A Comparitive Study of: Quality Assessment of Object Oriented Software at Design Level

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***Abstract*–In this paper we approach a quality assessment tool which will achieve the quality parameter at the design level . Earliar , In every case we check the quality after the completion of software means when software is coded and ready to use then we come to know that high quality software is achieved or not. The need of Quality assessment in Object Oriented Software is very essential .In Earlier model , ISO9126 introduced a type of quality in use having four elements- Effectiveness , Productivity, Safety and Satisfaction. ISO9126 defines the quality parameters- Functionality, Reliability , Usability, Efficiency, Maintainability ,Portability. In 1994, Chidamber and Kemerer proposed six OO design and complexity metrics known as CK metrics suite. We approach to incorporate a quality assessment tool which will check the Quality of the software at design level with the help of UML parser .This will reduce the development cost of OO software of low design quality software which causes system to exhibit low maintainability, low reuse , high complexity and fault prone because with the help of this approach we will be able to achieve high quality software at design level**

Index Terms- Quality hierarchy, Quality Attribute , Design Properties

I. INTRODUCTION-

Today , In this era we are highly dependent on software for our work in various field so the need of intangible asset Quality is increasing day by day.' Quality'[1] is the confirmation of prescribed requirements. Quality is an asset which is intangible means it can't be measured or graded it only can be judged or felt. Assessment of software quality varies from people to people . confirmation of prescribed requirements. Quality is an asset which is intangible means it can't be measured or graded it only can be judged or felt. Assessment of software quality varies from people to people . it's depends on their point of view[2]that makes the direct quality assessment difficult. Software quality models [3] are used for explaining the quality factors of a software product of any nature or of any a software region. A Software quality models and their metrics can be used in various contexts, like during the development of a new application [4,2] or during selection of the commercial components [5].Earlier which quality assessment elements was used that are changed due to OO paradigm. As OO uses different notation such as encapsulation, polymorphism , inheritance –this inculcate new metrices to quantify the products of Object Oriented paradigm[6],[7],[8] . ISO-9126, a Software Product Evaluation Standard published by the International Standards Organization (ISO) in 1991, defines software quality using attributes like reliability, portability, usability, functionality, efficiency and maintainability. Since these are relatively higher level attributes, they can be further defined in terms of certain sub-attributes like Functionality (accuracy, compliance, suitability, interoperability and security), Reliability (maturity, fault-tolerance, and recoverability), Usability (understandability, learnability, and operability), Efficiency (time behaviour, and resource behaviour), Maintainability (analyzability, stability, testability and changeability), Portability (adaptability, replaceability, conformance, and installability) [9].The overallcost of developing a software product is ruined when its quality parameters are not satisfactory and it is turned into a low quality software so to overcome from this situation we have some sets of objectives:

- Analysis of existing metrics and measures for design strength and quality of object oriented software.
- To Identify where the existing measure limits and to find out the defects
- Development of new measure to achieve a high quality software
- Development of new method to assess the design strength of OO software

II. LITERATURE SURVEY

Measurement of software quality is primarily based on software quality metrics. Indirect models have been developed by researchers to measure software product quality by using a set of quality attributes, characteristics and metrics [10],[11],[13]. The main assumption for determining the quality models is that external product attributes are influenced by characteristics of internal products and also evaluation of internal characteristics concludes about external quality attribute of products [9],[11],[6].

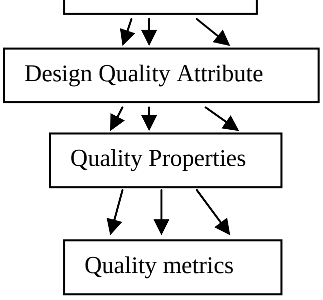

Figure: 1 Design Quality Hierarchy

2.1 EARLIER MODELS

The quality model presented by Jim McCall et al, (also known as the General Electrics Model of 1977) is one of the most renowned predecessors of today's quality models [14].For determining the product quality of Software, McCall quality model gives three major aspects:

a) Product revision ability to undergo changes.
b) Adaptability to new environments
c) Product operations its operation characteristics.

Barry W. Boehm's quality model (1978) is the second basic and commencing predecessors of today's quality models [15].Overall quality level contributed by a hierarchical quality model, structured around primitive, intermediate and high level characteristics presented in both Boehm's as well as in McCall's quality model[11].R. Geoff Dromey's quality model [16] is the most recent model that is similar to McCall's and Boehm's quality model. Being a product based quality model, it emphasizes the fact that quality evaluation differs for each product and also there is a need for a more dynamic idea for modeling the process that can be applied for product transition in different systems [6]. Elements of this model are:

- Product properties that influence quality
- High level quality attributes
- Means of linking the product properties with the quality attributes.

ISO 9126 is the software product evaluation standard from the International Organization for Standardization. It defines six properties which describe software quality and minimum overlap. ISO9126 also introduces another type of quality-quality in use-having following elements [9]:-

- Effectiveness
- Productivity
- Safety
- satisfaction

ISO9126 describe the following quality parameters: funtionality,reliability,usability,efficiency,maintainability,portability with the advent of object oriented programming coupling, cohesion, inheritance & abstraction have been identified as the basic properties of software design quality. Based on above properties, numbers of metrics have been proposed to evaluate the design quality of object oriented software. Based on his experiences in Object Oriented software developments, Lorenz (1993) proposed eleven metrics as OO Design Metrics [13].

2.2 CK METRIC SUITE

In 1994, Chidamber and Kemerer [6] proposed six OO design and complexity metrics, which later became the commonly referred to CK metrics suite.These metrics are based on Bunge's ontology as the theoretical basis and analytically evaluated against Weyuker's measurement principles. All these metrics incorporate the concept of inheritance,coupling&cohesion.WMC,DIT,NOC,CBO,RFC , LCOM. Usefulness of the CK metrics suite for predicting the probability of detecting faulty classes, Basili and Colleagues (1996) performed an empirical study over the CK metrics [17].

2.3 MOOD METRIC SUITE

The MOOD (Metrics for Object Oriented Design) metrics set refers to a basic structural mechanism of the OO paradigm as encapsulation (MHF and AHF), polymorphism (PF), message-passing (CF) and are expressed as quotients[17],[18].Method Hiding Factor (MHF),Attribute Hiding Factor (AHF),Method Inheritance Factor (MIF),attribute Inheritance Factor (AIF),Polymorphism Factor (PF),Coupling Factor (CF)

2.4 QMOOD METRIC SUITE

Bansiya J. et. al. [19] presented a hierarchical model named as QMOOD for assessment of design quality of Object Oriented Software Systems in quantitative terms using various lower level and higher level quality metrics / parameters. This model has lower level design metrics each corresponding to a design property and quality is calculated as an aggregation of high level quality attributes.The high level metrics are assessed using weighted OO properties. The QMOOD is a comprehensive quality model that establishes a clearly defined and empirically validated model to assess OOD quality attributes such as understandability and reusability and relates it through mathematical formulas, with structural OOD properties such as encapsulation and coupling. The QMOOD model consists of six equations that establish relationship between six OOD quality attributes and eleven design properties.All these are measurable directly from class diagrams, and applicable to UML class diagrams.

III. PROPOSED SOLUTION

The approach for assessment of software design quality will take UML diagrams of the selected object oriented software as input and calculates the design quality. UMLet tool will be used for creating the UML diagrams of the selected software. Design metrics will be fetched from the UML diagrams using a parser developed by us. The design quality has been assessed through metric values using a hierarchical model. The design quality attributes will be assessed on the following equations[19] :-

- Reusability=0.25*Coupling+0.25*Cohesion+0.5* Messaging+0.5*Design Size
- Flexibility=0.25*Encapsulation-0.25*Coupling+0.5*Composition+0.5*Polymorphism
- Understandability=0.33*Abstraction+0.33*Encapsulation-0.33*Coupling+0.33*Cohesion-0.33*Polymorphism-0.33*Complexity-0.33*Design
- Functionality=0.12*Cohesion+0.22*Polymorphism+0.22*Messaging+0.22*Design Size+0.22*Hierarchies
- Extendibility =0.5*Abstraction-0.5*Coupling +0.5*Inheritance +0.5*Polymorphism
- Effectiveness=0.2*Abstraction0.2*Encapsulation+ 0.2*Composition+0.2*Inheritance+ 0.2*Polymorphism

IV. CONCLUSIONS

Identification of an optimal set of metrics that play decisive role in both design quality as well as product quality shall be of great importance for academicians, software engineering researchers and object oriented software industry. The proposed model for assessing the quality of a project during the early phases (design phase) of development process with the help of UML parser will prevent the wastage of time, development cost and resources during software development. The design based approach of measuring software quality turns out to be extremely fruitful in all aspects in judging the software quality either individually or comparative

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