

CHAPTER 3

TESTABILITY MEASUREMENT FRAMEWORK

3.1 INTRODUCTION

Measuring testability at design phase in the development life cycle always support and helps to produce high quality software within time and budget. It is very expensive and error prone decision to correct the design to get better testability after the coding has started. Considering view of this fact, in this chapter we propose a Testability Measurement Framework (**TMF^{OOD}**) for object oriented software at design phase. Proposed framework correlates the testability factors with object oriented design properties and also correlates design properties with object oriented design metrics. The developed framework reduces the gap between object oriented design properties, metrics and testability. This framework provides a method to develop a model to measures testability of object oriented software at design phase and makes it possible to produce reliable end product within time and budget.

3.2 MOTIVATION

The concerns that motivated us for the development of testability measurement framework are enumerated below.

- Present testability models and metrics for object oriented design (OOD) contain ambiguous details that limit applicability.
- Unavailability of testability measurement framework for OOD quality assessment with design level metrics, well defined in terms of design properties.

- Validation of quality characteristics values that help designers to produce quality oriented design.
- Provide step by step procedures/guidelines for developing a model to measure testability of OOD and producing what the customer wants.

3.3 FRAMEWORK SIGNIFICANCE

The framework has the following significance:

- Proposed framework provides proper guidelines for model development to measure testability of object oriented software at design phase.
- It may assist to find the object oriented design properties over the software testability measurement.
- It may help out to advancement in development techniques and methodologies of object oriented design over the estimation of software testability.
- It may assist to make up high quality reliable and testable software.
- It may facilitate to producing software that satisfies software requirement specifications.

3.4 TESTABILITY MEASUREMENT FRAMEWORK (TMF^{OOD})

Testability measurement framework for object oriented design considers that measurement is a guideline/tool for measuring testability and effectiveness of an estimation activity. Software testability measurement process involves both quantification and prediction with the help of the proposed testability measurement framework. This framework forms a roadmap to industry personnel and researchers

to develop a model to measure software testability at design phase of development life cycle.

The prescriptive framework is depicted in Fig.3.1. The proposed framework consists of seven phases. The subsection 3.4.1 to subsection 3.4.8 explains the 7 phases of the proposed framework.

3.4.1 Recognition of Testability Factor

Testability is a high level factor to software quality. In order to measure testability, its straight measures are to be recognized. In this phase, all testability factors are to be documented. After this, design phase factors will also be finalized keeping in view their impact on the overall testability.

3.4.2 Object Oriented Software Characterization

Object oriented software characteristics that have affirmative impact on testability measurement will be recognized in this phase. The prominent object oriented design properties are: Inheritance, Coupling, Cohesion and Encapsulation. The involvement of each property to boost the design will also be analyzed.

3.4.3 Recognition of Metric

Metric selection is important steps in measuring testability of object oriented design. Software metrics are measures that are used to quantify different attributes of the software products, software development resources and software development process in making their classes testable. A suite of object oriented metrics that covers design properties should be identified at this step.

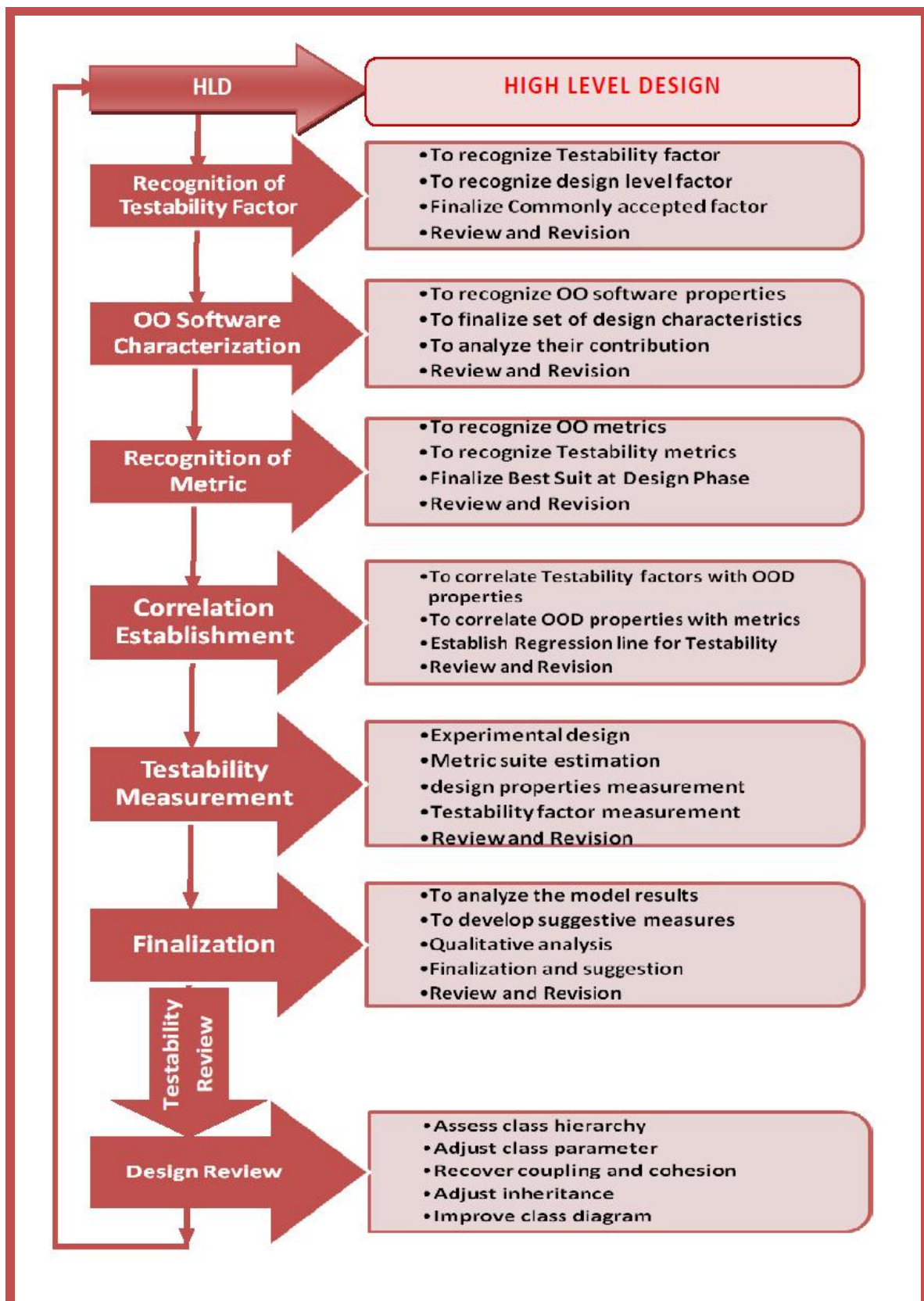


Fig. 3.1: Testability Measurement Framework (TMF^{OOD})

3.4.4 Correlation Establishment

This is the most important step of the proposed framework. In this step a correlation is established between the identified testability factors with object oriented design properties. A regression line can be established to measure testability factors in terms of design properties with the help of design metrics.

3.4.5 Testability Measurement

In this step, established hierarchical multiple regression analysis can be used to develop a model to evaluate software testability in terms of testability factors. Moreover, the association of testability with these factors needs to be tested and justified with the help of statistical procedures.

3.4.6 Finalization

In this step, results of the model are analyzed and on that basis suggestive measures can be proposed to review the design. The result should be used for review and revision of the identified design.

3.4.7 Design Review

On the basis of the results achieved from the finalization phase, the particular design is to be reviewed and revised to obtain better level of testability. Design characteristics are to be sincerely examined and may be adjusted as a result in order to achieve the acceptable index value.

3.4.8 Review and Revision

Review and revision is common in all phase of the testability measurement framework. In this course of action each phase of the framework are reviewed and

revised. Absolute suggestions and improvements are included in this step. The changes that occur at any stage may be included during the review and revision.

3.5 SUMMARY

A testability measurement framework for object oriented design has been proposed in this chapter. This framework gives a layout of steps that can be followed to develop a model for testability measurement. The framework comprises of seven steps namely Testability Factorization, Object Oriented Software Characterization, Recognition of Metric, Correlation Establishment, Testability measurement and Finalization, along with an added common step of Design Review. Order of the implementation of every step for testability measurement has been clearly mentioned in the proposed framework. This framework gives a generalized way to develop a testability measurement model.

In the next chapter we will talk about Modifiability estimation.