Object Oriented Maintainability Quantification Framework

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ABSTRACT

Quantifying maintainability at early stage in the software development cycle always support and assistances to deliver quality oriented software within time and cost. It is very expensive and error prone result to precise the design to get better maintainability after the coding has started. In view of this truth, in this paper we propose a Maintainability Quantification Framework ($\mathbf{MQF^{OOD}}$) for object oriented software especially at design phase. Developed framework relates the maintainability key factors with object oriented design properties and also relates design properties with object oriented design metrics. The proposed framework decreases the gap amongst object oriented design properties, related metrics and maintainability. This framework provides a system to develop a model to quantify maintainability of object oriented software considering at design phase and makes it possible to deliver consistent end product within time and cost.

Keywords

OBJECT ORIENTED, Framework, Maintainability, Modularity, Reusability, Analyzability, Modifiability and Testability, Design phase

1. INTRODUCTION

Quantifying maintainability at a later stage leads to the late arrival of desired information, leading to late decisions about changes in design. This basically increases cost and rework. Therefore, near the beginning, quantification of maintainability in the development process may improve quality and reduce maintaining efforts and costs [1, 2, 3, 5, 6, 7, 8]. Practitioners repeatedly advocate that maintainability should be planned early in the design phase [11, 12, 13, 14, 15, 16, 17]. Maintainability quantification in the early hours at design phase is highly emphasized in my proposed study; hence, considered important for the delivery of quality software. The concerns that inspired us for the development of maintainability quantification framework are listed below.

- Existing maintainability models and metrics for object oriented design and development contain ambiguous details that limit applicability [9, 10].
- Unavailability of maintainability quantification framework for object oriented design and development quality assessment through design level metrics, well

defined in terms of object oriented design properties [16].
- Authentication of quality-oriented characteristics values that support designers and developers to produce quality-oriented design [16].
- Make available step by step procedures/strategies for developing a model to quantify maintainability of object oriented design and producing what the client wants.

2. SIGNIFICANCE OF PROPOSED MAINTAINABILITY QUANTIFICATION FRAMEWORK

The proposed framework has the resulting importance/significance:

- Developed framework offers appropriate guidelines for model development to quantify maintainability of object oriented software considering at design phase.
- It may assist to discovery the object oriented design characteristics over the software maintainability quantification.
- It may support out to improvement in development procedures and methodologies of object oriented design over the quantification of software maintainability.
- It may assist to make up high quality reliable and maintainable software.
- It may facilitate to delivering software that satisfies software requirement
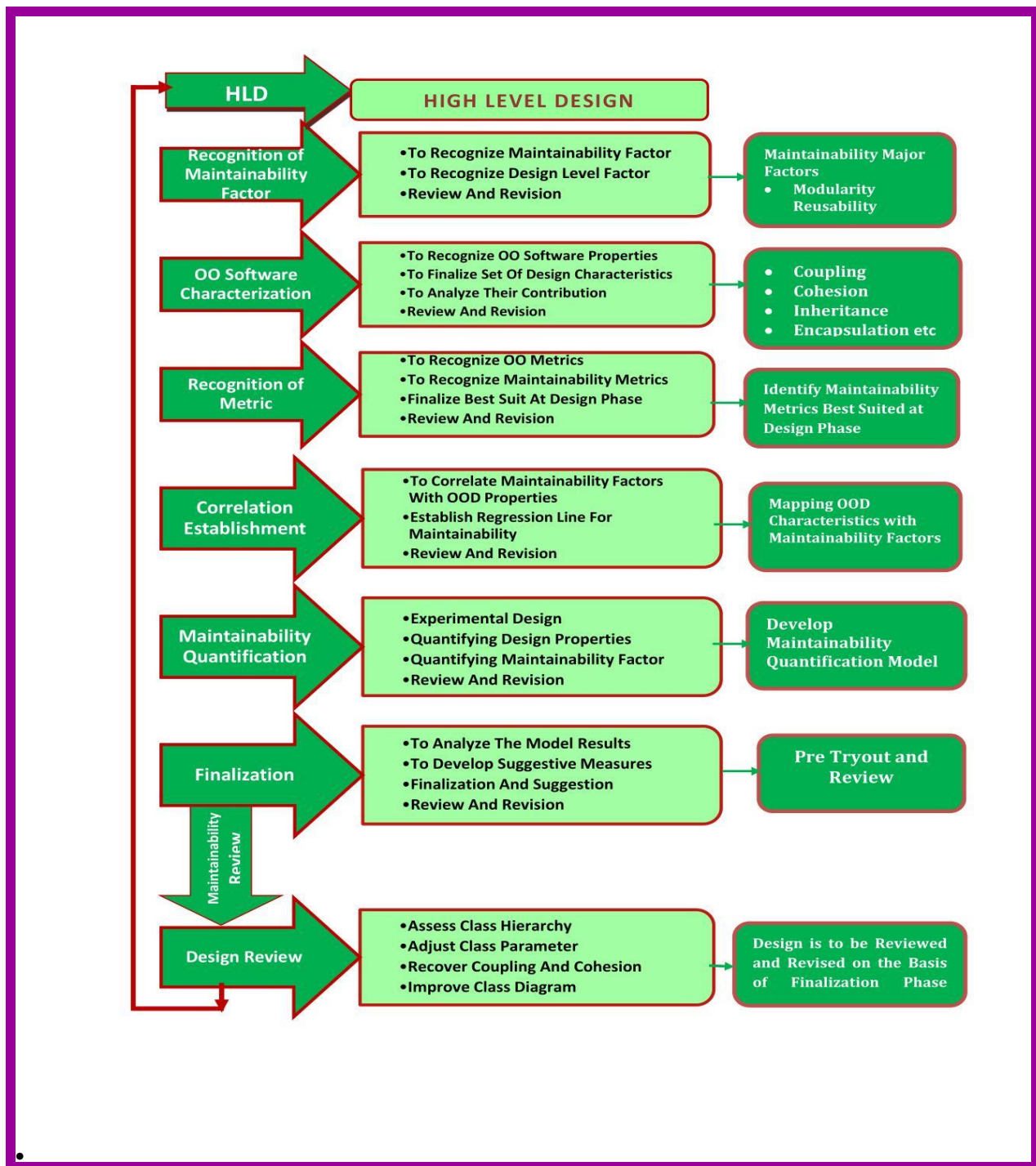- specifications.

Figure 1: Maintainability Quantification Framework (MQF^{OOD})

4. Maintainability Quantification Frameworks (MQF^{ood})

Maintainability quantification framework for object oriented design and development reflect that quantification is a guideline/tool for Quantifying maintainability and usefulness of an estimation activity. Object oriented software maintainability quantification process includes mutually quantification and prediction with the assistance of the developed maintainability quantification framework. Proposed framework constitutes a roadmap to software industry personnel's, quality controllers as well as researchers to develop a model to quantify software maintainability considering at initial stage especially at design phase of software development cycle. The proposed framework is showed in Fig. 1. The prescriptive framework comprises of seven different phases. The subclass 4.1 to subclass 4.8 describes the seven phases of the developed framework

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4.1 Identification of Maintainability Factors

Maintainability is a high-level software quality factor. In order to quantify maintainability, its straight measures are to be identified. In this stage, all related maintainability factors are to be documented. After this, design stage factors will also be decided keeping in view their influence on the overall maintainability.

4.2 Object Oriented Software Characterization

Object oriented software properties that have agreeing influence on maintainability quantification will be identified in this stage. The prominent object oriented design and development properties are: Encapsulation, Polymorphism, Inheritance and Coupling. The participation of each design property to increase the design will also be analyzed.

4.3 Identification of Metric

Design level metric selection is significant stages in Quantifying maintainability of object oriented design and development. Object oriented software metrics are measures that are used to enumerate dissimilar characteristics of the software products, software development properties and software development procedure in making their classes more maintainable. A set of object oriented design metrics that covers design properties should be identified at this phase.

4.4 Correlation Establishment

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

4.5 Maintainability Quantification

In this phase, recognized hierarchical multiple regression analysis can be applied to develop a model to quantify software maintainability in terms of maintainability factors. Moreover, the association of maintainability with these factors needs to be tested and justified with the help of statistical procedures.

4.6 Finalization

In this step, outcomes of the developed maintainability model are examined and on that base suggestive measures can be planned to review the design. The outcomes should be used for review and revision of the recognized design.

4.7 Design Review

On the basis of the outcomes attained from the finalization stage, the specific design is to be reviewed and revised to attain better level of maintainability. Design properties are to be honestly scrutinized and may be adjusted as an outcome in order to attain the satisfactory index value.

4.8 Review and Revision

Review and revision is mutual in all stage of the maintainability quantification framework. In this sequence of action each stage of the framework is reviewed and revised. Complete suggestions and enhancements are comprised in this phase. The variations that arise at any step may be included throughout the review and revision.

5. Conclusions

A maintainability quantification framework for object oriented design has been developed in this paper. This framework gives an outline of phases that can be followed to develop a model for maintainability quantification. The developed framework contains of seven steps namely Identification of Maintainability Factor, Object Oriented Software Characterization, Identification of Metric, Correlation Establishment, Maintainability quantification and Finalization, sideways with a supplementary common step of Design Review. Direction of the implementation of every step for maintainability quantification has been undoubtedly stated in the developed framework. Proposed framework provides a widespread way to develop a maintainability quantification model.

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