Preliminary Design Document		✔		✔	✔				
Software Programme Specification		✔		✔	✔				
Software Test Procedure		✔		✔	✔	✔			
Test Plan		✔		✔		✔			
Drafted UAT Plan		✔		✔					

UAT Plan				✔					
Test Report				✔		✔			
Software Installation Plan					✔				
Software Maintenance Manual					✔				
Design Document						✔			
Project Code						✔			
Source Code Documentation						✔			
User Manual Installation Guide						✔	✔		
Software Release Note							✔		
Closing Agreement							✔		✔
Project Closure Report									✔

1.8 Training

Training will be conducted when necessary such as when there is new changes in quality plan or new project team member. The purpose of the training is to ensure all parties including project team can carry out the quality plan effectively and efficiently. Each team member has different role in ensuring that the project quality. This policy will be applied to all permanent employees regardless their personal preference or status. Temporary employees or intern may attend the training based on the situation decide by Project Manager.

1.8.1 Programme

Training activities can be in various forms, which may includes but not limited to:

- Offline training course
- Online training course
- Seminars
- Webinars
- Workshops
- On-job training
- Mentor and mentee session

1.8.2 Training Need Analysis

Type of Need Analysis	**Analysis checklist**
Work/Task Analysis	Analysis of the tasks being performed. - What are the task being performed?
Performance Analysis	Analysis of the performance of performing certain tasks. - How fast you can complete this task?
Content Analysis	Analysis of the laws, documents and procedures needed - What is the required documents for the task?
Goal Analysis	Analysis whether that training can achieve the desired goal - What is the goal you can achieve?
Needs vs Wants Analysis	Analysis of the purpose of the training - Why this training has to be done?
Feasibility Analysis	Analysis the purpose of the training - Is the training will benefit then current approach?

1.8.3 Procedure and Guideline

- All project team members are eligible to join the training programme.
- Project team leaders are required to take notes on the attendance of team members and evaluate their training efforts
- Team members must register themself before attending the training
- Participants are allowed to provide suggestion on future training programme

The following procedures must be comply by all team members when registering a training

1. Project leaders and team members discuss the importance and impacts of the training toward the project.
2. Project leaders and team members proposed a budget and submit to Human Resource Department.
3. Human Resource Department will either approve or reject the application, with valid reasons.
4. Project leaders have to provide receipts in order to claim the budget for the training purposes.

1.8.4 Post-Training Assessment

Upon completion of every training, an assessment has to be done to ensure that the objectives of the training have been achieved.

The evaluation method of training effectiveness are stated as followed:

1. Visual Confirmation

Trainers are required share a visual confirmation on how they can complete a task in real-life scenario. They visual confirmation can be recorded as a as visual proof for future reference.

2. Social Ownership

Social ownership puts learners in the position to teach others by showing how they apply concepts in their real world. The peer-teaching moments can be captured or recorded for future reference.

3. Skill Assessments

Create a visual assessment of a trainer's skill set and performance before and after the training moment.

1.9 Audit

The ultimate goal of the project audit is to ensure that the project is meeting the project management standards through investigations and evaluations.

The following are five main objectives of a project audit:

1. **Assure Quality of Products and Services**
   It evaluating the deliverables produced during various phases of the project from the design phase all the way to the implementation phase. During the design phase review, a project audit assesses the completeness of the design concepts including analysing alternative designs. It also conducts a complete technical assessment of the design before purchasing or coding software. Next a project audit evaluates the readiness for full implementation during the implementation readiness review. During the implementation, the project audit assesses and validates the implementation on each site that implements the new solution.

2. **Assure Quality of Project Management**
   A project audit assures that project management is meeting the standards by evaluating if it follows the organization's policies, processes and procedures. It scrutinizes the methodology used to help identify the gaps in order to make the necessary improvements.

3. **Identify Business Risk**
   It helps identify business risk that may involve budget, time, scope and quality. It evaluates the feasibility of the project in terms of affordability and returns by providing transparency to the project status and performance by evaluating the cost, time and resources. It reports to the company its findings and provides an outlook of the budget and the business risks to help company decide whether to proceed with the project or not.

4. **Enhance Project Performance**
   It improves resource and budget allocation. By identifying priorities, corrective measures and preventative actions can lead to a successful project outcome. Discovering problems along the way allows the project team to provide solutions. It also helps prevent future recurrence of similar issues.

5. **Learn**
   Project audit providing reviews and feedbacks allow individuals and project teams to reflect on performance. The results aim to re-energize the project teams to improve performance, resolve conflicts and learn from past mistakes.

1.9.1 Audit Process

Project audit is a continuous process that starts at the execution stage of a project and goes on till the project's end. It checks the project against success criteria and confirm that the project remains effective and follows documented quality standards and requirements. The following shows the general steps of the project audit process.

1. **Success criteria development**
   Firstly, is run interviews with the project sponsor and the project manager to determine and agree on the project's success criteria and ensure that the criteria are established in line with the business requirements. Next, is to developed a checklist that includes questions regarding the success criteria, the checklist is then send to the members of the core team and to selected stakeholder who are directly involved in the project. Then, assign a facilitator or auditor who will interview the team to collect the response from the team. Auditor need to focus on their viewpoints regarding the project's successes, failures, missed opportunities and challenges. Besides, an audit questionnaire that includes open-ended question need to be developed and then sent the questionnaire to the team. After that, a meeting needs to be organized with the team to discuss their thoughts and ideas regarding the project's current state. The meeting also focuses on discuss and address major project issues, concerns and challenges during the meeting. Auditor and the team need to identify and agree on the best practices of teamwork and collaboration. Finally, close the meeting and confirm the fist step of the project audit checklist is done.

2. **Analysis**
   In this process, individual research interviews will be carried out with the key stakeholders which is internal stakeholders and external stakeholders such as project sponsor, project manager, and team to identify and discuss the past, present and future problems, challenges and opportunities of the project. After the interview done, a report that summarize the discussion and specifies the general problems of the project is developed. The purpose of the summarized report act as a reference to perform the root-cause analysis to identify and gain insight into the core reasons of the problems. Auditor need to audit every problem to determine its severity and impact on the project and set priority for the problems, depending on their impacts and severity. At last, all of the prioritized problems will be combined into a list with different categories such as business requirements, team-related, scope, documentation, milestones and deliverable status, risks and contingency, issues and changes and quality. After each of the problems are categorized well, each of the categories will be audit again to identify and determine which project expectations have been meet and which ones remain unsatisfied and unmet. Project quality will be review to identify what solutions can be applied and what opportunities can be realized. Besides, meet the key stakeholders to agree upon other possible solutions that have not been specified by the quality plan to the problem. Lastly, define and record the lessons learned that can improve the quality and performance of other future projects within the same organization. Second step of the project audit checklist is now finished.

3. **Reporting**
   In this process, all the records that are made during all the interviews and meetings conducted at the previous process listed in the project audit checklist and the information obtained from the questionnaire will be collected. All the data will be combined into a project document. Besides, identify the solutions that have been defined by the quality plan and successfully applied to addressing the problems, opportunities that have been successfully realized and other solutions that have been implemented. Then, make a list of all the problems that have been successfully resolved. Next, a project audit report and recommendations to the report will be developed. The report also needs to mention about the details of the audit process. Finally, the report will be submitted to the senior management.

1.9.2 Audit Checklist

Quality Audits will be conducted referring to the audit checklist below to measure the application of the approved Quality Plan and discover deviations that can be negative for the project and the outcome of the project.

The following provides a detailed checklist that assist and review the health of a project:

Relevance (How relevance is this attribute to this project or audit?)

1 – Little / None

3- Moderate

5 – Critical

Theory & Practice (An indication of this attribute's strength or weakness)

1 = Not addressed

3 = Adequate

5 = Well Covered

Item	Attribute	Relevance	Practice	Assessment
1.	**Project Planning**			
1.1	Does the project have a formal Project Plan?			
1.2	Are the key elements of Project Plan present? a. Project Definition & Scope? b. Cost / Benefit Analysis? c. Project Objectives? d. Staffing Requirements? e. Timeline? f. Risk Analysis? g. Critical Success Criteria?			
1.3	Have all the stakeholders been identified?			
1.4	Is a stakeholder management plan in place? Have project accountabilities & responsibilities been clearly defined?			
1.5	Have the scope, objectives, costs, benefit and impacts been communicated to all involved and/or impacted stakeholders and project team?			
1.6	Have all involved stakeholders and project team committed to the project?			
1.7	Have a project Communication Plan been developed?			
1.8	Are funding and staffing resources estimation are detailed and documented for the use in planning and tracking the project?			

1.9	Does a documented project organizational policy and plan exist?			
1.10	Have adequate resources been provided by management to ensure project success?			
1.11	Is current scope of the project substantially different than that originally defined in the approved project plan?			
1.12	Has the approach and development strategy of the project been defined, documented and accepted by the appropriate stakeholders?			
1.13	Have project management standards and procedure been established and documented?			
2.	**Project Management**			
2.1	Have the key elements of a coherent project management strategy been established? a. Project Scheduling & Tracking b. Project process c. Change Management Plan d. Issue Management Process e. Software Configuration Management			
2.2	**Project Scheduling & Tracking**			
2.2.1	Has as structured approach been used to break the scope statement into small manageable task?			
2.2.2	Are all the project team members involved in the development of the task decomposition?			
2.2.3	Are the task assigned to each team members with reasonable duration (8- 40 hrs)?			
2.2.4	Are all the small tasks deliverables effectively tracked and compared to project plan?			
2.2.5	Are target dates established for each small task deliverable?			
2.2.6	Any corrective action takes when actual results are substantially			

	different from detailed project plan? (Further explain)			
2.2.7	Are the changes in deliverable of tasks agreed to by all affected groups & individuals?			
2.2.8	Is the tracking & controlling project activities, work products & costs such as effort, schedule and budget well defined and assigned to a specific individual?			
2.2.9	Is there general agreement & acceptance of the current status and progress of the project?			
2.2.10	Is the project work proceeding in accordance with the original project schedule?			
2.2.11	If the project work not proceed with the original project schedule, have all project delays been adequately accounted for, communicated to all stakeholders and adjustments make in overall project schedule?			
2.2.12	Is PERT/Critical Path or other relevant equivalent methodology being used?			
2.3	**Project Status Reporting**			
2.3.1	Is the project status reviewed with senior management at appropriate intervals? a. Overall status b. Project performance (achievements & milestones) c. Open issues d. Risks e. Action items f. Cost & time performance against plan g. Quality metrics h. Client involvement			
2.3.2	Have adequate procedures been put in place for project coordination and status reporting across project boundaries			
2.3.3	Do project teams & team members report on status/activities/progress?			

2.4	**Project Estimating**			
2.4.1	Are current project time & resource estimates reasonable based on the current project stage?			
2.4.2	Are actuals compared against estimates to analyse and correct variances?			
2.4.3	Are software metrics formally captured, analysed and used as a basis for other project estimates?			
2.4.4	Do the estimating techniques include any of the following features? a. Ranged estimates? b. Risk Rating? c. Quality Assurance Overhead? d. Contingency?			
2.4.7	Are project team members involved in detailed estimating and scheduling?			
2.4.8	Are stakeholders aware and supportive of the principles and practices of modern software estimation?			
2.5	**Risk Management**			
2.5.1	Was an original risk assessment completed?			
2.5.2	Is there a process in place to monitor project risks?			
2.5.3	Has provision been made to reassess project risks at various project stage?			
2.5.4	Have all unresolved risks been documented?			
2.5.5	Have all unresolved risks been escalated to an issues log?			
3.0	**Quality Management**			
3.1	Is there a Quality Plan covering all Policies, Guidelines and Procedures?			
3.2	**Quality Assurance**			
3.3.1	Has an overall Quality Assurance Plan been developed for the project?			

3.3.2	Does the plan address key project elements? a. Project Management? b. Project Planning? c. Software Quality Assurance (SQA)			
3.3.3	Does the SQA provide objective verification of adherence to applicable standards, procedures & requirements?			
3.3.4	Are all key components of an SQA plan present? a. SQA Plan b. Software development standards & methods c. Methodology d. Testing Standards & Methodology e. Software Metrics f. Data Naming Conventions g. Data Architecture Standards			
3.3.5	Are the results of SQA reviews provided to affected groups & individuals?			
3.3.6	Are there a set of procedures defining the scope, procedures and deliverables defining Quality Control?			
3.3.7	Is there a set of procedures to capture, analyse and act on quality metrics?			
4.0	**Management Procedures**			
4.1	**Stakeholder Management**			
4.1.1	Is there a format set of procedures supporting Stakeholder Management?			
4.1.2	Is it standard practice to formally commit stakeholders to the project via agreements?			
4.1.3	Does a comprehensive set of Stakeholder Agreements exist?			
4.2	**Issues Management**			
4.2.1	Is there a formal set of procedures supporting Issues Management?			

4.2.2	Is there any form of automated support for Issues Management?			
5.0	**Resource**			
5.1	Are all resource assumptions documented?			
5.2	Does the project team have the skills necessary to successfully complete current project(s) and support the application?			
5.3	Have the personnel with the necessary skills and competence have identified and has agreement for their participation in the project been reached with the appropriate management?			
5.4	Is there a project organization chart showing the reporting relationships and responsibilities for each position?			
5.5	Is there a proper project work location been established that will allow the team to work together with user personnel?			
5.6	Does the detailed work plan match with the complexity of tasks with the capabilities of personnel?			
5.7	Has adequate time for orientation & training of project staff been provided for in relation to technical nature of the application and the experience levels of project personnel?			
5.8	Has appropriate allowance been made for the effort of the learning curve on all personnel joining the project who do not have the required prior industry, functional & technical expertise?			
5.9	Are the appropriate IT resources adequate to meet planned commitments?			
6.0	**Users**			
6.1	Is user involvement adequate?			
6.2	Are the people assigned to the project sufficiently qualified?			

6.3	Is there a formal Service Level Agreement (SLA) with the appropriate client departments?			
6.4	Has the provision been made for training staff, including: a. Formal training related to the project? b. On the job training? c. Formal training not related to the project? d. Vendor training?			
6.5	Are users adequately trained and are all training requirement filled?			
7.0	**Development Approach**			
7.1	**Methodologies**			
7.1.1	Is the selected method appropriate for the Application Technical and Data Architecture?			
7.2	**Analysis & Design**			
7.2.1	Are requirements & design standards in place?			
7.2.2	Are specification clearly traceable from physical design to logical requirements?			
7.2.3	Do the design specification documents reference : a. Purpose/Scope b. Requirements specification c. Testing & Data Conversion Strategy			
7.3	**Development / Construction**			
7.3.1	Are coding standards in place?			
7.3.2	Is there a clearly documented relationship between logical (conceptual) design and technical design?			
7.3.3	Is design and code re-use supported?			
7.3.4	Are program control procedure in place?			
7.3.5	Are these procedures to govern unit test cases, conditions, expected results, logs & sign-offs?			

7.3.6	Do adequate development and test environments exist?			
7.4	**Testing**			
7.4.1	Which of the following test phases are covered by the methodology? a. Unit Testing b. System Testing c. Integration Testing d. User Acceptance Testing			
7.4.2	Is test strategy in place?			
7.4.3	Do detailed test plan/cases exist?			
7.4.4	Are all necessary Quality Control procedures in place?			
7.4.5	Is there an audit trails of all tests and results?			
7.4.6	Are effective testing tools incorporated?			
7.4.7	Will the following components of system testing be carried out? a. Communication? b. Volume? c. Stress? d. Recovery? e. Usability? f. Operation? g. Environment? h. Security? i. Efficiency/Performance?			
7.4.8	Is adequate allowance made for regression testing?			
7.4.9	Is adequate allowance made for defect repair both before and after implementation?			
8.0	**Application Architecture**			
8.1	Are object-based design and layered architecture principles being employed?			
8.2	Does the application confirm to recognized industry architecture standards?			
8.3	Is the application being implemented using client / server architecture?			

8.4	Are application interfaces designed in such a way as to facilitate maintenance and change?			
8.5	Does the application architecture support information needs at all levels of user operations (Strategic/Tactical/Operational)?			
8.6	**Client / Server**			
8.6.1	Are there design limitations which are impacting service delivery and / or performance?			
8.6.2	Is the current architecture scalable?			
9.0	**Data Architecture and Standards**			
9.1	Is the project operating under a formal set of data architecture standards?			
9.2	Does a format data architecture and model exist for the application?			
9.3	Has a fully attributed data model been developed for the application?			
9.4	Has the data model been integrated with the other user and system views of the data?			
9.5	Has a set of data naming convention and /or standards been established?			
9.6	Is an active data dictionary in place?			
9.7	Has the DBMS been optimized to support any of the following: a. OLTP? b. Decision Support/EIS? c. Data Warehousing?			
9.8	Is the DBMS cost effective against expectations as defined in the Business Case?			
9.9	Does or will the DBMS support extensibility appropriate for current and future business needs?			
10.0	**Production and Operations Support**			
10.1	Do adequate operations procedures exist?			
10.2	Do formal & documented procedures exists for: a. User (security) maintenance?			

	b. Acceptance of applications to Production Support?			
10.3	Are any of the following types of maintenance carried out on a planned basis: a. Perfective maintenance b. Preventive maintenance c. Adaptive maintenance			
10.4	Are Service Level Agreements in place between the Support Functions and the user departments?			
10.5	Are Help-desk functions well-defined, efficient and adequately resourced?			

1.10 Tracking, monitoring and controls

1.10.1 Project Tracking

Project tracking includes comparison between project plan with the actual advance of the project. It is to ensure the that the project is on track and within the cost budget.

There are some activities in project tracking such as determine percentage of work done, determine resources spent, compare work done and resources spent to produce earned value analysis and track milestone.

- Determine percentage of work done

  Some of the tools can be used to track project progress. For instance, OmniPlan, Todoist, Scoro, paymo, Jira and Trello. These tools are used to record the todo list, doing list and done list for every activities. When an activity is first assigned to a programmer, the activity assigned will be placed on the to-do list. When the activity is performing by the programmer, the activity will be shifted to ongoing list. After the activity is done, the activity will be moved to done list. The project manager can track the percentage of work done by looking at number of items in done list.

- Determine resources spent on work done

  The next activity in the project tracking process is to ensure the resources such as time and cost are adequate for the project. In terms of time, resources spent can be tracked with tracking software such as Jira and Trello. where as in terms of cost, the cost spent can be recorded with cash flow analysis and life cycle costing

- Compare work done with resources spent to produce earned value analysis

  After the resources are determined, the cost performance index and schedule performance index can be calculated by Earned Value Management. EVM is a project performance technique that integrates scope, time and cost data. The cost performance index can be calculated by using Earned Value divide by Actual Value, while

schedule performance index can be calculated by dividing Earned value and planned value. cost performance and schedule performance index is positive number indicates the project is within the schedule and within the budget whereas negative number indicates project is over budget and behind schedule. Then, with the cost performance and schedule performance index calculated, the estimate cost at completion and estimated time to complete the project can be determine.

1.10.2 Project monitoring and control

The monitoring and controlling process oversees all the tasks and metric necessary to ensure that the project is within scope, on time and on budget.It involves tracking the project performance with the planned project management activities. This process is performed continuously throughout the project. The monitoring and control procedure is as below:

1. Scope verification and control
   Scope verification process ensures that the project deliverables are formally accepted while scope control process ensures that changes to project scope are controlled.
   The outputs for this process include accepted deliverables, requested changes, updates to control documents, updates to project management plan.

2. Schedule control
   Schedule process monitors and controls changes to the project schedule. This process can be done by using software tools such as trello and jira. The outputs of this process are updates to the schedule model data and performance measurement.

3. Cost control
   Cost control process monitors and controls costs and changes to the project budget. The outputs of this process consists of cost estimate update, updates to the project management plan.

4. Quality control
   The quality control process measures specific project results to determine whether the project is meeting quality standards. The outputs of this process consist of validated defect repair, quality control measurement and validated deliverables.
5. Performance reporting
   This process collects and distributes performance information including status reports, progress reports. The output for this process includes performance report.

6. Risk control
   The risk control process tracks identified risks, monitoring residual risks, identifying new risks, executing risk response plans and evaluates effectiveness throughout project life cycle. The outputs for this process are risk register updates, project document updates and etc.

1.11 Management review and responsibilities

Management review is a formal, structured meeting which involves top management and should be performed annually or quarterly. It is a continuous analysis and improvement of a

company's process. This is to determine the project's sustainability, adequacy, and effectiveness of the quality management system to achieve the stated quality objectives.

1. The reviewal of quality management system should be review at minimum of annually, or quarterly. The review process should involved at least one person of the project team member. This review can be in remotely in video call, online conference or in person. The review will examine the quality of the management system to ensure its align with the objectives.

2. The review that take placed must be planned and carried out taking into consideration to the changes to internal and external issues that are relevant to the quality of the management system including its strategic direction.

3. In management review, information on the quality performance must be planned and carried out. The information including trends
    a. Customer satisfaction and feedback from the relevant interested parties
    b. The extent to which quality objectives have been met
    c. Process performance and conformity of products and services
    d. Non-conformities and corrective actions
    e. Monitoring and measurement results
    f. Audit results
    g. The performance of external providers

Form Template

Test Form

Project Title :	
CRF Num :	Test Priority : Low / Medium / High
Test ID :	Test Designed By :
	Test Design Date :
Test Title :	
Module Name :	
Test Descriptions :	
Test Status : Pass / Fail	
Test Executed By : _____ Name :	Approved By : _____ Name :

Software Release Note:

Project Title:	
Release Note Reference:	Release Date:
Software Version:	Release Type: Major / Minor / Security
New: #requirement 1 - added requirement feature	
Improvements:	
Fixes:	
Operations:	
Issued by Name: Position: Signature: Date:	Approved by Name: Position: Signature: Date:

Test Case

Project Name:		Test Designed by:				
Module Name:		Test Designed date:				
Release Version:		Test Executed by:				
Test type		Test Execution date:				
Purpose of Test						
Pre-condition						
Dependencies						
Test Priority						
Test No.	Target File/ Screen	Test Data / Situation	Expected result	Actual Result	Outcome	Action Required

Change Form

Project title:	
Change Request No:	Date:
Change Requestor:	Change request level: Low/Medium/High
Change Type: ❏ Fault ❏ Enhancement ❏ Request ❏ Other:_____	Impact level: Low/Medium/High
Change Description/ Analysis:	
Files Affected:	
Duration of Change:	
New/Drop of Files, Variables (Global/Local):	
Change Perform By:	
Testing Required (Outline):	
Coding Effort:	
Testing Effort:	
Analysis by: _____ Name: Position: Date:	Approve by: _____ Name: Position: Date:

Configuration Management Form

Sr. No	Description	Revisions & Dates		
		1- Rev & Date	2- Rev & Dates	3- Rev & Dates
1	Drawings			
2	Process Flow Diagram			
3	Process Failure Mode Effectiveness Analysis			
4	Control Plan			
5	Work Instruction			

Prepared by: Verified by: Approved by:

_____ _____ _____

Test script form

Test script identification number		**Execution date**	
Test script version		**Author**	
Test specification identification **(reference to the document in which the test cases and its origin are described)**			
Test object include version **(description of test object(s) and related version number)**			
Test basis include version **(list the test basis with version numbers)**			

Prepared by

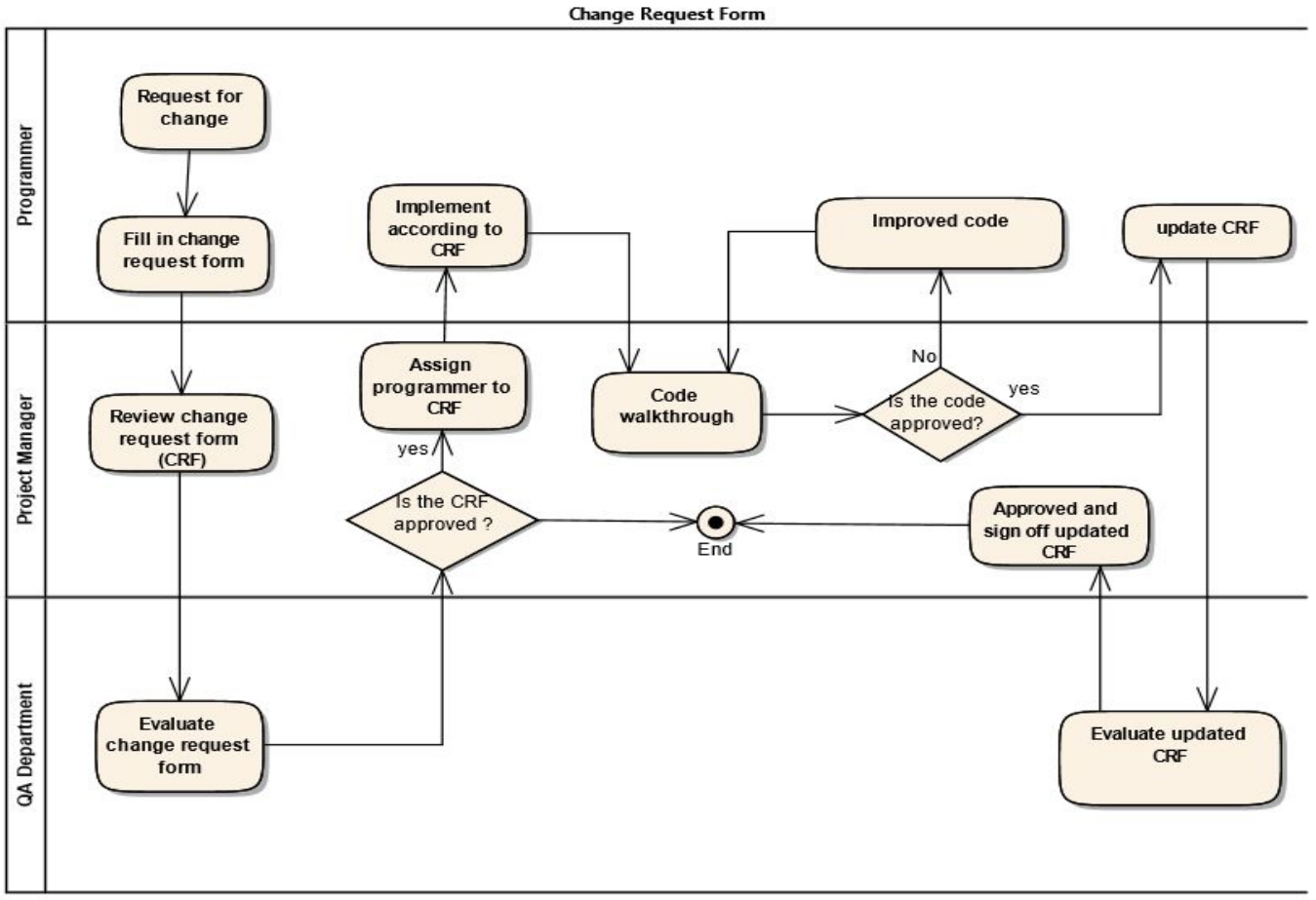
_____

Prepared on

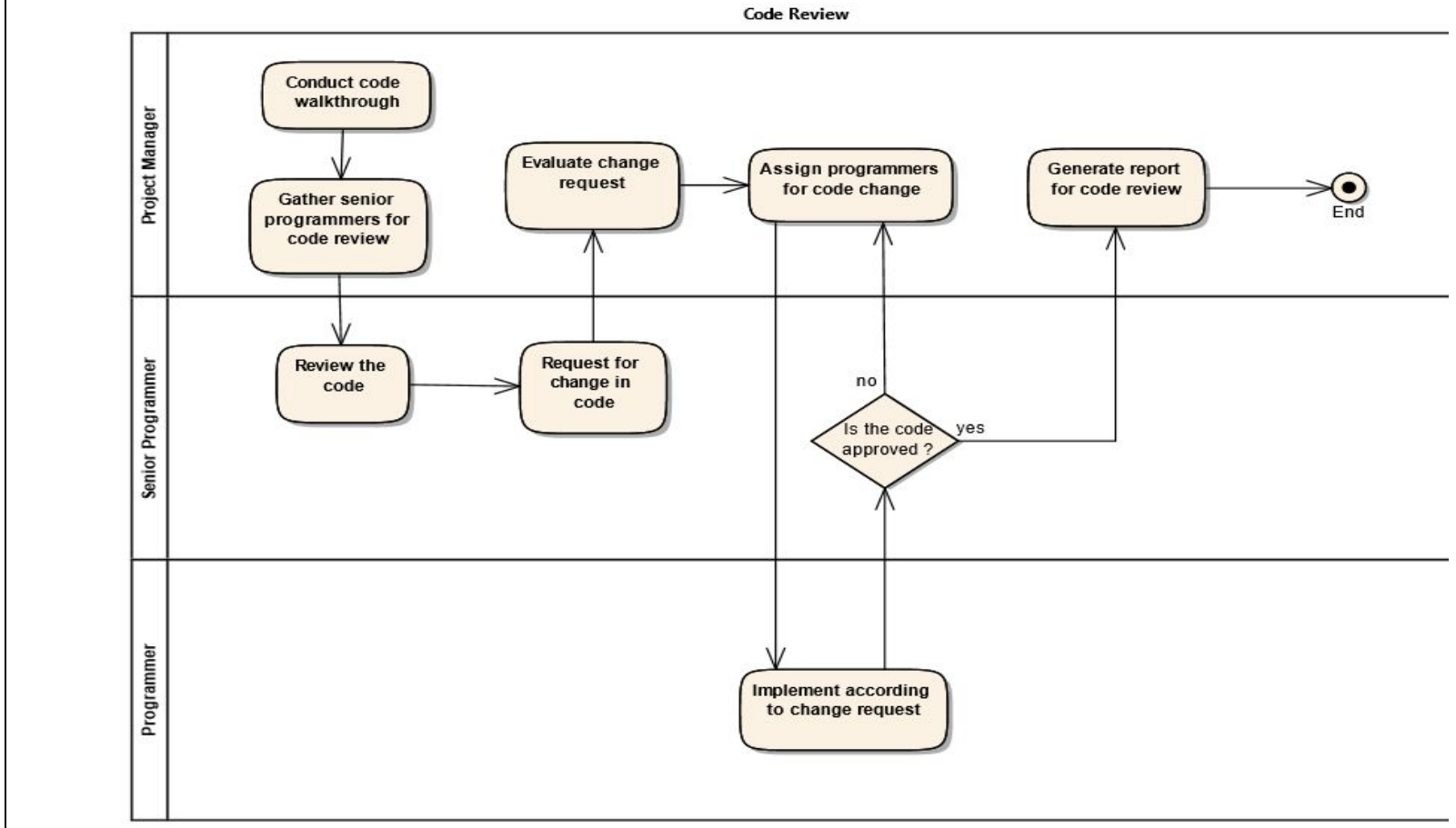
_____

Process Flow

Ref No: **Department:** Software Engineering **Process Title:** Process flow of Change Request Form **Owner Contact Person**: project manager, quality assurance department, programmer	**Page:**1 of 1 **Date:** **Version**:1.0.0

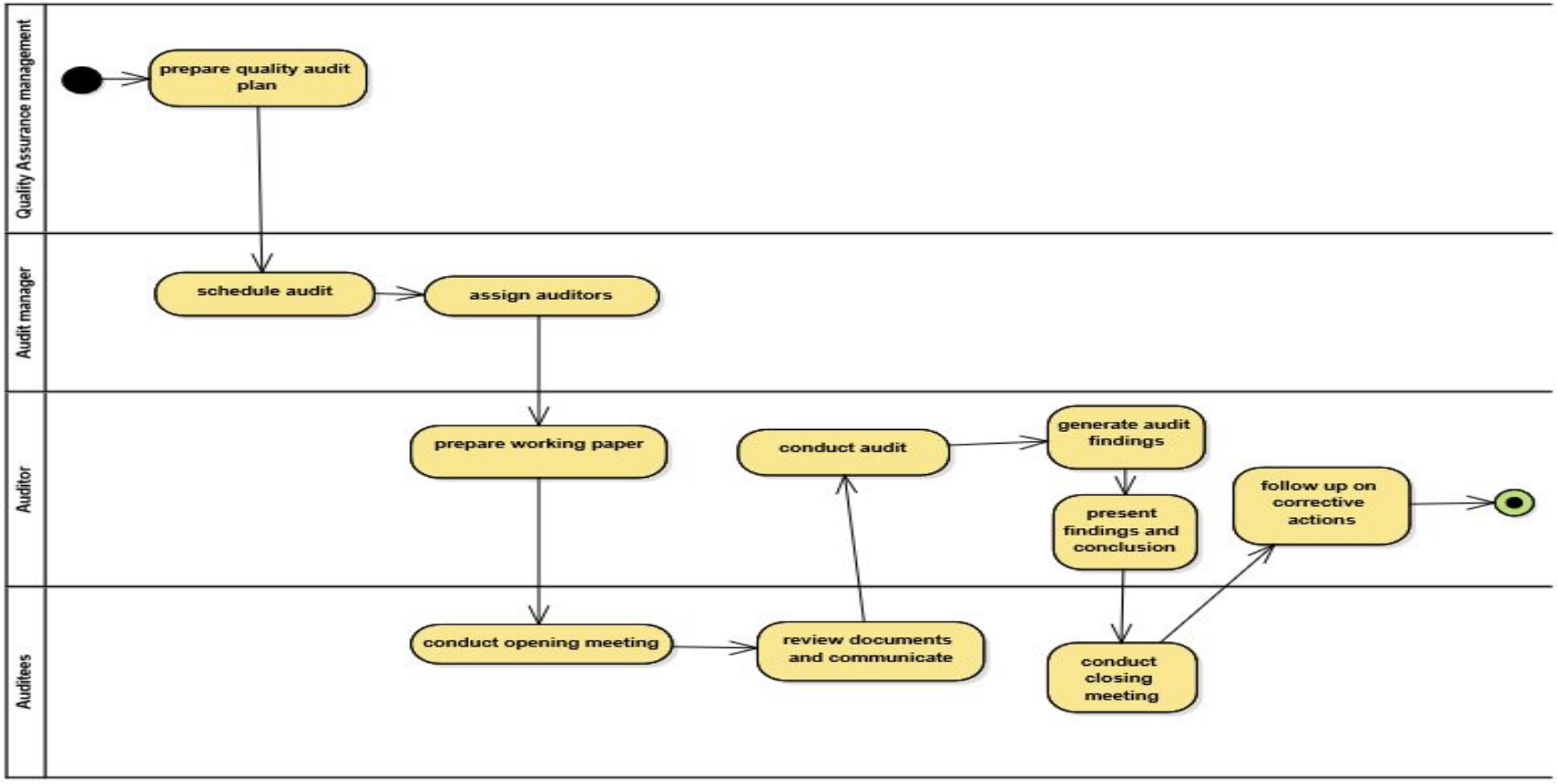


Ref No: **Department:** Software Engineering **Process Title:** Process flow of code review **Owner Contact Person**: project manager, senior programmer, programmer	**Page:**1 of 1 **Date:** **Version**:1.0.0



Internal audit

Ref No: **Department:** Software Engineering **Process Title:** Process flow of internal audit **Owner Contact Person**: project manager, software department	**Page:**1 of 1 **Date:** **Version**:1.0.0



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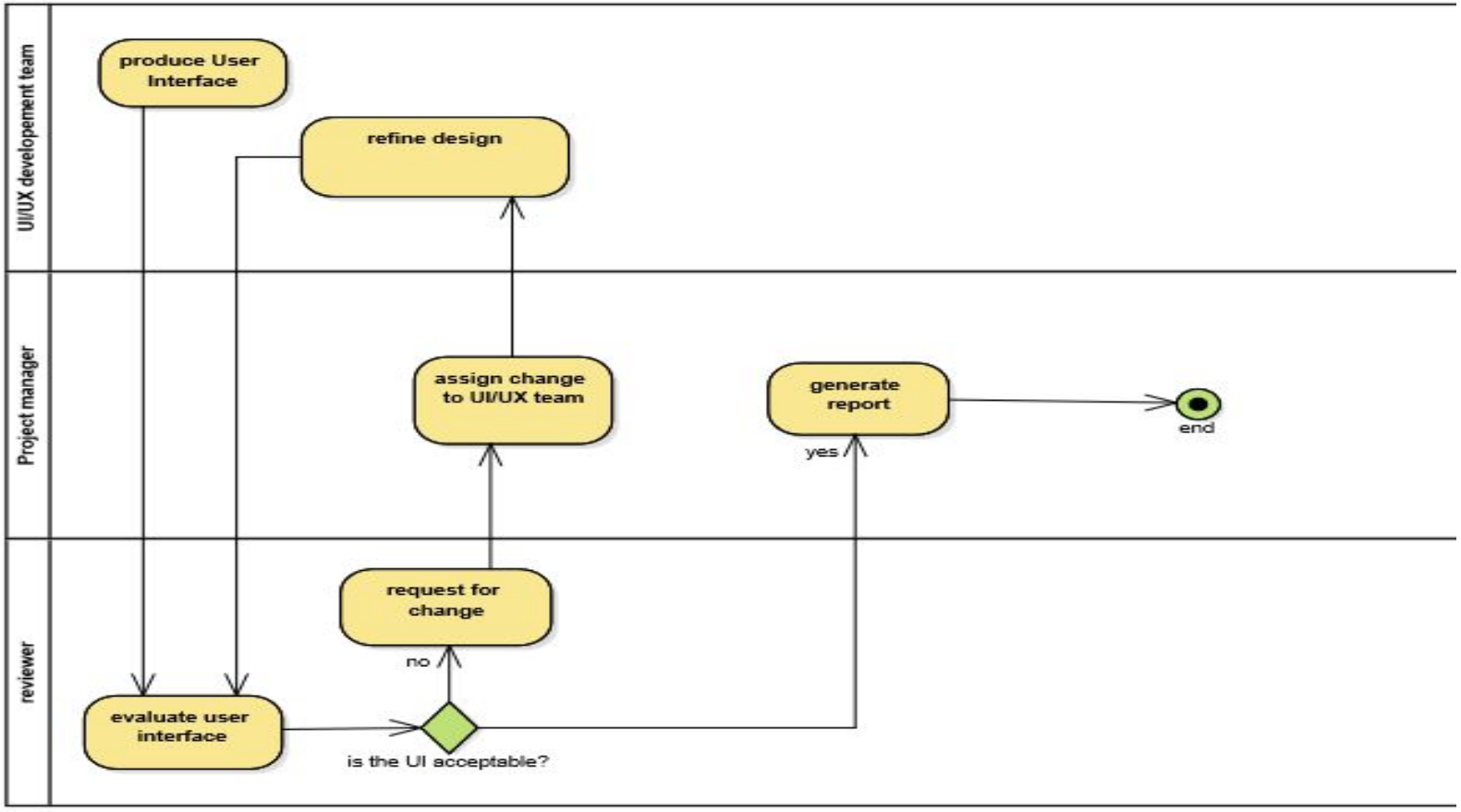

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Department:Software Engineering

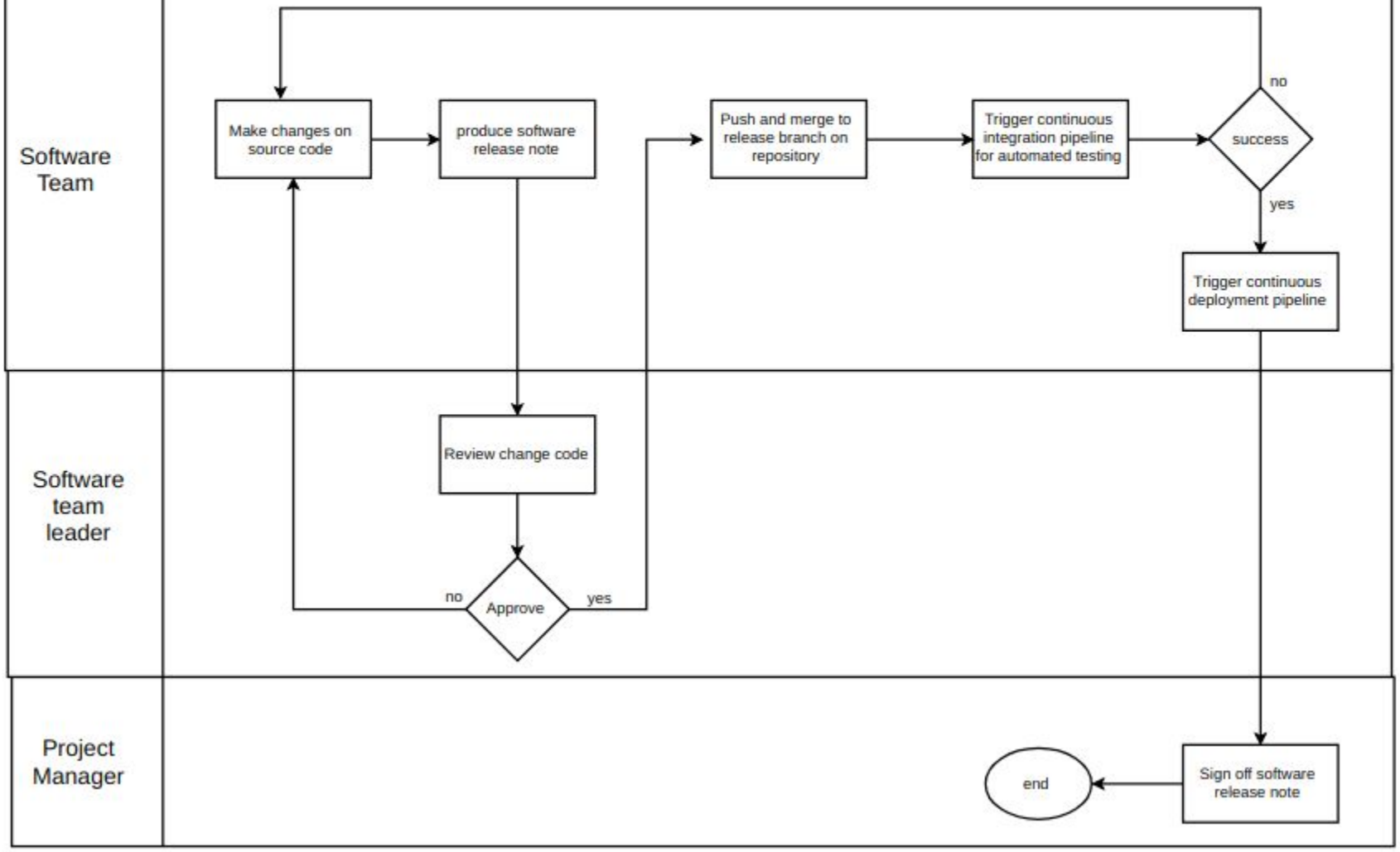
Process Title: Process flow of software release

Owner Contact Person: Project Manager, Software Team

Page: 1 of 1

Date:

Version: 1.0.0



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Department:Software Engineering

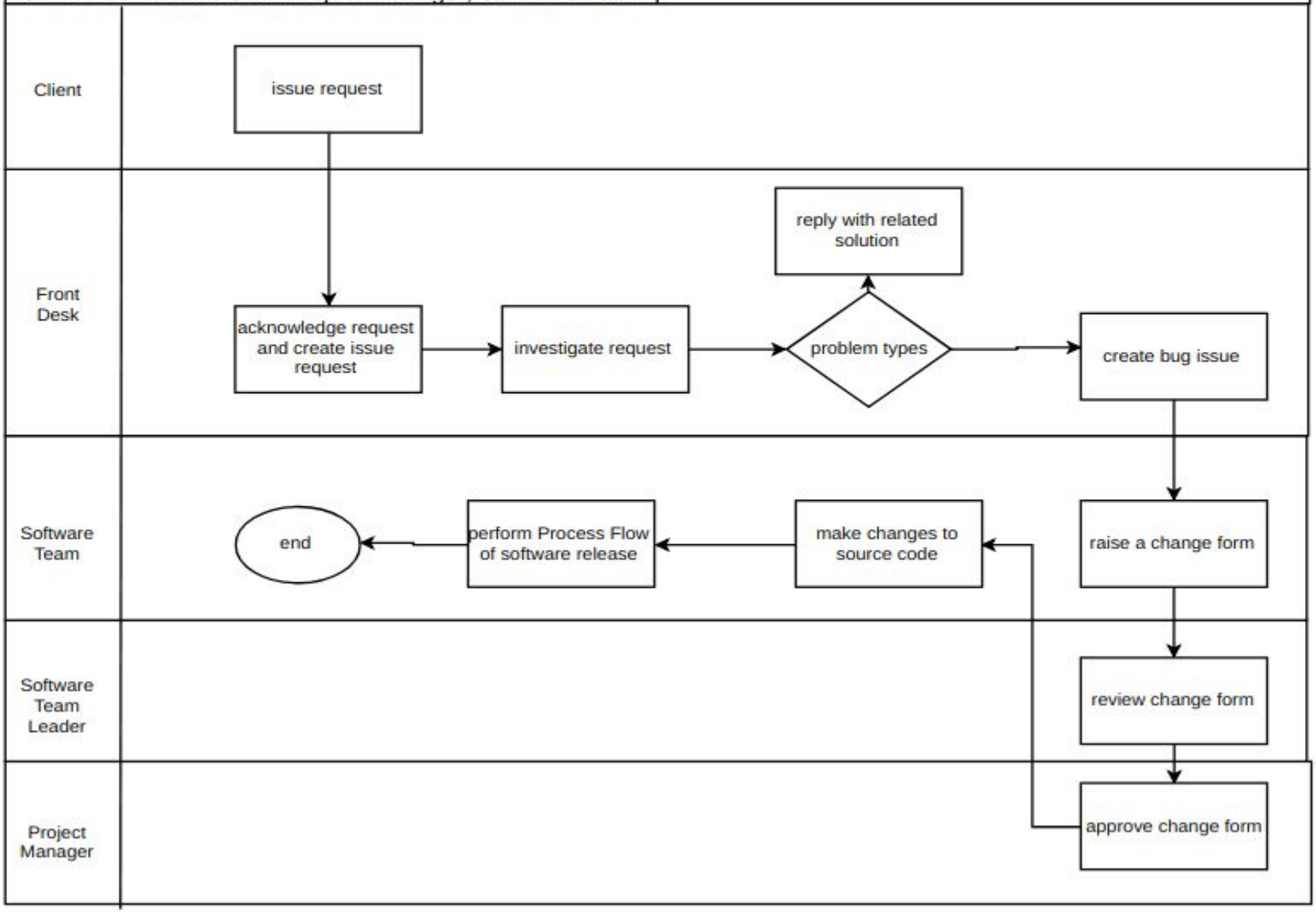
Process Title: Process flow of issue report

Owner Contact Person: Project Manager, Software Team

Page: 1 of 1

Date:

Version: 1.0.0



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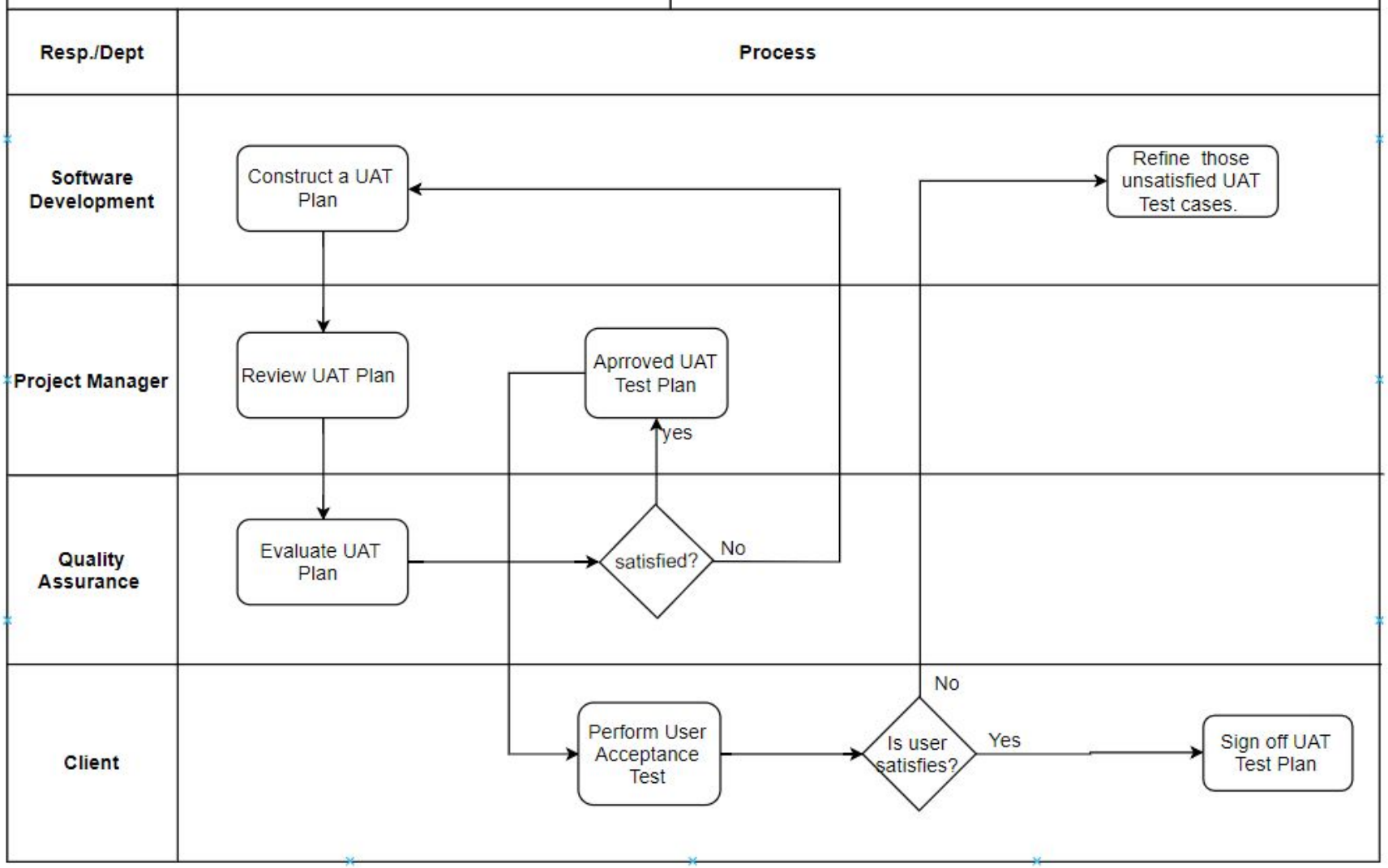

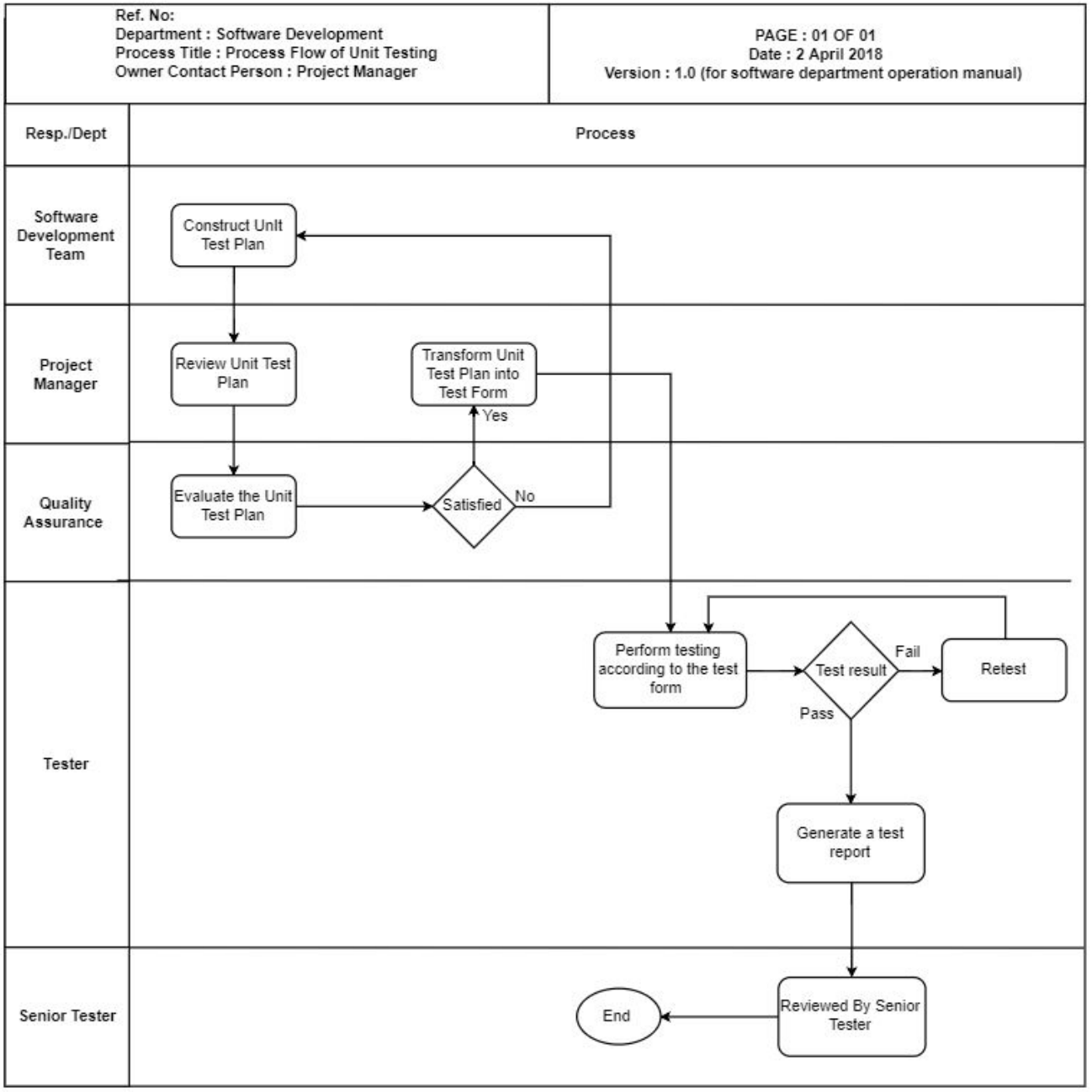
Ref. No:
Department : Software Development
Process Title : Process Flow of Unit Testing
Owner Contact Person : Project Manager
PAGE : 01 OF 01
Date : 2 April 2018
Version : 1.0 (for software department operation manual)
Resp./Dept
Process
Software Development Team
Construct UnIt Test Plan
Project Manager
Review Unit Test Plan
Transform Unit Test Plan into Test Form
Yes
Quality Assurance
Evaluate the Unit Test Plan
Satisfied
No
Tester
Perform testing according to the test form
Test result
Fail
Retest
Pass
Generate a test report
Senior Tester
End
Reviewed By Senior Tester