FPT SOFTWARE

STANDARD

Standard Life Cycle Models

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1. INTRODUCTION

1.1. Purpose

This document defines Standard Life Cycle (SLC) models implemented in software projects, both of development and maintenance types. Based on these SLC models, Project Managers (PM) have responsibilities to create a tailored SLC model, which is called Project Defined Life Cycle (PLC), for their project to satisfy the project's contractual and operational constraints.

1.2. Application scope

The document is applied to all Fsoft's projects which do not have special requirements on SLC.

1.3. Related documents

No.	Code	Name of documents
1	02e-HD/PM/HDCV/FSOFT	Tailoring processes
2	xx-QT/PM/HDCV/FPT	Software Process Descriptions

1.4. Definition (refer to Concepts document)

Terminology	Explanation
SLC	Standard Life Cycle
PLC	Project Defined Life Cycle
PM	Project Manager
SDLC	Software Development Life Cycle
SMLC	Software Maintenance Life Cycle
PP	Project Plan
URD	User Requirement Document
SRS	Software Requirement Specification
ADD	Architectural Design Document
DDD	Detailed Design Document
SEPG	Software Engineering Process Group
QA	Quality Assurance Group
OSDC	Offshore Software Development Center
UT	Unit Test

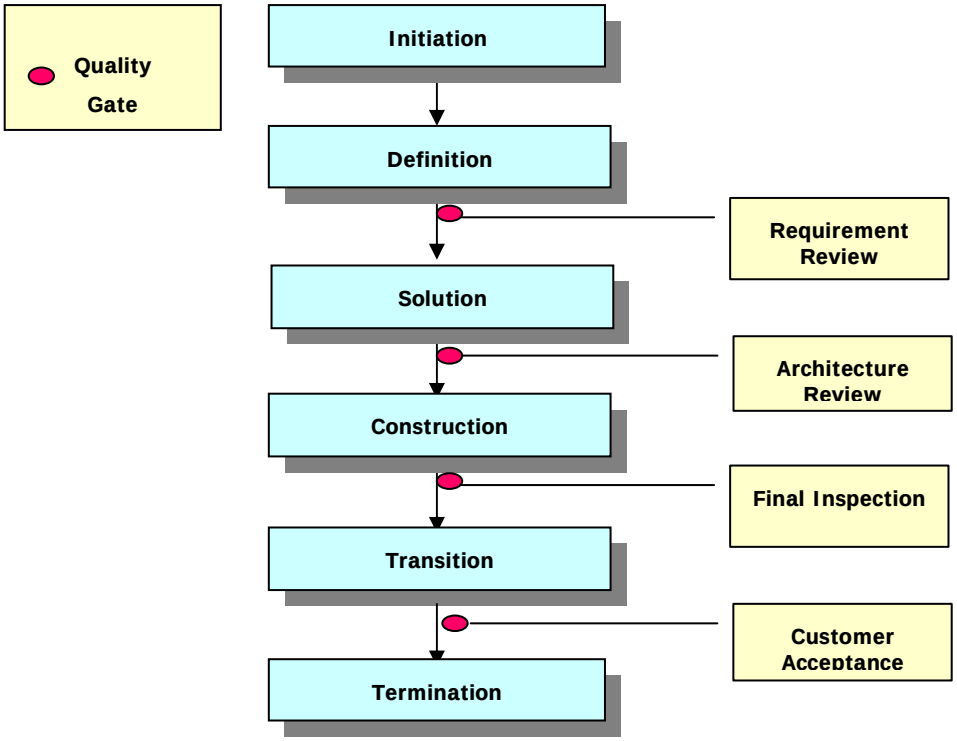
Terminology	Explanation
IT	Integration Test
ST	System Test
AT	Acceptance Test

2. STANDARD LIFE CYCLE MODELS

2.1. Software Development Life Cycle Model

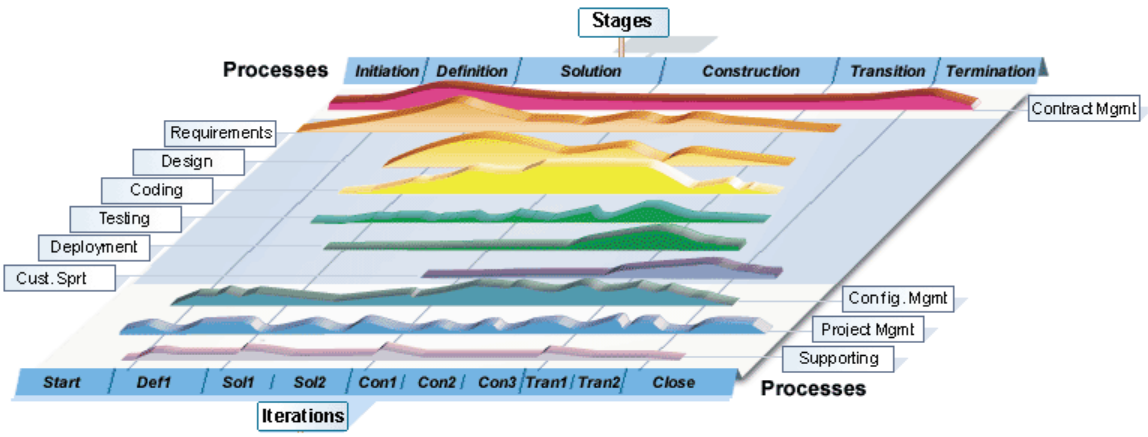
2.1.1. Diagram

The Software Development Life Cycle stages are depicted in the following diagram:



Software Development Life Cycle (SDLC)

The overall picture of the SDLC in combination with processes is below:



2.1.2. Mandatory outputs

The SDLC has main mandatory outputs of stages in which the outputs are released as the first completed version in the following table:

No	Output	Stage	Code of template	Code of checklist
1	Work Order	Initiation	14e-BM/PM/HDCV/FSOFT	N/A
2	User Requirement Document	Definition	06ae-BM/PM/HDCV/FSOFT	04e-CL/PM/HDCV/FSOFT
3	Software Requirement Specification	Definition	06be-BM/PM/HDCV/FSOFT	03e-CL/PM/HDCV/FSOFT
4	Project Plan	Definition	01e-BM/PM/HDCV/FSOFT	02e-CL/PM/HDCV/FSOFT
5	Architectural Design Document	Solution	04ae-BM/PM/HDCV/FSOFT	05e-CL/PM/HDCV/FSOFT
6	Test Plan (Unit Test Plan, System Test Plan)	Solution	02-BM/PM/HDCV/FSOFT	08ae-CL/PM/HDCV/FSOFT
7	Test Cases and Test Data (Unit Test cases, Integration Test cases, System Test cases)	Construction	02ae-BM/PM/HDCV/FSOFT 02ce-BM/PM/HDCV/FSOFT	08be-CL/PM/HDCV/FSOFT
8	Detailed Design Document	Construction	N/A	06e-CL/PM/HDCV/FSOFT
9	Software Package	Construction	N/A	31e-BM/PM/HDCV/FPT
10	Acceptance Note	Termination	14e-BM/PM/HDCV/FSOFT	N/A

2.1.3. Application

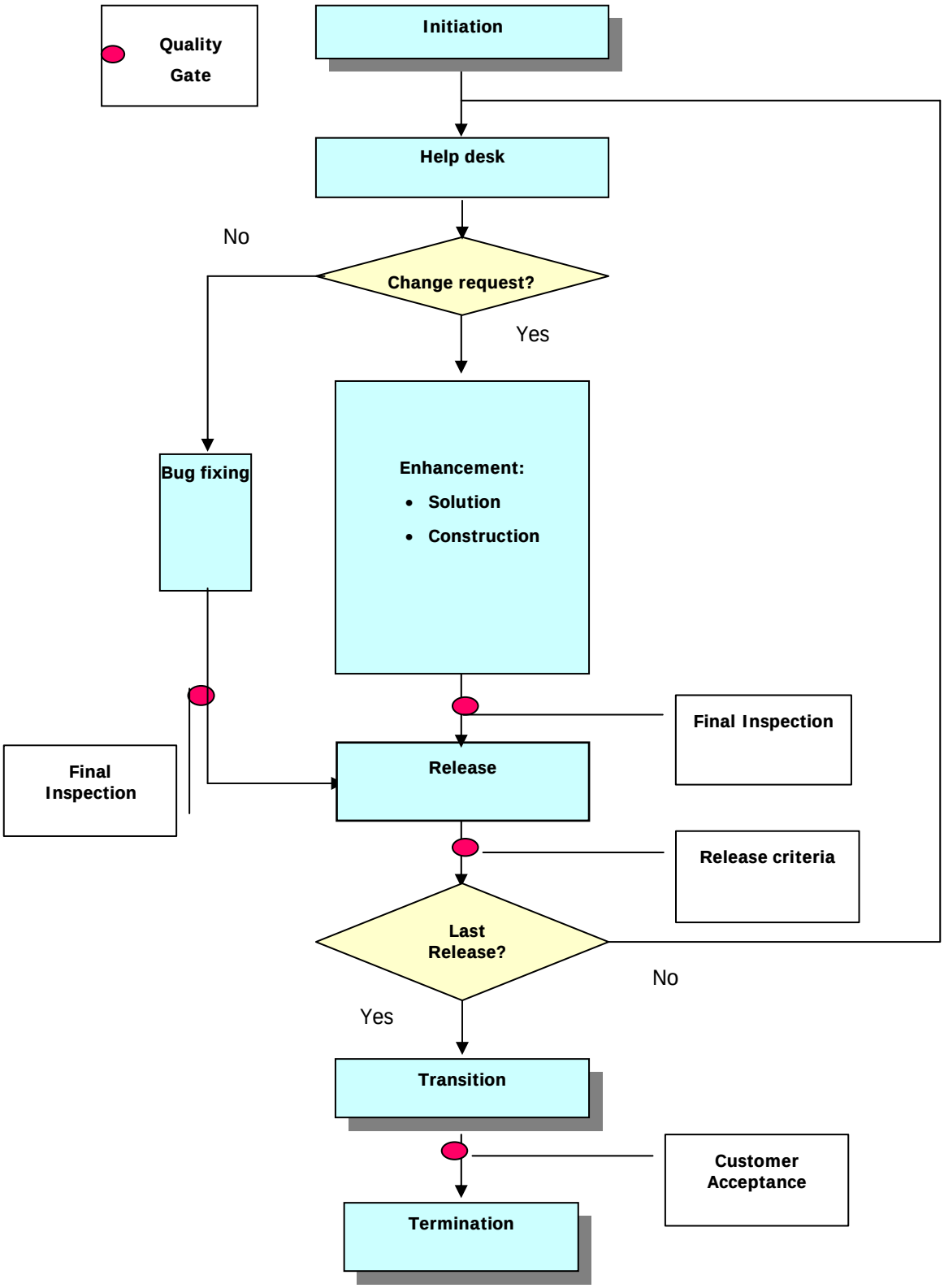
The SDLC is applied to the following types of projects:

- Custom–made software solution.
- Off-the-shelf product development.

2.2. Software Maintenance Life Cycle Model

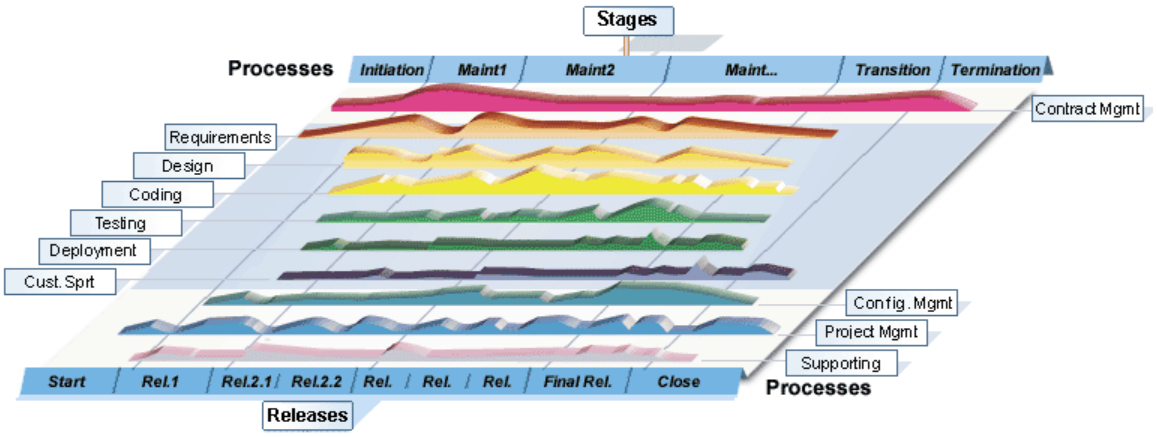
2.2.1. Diagram

The Software Maintenance Life Cycle stages are depicted in the following diagram:


Quality Gate
Initiation
Help desk
No
Change request?
Yes
Bug fixing
Enhancement:
Solution
Construction
Final Inspection
Final Inspection
Release
Release criteria
Last Release?
No
Yes
Transition
Customer Acceptance
Termination

Software Maintenance Life Cycle (SMLC)

The overall picture of the SMLC in combination with processes is below:



2.2.2. Mandatory outputs

The SMLC has main mandatory outputs of stages in which the outputs are released in following table:

No	Output	Stage	Code of template	Code of checklist
1	Work Order	Initiation	14e-BM/PM/HDCV/FSOFT	N/A
2	Updated User Requirement Document	Transition	06ae-BM/PM/HDCV/FSOFT	04e-CL/PM/HDCV/FSOFT
3	Updated Software Requirement Specification	Transition	06be-BM/PM/HDCV/FSOFT	03e-CL/PM/HDCV/FSOFT
4	Updated Project Plan	All Maints	01e-BM/PM/HDCV/FSOFT	02e-CL/PM/HDCV/FSOFT
5	Updated Architectural Design Document	Transition	04ae-BM/PM/HDCV/FSOFT	05e-CL/PM/HDCV/FSOFT
6	Updated Test Plan	All Maints	02-BM/PM/HDCV/FSOFT	08ae-CL/PM/HDCV/FSOFT
7	Updated Test Cases and Test Data	All Maints	02ae-BM/PM/HDCV/FSOFT 02ce-BM/PM/HDCV/FSOFT	08be-CL/PM/HDCV/FSOFT
8	Updated Detailed Design Document	All Maints	N/A	06e-CL/PM/HDCV/FSOFT
9	Updated Software Package	All Maints	N/A	31e-BM/PM/HDCV/FPT
10	Acceptance Note	Termination	14e-BM/PM/HDCV/FSOFT	N/A

2.2.3. Application

The SMLC is applied to the following types of projects:

- User support and maintenance of software products.

2.3. Notes

Each stage of SLC has its own objectives and set of work products which have been generated by implementing appropriate processes. Depending on the complexity of the project, any stage of SLC has one or some iterations/releases. An iteration/release encompasses the development activities that lead to a product release (internal or external) - a stable, executable version of product, together with any other peripheral elements necessary to use this release.

A work product is either mandatory or optional. The nature of the stage is defined by a set of mandatory work products.

All stages of the SLC are verified and validated by external reviewers (QA) through Quality Gates to determine:

- If the objectives of the stage have been met.
- If the mandatory work products have satisfied the requirements.

A satisfactory assessment allows the project to move to the next stage. Resulting action items should be tracked to closure by necessary corrections.

To conform to the specific requirements of the project, the PM should use Tailoring guideline (02e-HD/PM/HDCV/FSOFT) that describes permitted deviations of SLC and standard processes. The PLC should be included in the Project Plan (PP) and must be reviewed by SEPG.

After each SLC stage has been signed off, the PP will be reviewed and updated, if necessary. The approved PP should be baselined so that it is possible to revert it in case of need. Any change of the baselined document thereafter has to be implemented only through formal processes of change management and configuration management.

Traceability Matrix should be defined to verify whether all the requirements are defined and tested for the project. This may be maintained as a separate document, which will refer to the relevant sections of various documents/records generated in the project. The PM should review and approve this matrix. The traceability matrix should be updated to reflect any change that may take place during the execution of the project.

3. STANDARD DEVELOPMENT LIFE CYCLE STAGES

3.1. Initiation

3.1.1. Overview

Initiation stage, the start of project SLC, is triggered by the release of Project Opening and Project Manager Appointment Decision. During that stage, the followings activities are carried out:

- Project's software scope and boundary conditions, including the operational vision and proposed products, are established.
- Overall cost and schedule of the project are estimated.
- Potential risks are defined.
- Project kick-off meeting is conducted

Based on these outputs, a project team is formed, Work Order is approved, Project plan is drafted and all necessary resources/tools/supports required to carry out the project will be provided.

3.1.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Work Order	Mandatory	Completion	Software project management
2	Contract Review	Mandatory	Completion	Software contract management
3	Project Plan	Mandatory	Section 1, 2, 5	Software project management
4	User Requirement Document	Optional	User requirement list	Requirements
5	Proposal	Optional	Completion	Software contract management

3.2. Definition

3.2.1. Overview

The Definition stage aims at defining user requirements for software packages. Studying and translating the user requirements into a clear, well-formulated and complete User Requirement Document (URD), analysing the URD and creating Software Requirement Specification (SRS) are the main activities of this stage. These documents (called

Requirement documents) may be combined into a single one. In some cases projects could create a prototype for clarifying the user requirements with customers.

The expertise of a software engineer should be used to help define and review the requirements. ***Definition of user requirements is mandatory for all projects.*** In cases when the customer has responsibility for creating the URD, the PM should require the customer to submit this document as a mandatory output of this stage.

Acceptance Test Criteria are defined in this stage, to outline the approach to be adopted for demonstrating the compliance of the software to user requirements. This can be updated/refined during the later stages of SDLC. ***Ensuring that the Acceptance Test Criteria are documented is the primary responsibility of the PM.*** Acceptance Test Criteria could be documented as a part of the URD.

The PM is responsible for determining whether or not the customer requirements define the need of the application of specific statutory or regulatory requirements and ensuring that they are included in the entire relevant project documents.

Design work can begin even before the SRS is officially released as long as a preliminary developmental release of the document is reviewed and baselined.

On the basis of the mutually agreed requirements, the project plan is prepared in full context as required in the project plan template and reviewed by groups that have affected to the achievement of project objectives.

3.2.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	User Requirement Document	Mandatory	Completion	Requirements
2	Software Requirement Specification	Mandatory	Completion	Requirements
3	Project Plan	Mandatory	Completion	Software project management
4	Project Report	Mandatory	Milestone	Software project management
5	Test Plan (Unit Test Plan, Integration Test Plan, System Test Plan)	Optional	System Test	Test
6	Prototype	Optional	Critical requirements	Requirements

3.3. Solution

3.3.1. Overview

The main purpose of this stage is to define an effective solution to meet customer requirements. Analysing and creating a design for the software package are the main activities of this stage.

Depending on the characteristics of each project, the stage normally divides into two sub-stages, namely the Architectural (High level or Preliminary or System) Design and Detailed Design.

- Architectural Design Document is the step in moving from the domain of problems to the domain of solutions. The results of this step are described in an Architectural Design Document (ADD) that includes a collection of software components and their interfaces.
- The Detailed Design is the step, where the design contents outlined in the ADD are decomposed until they can be expressed as modules. The detailed design describes project's implementation details in a Detailed Design Document (DDD). This step could be moved to the next stage.

Test Plan is completed in this stage outlining the approach to be adopted for demonstrating the compliance of the software to SRS (System Test) and ADD (Integration Test).

In this stage, a prototype and some critical modules of software may be developed and tested (unit tested by Development team and integration tested by Test team) to ensure the property of the solution.

3.3.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Architectural Design Document	Mandatory	Completion	Software design
2	Test Plan (Unit Test Plan, Integration Test Plan, System Test Plan)	Mandatory	Completion	Test
3	Project Report	Mandatory	Milestone	Software project management
4	Project Plan	Optional	Updated for Construction Stage	Software project management
5	Prototype	Optional	Completion	Requirements
6	Detailed Design Document	Optional	Critical modules	Software design
7	Software Package	Optional	Critical modules	Coding
8	Test Cases and Test Data	Optional	Critical modules	Test

No	Work Products	Severity	State	Process
	(Unit Test Cases)			
9	Test Reports (Unit Test Report)	Optional	Critical modules	Test
10	Requirement Documents	Optional	Updated for customer change requests	Requirements

3.4. Construction

3.4.1. Overview

The goal of the **Construction stage** is to develop the system. Generally, the Construction stage is a manufacturing process, where the emphasis is placed in managing resources and controlling operations to optimize costs, schedules and quality.

Testing is one of the main activities in this stage. It includes Unit test implemented by Development team and Integration/System implemented test by Test team. ***The test results for any test stages should be recorded for all projects.***

If defects are identified during testing, they will be tracked to the closure. After rectifying the reported defect, regression test is to be performed. The test plan for the respective unit should be executed completely to prevent the occurrence of new defects while an existing one is being solved.

3.4.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Detailed Design Document	Mandatory	Completion	Software design
2	Test Cases and Test Data (Unit Test Cases, Integration Test Cases, System Test Cases)	Mandatory	Completion	Test
3	Software Package	Mandatory	Completion	Coding
4	Test Report (Unit Test Report, Integration Test Report, System Test Report)	Mandatory	Completion	Test
5	Project Report	Mandatory	Milestone	Software project management
6	Project Plan	Optional	Updated for Transition Stage	Software project management

No	Work Products	Severity	State	Process
7	Code Review Report	Optional	Completion	Coding
8	Requirement Documents	Optional	Updated for customer change requests	Requirements
9	Installation Manual	Optional	In skeletal form	Coding
10	User Manual	Optional	In skeletal form	Coding

3.5. Transition

3.5.1. Overview

The focus of the Transition stage is to ensure that the software is available for end users. Delivering the software to customer, implementing the software systems on customer site, conducting test activities for acceptance and supporting customers/users are main activities of this stage.

At this point in the lifecycle, user's feedbacks should mainly focus on fine product tuning, configuration, installation and usability issues. All of the major structural issues should have been worked out much earlier in the project life cycle.

Activities performed during an iteration of the Transition stage depend on the goal. For example, when fixing bugs, implementation and test are usually enough. If, however, new features have to be added, the iteration is similar to that in the Construction stage requiring analysis & design, coding, testing (unit, integration, system,...), etc.

The Transition stage will start when a baseline is mature enough to be deployed in the end-user domain. This typically requires that some usable subsets of the system have been completed with the acceptable quality level and user documentation so that transitioning to the user provides positive results for all parties.

By the end of this stage, project objectives should have been met and the project should be in a position to be closed out. In some cases, the end of the current life cycle may coincide with the start of another lifecycle on the same product, leading to the next generation or version of the product. For other projects, the end of the Transition stage may coincide with a complete delivery of the work products to the third party that may be responsible for the operations and maintenance of the delivered system.

3.5.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Software package	Mandatory	Accepted by customer	Coding
2	Release Note	Mandatory	Completion	Configuration management
3	Project Report	Mandatory	Milestone	Software project management
4	Installation Manual	Optional	Completion	Coding
5	Acceptance Report	Optional	Completion	Deployment
6	Support Diary	Optional	Completion	Customer support
7	User Manual	Optional	Completion	Coding

3.6. Termination

3.6.1. Overview

The project closes at this stage when customer accepts the whole project. Project assets must be collected and transferred to Fsoft Process Asset Library.

The goal of this stage is to summarise the results of the project and to provide the project knowledge and experiences for other projects.

The SEPG or authorized personnel must collect customer opinions about the project and its deliverables. ***Customer satisfaction survey is mandatory for all projects.*** Project QA should prepare the quality control report.

3.6.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Customer Satisfaction Survey	Mandatory	Completion	Software contract management
2	Project Report	Mandatory	Post mortem	Software project management
3	Project Assets	Mandatory	Completion	Software project management
4	Acceptance Note	Mandatory	Completion	Software project management

4. STANDARD MAINTENANCE LIFE CYCLE STAGES

4.1. Initiation

4.1.1. Overview

In Initiation stage of the SMLC, like one of the SDLC, a project team is formed, a Work Order is approved, a Project plan is drafted and all necessary resources/tools/supports required to carry out the project will be provided.

The Work Order is created for fixed time periods depending on the customer requirements on maintenance activities.

The duration and number of the maintenance stages with their periodical releases should be defined in the PP.

Generally the scope of a maintenance project could include some levels of maintenance activities:

- Level 1 includes end user support activities like call logs.
- Level 2 includes technical support activities like environment set up, installation.
- Level 3 includes software development activities like Bug fixing (Corrective), Change requests implementation (Adaptive or Preventive).

Normally an OSDC's maintenance project includes only activities at the third level, the activities at level 1 & 2 are conducted onsite by customer system supporters. This SMLC is applicable for maintenance activities at level 3.

4.1.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Work Order	Mandatory	Completion	Software project management
2	Contract Review	Mandatory	Completion	Software contract management
3	Project Plan	Mandatory	Section 1, 2, 5	Software project management
4	Customer Requirement	Optional	Requirement list	Requirements

4.2. Maintenance stage

Each maintenance stage normally includes:

- Help Desk
- Bug Fixing workflow
- Enhancement workflow
- Release sub-stages

4.2.1. Help Desk

a. Overview

The Help Desk is established to receive customer requirements in a request form such as problem report or change request, to perform primary evaluation of the request and response to customer.

There are two ways to follow based on type of customer requirements:

- If the request is a change request, follow Enhancement workflow started by analysing the request and communicate with the customer in the Solution sub-stage.
- If the request is bug fixing, follow the Bug fixing workflow. The regression test should be conducted at the end of this workflow.

Sometimes, a problem report or a change request does not come from customer but from other sources. In these cases, project could make a release without customer initiation request (say: the improvement releases) but the release content should be agreed by customer.

The project plan is updated for the release.

b. Work Products

Main outputs of Help Desk are defined in the table below.

No	Work Products	Severity	State	Process
1	Customer requests	Mandatory	For the release	Customer support
2	Project Plan	Mandatory	Updated for the release	Software project management

4.2.2. Bug Fixing

a. Overview

The goal of the **Bug fixing workflow** is to correct customer submitted defects of the maintained system.

Analyzing submitted defects is one of the main activities of this workflow. The analyzed result should be recorded for all projects and could be used for updating respective work products of the maintained system.

Other main activities are coding and testing.

After rectifying the submitted defects, it is necessary to perform a regression test. The test plan for the respective unit should be executed completely to prevent the occurrence of new defects while an existing one is being solved.

The product' documents are updated for a set of bugs depending on project characteristics but the criteria of this updating should be clearly stated in the project plan.

b. Work Products

Main outputs of this workflow are defined in the table below.

No	Work Products	Severity	State	Process
1	Test Cases and Test Data	Mandatory	Updated for submitted defects in the release	Test
2	Software Package	Mandatory	Updated for defect injected sections	Coding
3	Test Report	Mandatory	Completion	Test
4	Code Review Report	Optional	Completion	Coding
5	Requirement Documents	Optional	Updated for defect injected sections	Requirements
6	Design Documents	Optional	Updated for defect injected sections	Software design
7	Installation Manual	Optional	Updated for defect injected sections	Coding
8	User Manual	Optional	Updated for defect injected sections	Coding

4.2.3. Enhancement

a. Overview

The Enhancement is the workflow like a small or shorted development project with the input being change requirements defined from change requests.

The Enhancement workflow is normally implemented in 2 sub-stages as follows:

The Solution step

This step aims at analyzing change requirements for maintained software packages and to define an effective solution to meet change requirements. Studying and translating the change requirements into a clear, well-formulated and updating Requirement Documents (URD and/or SRS), analyzing and updating Design documents for the software package are the main activities of this step.

In cases when the customer has responsibility for updating respective documents, the PM should require the customer to submit this updated document as mandatory output.

Acceptance Test Criteria are defined in this step, to outline the approach to be adopted for demonstrating the compliance of the software to change requirements. This can be updated/refined during the later stages of SMLC. ***Ensuring that the Acceptance Test Criteria are documented is the primary responsibility of the PM.*** Acceptance Test Criteria could be documented as a part of the updated URD.

Test Plan is completed outlining the approach to be adopted for demonstrating the compliance of the release of the software to the updated SRS (System Test) and ADD (Integration Test).

Construction step

The goal of the Construction step is to update the system. Main activities of this step of the SMLC like those in the Construction stage in the SDLC.

b. Work Products

Main outputs of this workflow are defined in the table below.

No	Work Products	Severity	State	Process
1	Requirement Documents	Mandatory	Completed parts for change requests	Requirements
2	Design Documents	Mandatory	Completed parts for change requests in the release	Software design
3	Test Plan	Optional	Completed parts for change requests in the release	Test
4	Software Package	Mandatory	Completed modules for change requests in the release	Coding
5	Code Review Report	Optional	Completion	Coding
6	Test cases	Mandatory	Completed parts for change requests in the release	Test
7	Installation Manual	Optional	Completed parts for change requests in the release	Coding
8	User Manual	Optional	Completed parts for change requests in the release	Coding

4.2.4. Release

a. Overview

The focus of the Release sub-stage is to ensure that the updated software of the release is available for end users. Delivering the updated software to customer, implementing the updated software systems on customer site and conducting test activities for release acceptance are main activities of this sub-stage.

The Release sub-stage will start when the release baseline is mature enough to be deployed in the end-user domain. Depending of customer request there are two types of releases:

- Emergency release: The release that has to be conducted without early planned schedule. The decision about these releases should be taken in the Help Desk sub-stage based on negotiations with customers.
- Periodical release: The release that has to be conducted in accordance with the planned schedule defined in the Initiation stage. The content of these releases could be changed in the Help Desk sub-stage based on negotiations with customers.

By the end of this sub-stage, release objectives should have been met and the project should be in a position to be closed out or started with next release.

Each maintenance stage includes at least a periodical release and/or some emergency releases. After the last release of maintenance stages the milestone report should be created to summarize the stage objectives, activities and releases of the stage. The project baselines should be conducted for the stage at the moment.

b. Work Products

Main outputs of this sub-stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Software package	Mandatory	Updated modules for the release	Coding
2	Release Note	Mandatory	Completion for the release	Configuration management
3	Project Report	Mandatory	Milestone for the stage after the last release of the stage	Software project management
4	Project Plan	Optional	Updated for the next release	Software project management
5	Installation Manual	Optional	Completed parts for the release	Coding
6	Acceptance Report	Optional	Completion for the	Deployment

No	Work Products	Severity	State	Process
			release	
7	User Manual	Optional	Completed parts for the release	Coding

4.3. Transition

4.3.1. Overview

The focus of the Transition stage is to ensure that the updated software of all releases is available for it end users. Conducting the regression test, delivering the final updated software (Final release) to customer, implementing the final updated software systems on customer site and conducting test activities for final acceptance are the main activities of this stage.

The Transition stage will start when all releases are accepted for deployment in the end-user domain. By the end of this stage, project objectives should have been met and the project should be in a position to be closed out.

At the end of this stage all project's documents should be refined, updated and finally baselined.

4.3.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Software package	Mandatory	Final updated and accepted by customer	Coding
2	Project documents	Mandatory	Final updated and baselined	Configuration management
3	Release Note	Mandatory	Completion	Configuration management
4	Project Report	Mandatory	Milestone	Software project management
5	Acceptance Report	Optional	Completion	Deployment

4.4. Termination

4.4.1. Overview

The Termination stage of a maintenance project is the same as of a development project.

4.4.2. Work Products

Main outputs of this stage are defined in the table below.

No	Work Products	Severity	State	Process
1	Customer Satisfaction Survey	Mandatory	Completion	Software contract management
2	Project Report	Mandatory	Post Mortem	Software project management
3	Project Assets	Mandatory	Completion	Software project management
4	Acceptance Note	Mandatory	Completion	Software project management

Approver	Reviewer	Creator
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