To produce clean software, testing is understood as a key activity. However, testing is typically understood as the dynamic evaluation of behavior of code. Hence, testing can commence only after code is ready. The defects uncovered via testing are not necessary only due to poor construction of code; they may also be due faulty design and lack of clarity in requirements. The final code represents the translation of these technical requirements derived from the expectations of the customer.

The cost of fixing a requirement defect is 80 times expensive at the implementation phase.

Early stage evaluation of cleanliness of requirements, design can play a vital role in ensuring cost effective validation. It is generally understood that late stage identification of defects significantly increases the cost of fix by multiple times compared to early stage detection and fix. However the act of validation of early stage artifacts is far more challenging as these are fuzzier that code. Assessing the correctness of the code behavior which is a realization of the expectation is indeed far easier compared to statically assessing the correctness of requirements.

How is this different from the typical requirement review process?

Typically reviews/inspections are the means to identify defects in the early stage artifacts of SDLC. Reviews/inspections are a formal examination of the early stage document artifacts and the effectiveness of the review/inspection is dependent on the process rigor and maturity of the reviewers. This solution on the other hand, pursues the act of evaluation from scientific and disciplined perspective significantly complementing the effectiveness of a typical review process.

This solution is an adaptation of the STEM™ 2.0, the defect detection technology of STAG for evaluating requirement cleanliness. STEM is a scientific and disciplined approach to produce clean software. This approach based on STEM™ 2.0 is a scientific enquiry process that commences with understanding the various consumers and their expectations, formulating the cleanliness criteria, identifying the potential defect types, evolve a staged defect detection model, formulating the specific tests and then deriving a set of evaluation scenarios.

Contents of this Solution

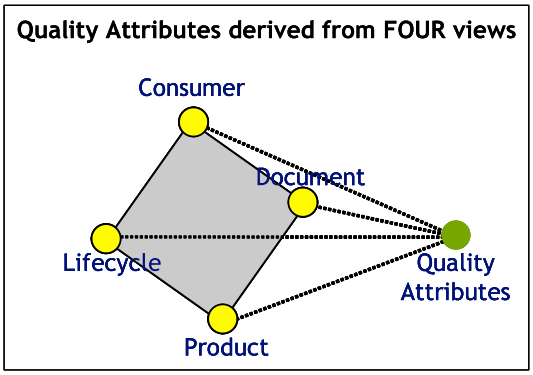
This solution outlines the attributes that a clean requirement should have from the various stakeholders' views and the potential defects that affect this. Then it outlines a staged defect detection model consists of various types of tests each of these focused on detecting specific types of defects. For each type of test, evaluation scenarios are enumerated and also the optimal order of execution of these.

Quality Attributes of CLEAN requirement

The quality attributes of requirements document is derived scientifically by viewing from four dimensions:

These attributes constitute the basis for arriving "Cleanliness Criteria" for a given requirements document.

Consumer	who are the users of the requirement and what do they expect
Lifecycle	what information is expected at each stage of the SDLC
Product	what are the expectations on the product and how are they satisfied by the requirements
Document	how clear and well organized is the requirement document



Defect catalog

The solution consists of a catalog of THIRTY+ (30+) defect types that should be detected to ensure clean requirements. These defect types are mapped to the quality attributes and the underlying four views. This defect type map clearly outlines how a type of defect may affect (a) final product (b) lifecycle (c) consumer and (d) document.

Staged defect detection model

This solution has a staged evaluation model that consists of TEN stages. Each stage consists of specific types of tests, each focused on uncovering specific types of defects. In total, there are about TWENTY+ (20+) types of tests.

Evaluation scenarios

The solution has a collection of standardized evaluation scenarios that are segregated by the test types. These are mapped to the defect types that it can uncover and quality attribute that it focuses on. The total number of evaluation scenarios number approximately SIXTY (60). Each scenario has a detailed execution steps wherever applicable to ease the execution.

Execution process model

This solution clearly the process model and the steps to be follow to ensure disciplined execution. The process model consists of FOUR main steps with sub-steps. Pre-conditions/criteria are listed wherever applicable to ensure efficient execution.

Process aids

This solution provides process aids in the form of templates, report formats and guidelines to aid in smooth implementation.

Measures of quality

This solution also contains the measures to objectively judge the quality of requirements and also the progress of quality during the process of evaluation.

Description of the theory of evaluation based on STEM 2.0

The solution outlines in detail the theory behind the design of this requirements evaluation method. This describes STEM 2.0 and its adaptation to evaluation of requirements.

Case study

Lastly this solution also contains an application on a real requirements document to illustrate its application.

Overview of the Evaluation Process

At a high level the evaluation process of this solution is as follows:

1.Create a baseline of features/use-cases
2.Identify the cleanliness criteria for each requirement based on the quality attributes proposed by this solution
3.Using the process model outlined, execute each test for each requirement
4.To execute each test, use the documented evaluation scenarios
5.Document the defects against the feature/use-case and the evaluation scenario
6.After executing all the evaluation scenarios, generate cleanliness report

This solution contains the various types of tests and the corresponding evaluation scenarios for each and hence no effort needs to be expended in designing evaluation scenarios.

Tool support

STEM Toolkit for Requirements evaluation is a tool that supports the implementation of this solution. It is a web based tool to allow the evaluator to follow the steps to evaluate the requirements using STEM 2.0 report issues, generate reports. The tool also guides the evaluator to follow the steps and ensure that the steps are performed in the optimal right order. In addition, it enables the project manager to manage defects and generate cleanliness & progress reports. The tool is also expected to aid the quality group to analyze metrics to allow for constant improvement of the process.

About STEM™ 2.0 in brief

STEM™ 2.0 is a scientific and disciplined way to uncover defects to produce clean software. It is a goal-focused approach with the goal being the potential defects to be uncovered being hypothesized, and the scientific approach to uncover these in a cost-effective manner. STEM 2.0 consists of STEM Core having of THIRTY TWO (32) scientific concepts that power a scientific thinking and STEM Way a goal-oriented process model made of EIGHT (8) disciplines organized in THREE (3) phases of evaluation.