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RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

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AN APPROACH TO EVALUATE SOFTWARE QUALITY MODEL

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ABSTRACT

Everyone has an idea about the meaning of quality. Software metrics and quality models play a pivotal role in measurement of software quality. There are many quality models and attributes used in both industries as well as in academia. However, we faced many issues related to existing software metrics and quality models during our research on measuring software quality using design patterns,. The goals of this work are to propose a systematic way of specifying the relevant quality attributes and their sub characteristics. In this paper, we present an approach of quality model for CBSE. Our model adopts the weight of quality characteristics which are obtained by carefully selected questionnaires for the stakeholders and Analytic Hierarchy Process (AHP) technique. AHP process is useful because we can know the importance of the sub characteristics that have been added in characteristics. We also present the evaluation process using checklists and result of a trial evaluation for validation of our model. As, a result, we believe that the proposed model helps to acquire high quality software.

KEYWORDS

Software quality model,, software matrics.

INTRODUCTION

As it is known that Component-Based Software Engineering (CBSE) is an emerging paradigm of software development, its goal is composing applications with plug & play software components on the frameworks. CBSE is aiming at realizing long-waited software reuse by changing both software architecture and software process. In CBD, an important role is laid by the Quality of the Software which is made by using different components.

COMPONENT BASED SYSTEM AND OBJECT ORIENTED APPROACH

OBJECT ORIENTED APPROACH

The OO paradigm emphasizes the creation of classes and that classes encapsulate both data and the algorithms that used to manipulate the data.

OO development is a conceptual process. It is not a programming technique. It can serve as a medium for specification, analysis, documentation, and interfacing, as well as for programming.

An object-oriented system programmed with an OOPL reduces the complexity in the system design and implementation, which in turn increase the maintainability. The Object Oriented approach had various advantages like Portability, code sharing etc.

DISADVANTAGES OF OO APPROACH

Inefficiency: One drawback to using object-oriented paging schemes is the fact that they can't really handle huge data structures efficiently.

Another major drawback to an object-based system is the overhead involved in handling replacement and defragmentation.

COMPONENT

Components can be defined as binary unit of independent production, acquisition and deployment that on interaction forms a functioning system. Components are run time entities, as they exist while the system is running, it is important to mention that the component is just not a design entity like classes in object orientation.

Some developers think that developing components is easy as they are same as objects. But the fact is, components and objects are not same but have a lot in common, so developing them is similar as that of making object in object oriented. A developer should consider few important aspects while developing components such that:

1. The challenge is to build a component which is safe, robust with maintaining its ease and lightweight.
2. To design generic components which can be reusable in all different kind of environment.

According to Clements, CBSE embodies the “the ‘buy, don’t build’ philosophy" and also that “in the same way that early subroutines liberated the programmer from thinking about details, CBSE shifts the emphasis from programming to composing software systems”.

DEVELOPING SOFTWARE SYSTEMS USING CBSE OFFERS MANY ADVANTAGES

- Development costs are reduced since existing components are used to develop the systems.
- Reliability is increased since the components has previously been tested in various contexts.
- Time to market is reduced since the components used already exist.
- Maintenance costs are reduced.
- Efficiency and flexibility is improved due to the fact that components can easier be added or replaced.

Nowadays many researchers have interest in evaluating software products using the standards. However, these standards for software quality do not provide the guidelines to apply the quality model and Quality is multidimensional construct reflected in the quality model, where each parameter in the model defines a quality dimension. A metrics measurement-based framework, linked to a quality model, is a requirement for effective software production and quality. There are a number of requirements that need to be met by a quality model, in order for confidence to be gained that the model correctly captures quality requirements, and correctly reflects how well those requirements have been met. A quality model links together and defines the various software metrics and measurement techniques that an organization uses. The aim of this study is to present a new approach to quality modeling which seeks to combine the previous hierarchical modeling approaches, whilst resolving conflicts of opinions of quality, so that quality measurement can be both tailored to a local environment and potentially can be compared across projects. By concentrating on removing conflicts of opinion between the Essential Views a consensus can be reached as to what properties constitute quality and how quality should be measured. It will also discuss what quality is by presenting a number of high-profile quality gurus together with their thoughts on quality (which in some cases actually results in a more or less formal quality model).

METHODOLOGY

Steps to be followed to carry out this research are:

STEP 1:- The research on the quality model of component based system starts with the study of what the components are, CBSE, its development life cycle. However quality is said to be composition of different attributes of a software product or component. Software quality attributes attempt to explain all aspects of a software system, and it is therefore a very wide concept.

STEP 2:- various attributes are calculated and studied based on the study of various existing quality models for general systems and CBS. When describing the quality of a software component one will have to choose a suitable set of quality attributes for the description of the system (or components). The aspects studied and difficulties encountered in this step are: Which quality characteristics and quality attributes should be considered?

STEP 3:- After the study of various quality attributes and quality models, a new quality model for CBS is proposed and evaluated using AHP technique. A quality model is the set of characteristics and sub characteristics, as well as the relationships between them that provide the basis for specifying quality requirements and for evaluating quality of the product or component.

RESULT

The final score of characteristics and their sub characteristics are calculated from the evaluation values of quality characteristics and their sub characteristics. The weights assigned to them are added. Then the individual total of characteristics is divided by the grand total of all the sum of weights of characteristics which gives how much important a certain factor is in the quality evaluation. The ranking vector values sum equal to 1.0 so each characteristic and sub characteristics can be roughly compared on percentage basis. For e.g. Functionality is given 21.5% importance whereas Portability is just 10.5% important.

Same process is done with sub characteristics. The weight of characteristics affects the weight of its sub characteristics. Like Security is 4.3% of 21.5% of Functionality and Reusability is 2.3% of 10.57of Portability.

Following tables show the weight profile of Characteristics and sub Characteristics:

TABLE 1: WEIGHT PROFILE OF CHARACTERISTICS

Characteristics	Weights
Functionality	0.2151
Reliability	0.1962
Usability	0.1736
Efficiency	0.1660
Maintainability	0.1434
Portability	0.1057

TABLE 2

Characteristics	Sub- characteristics	Weights
Functionality	Accuracy	0.0377
	Interoperability	0.0336
	Compliance	0.0430
	Security	0.0348
	Suitability	0.0246
	Complexity	**0.0413**
Reliability	Maturity	0.0640
	Recoverability	0.0706
	Fault Tolerance	0.0615
Usability	Learnability	0.0521
	Operability	0.0590
	Understandability	0.0624
Efficiency	Time behavior	0.0775
	Resource behavior	0.0885
Maintainability	Analyzability	0.0286
	Stability	0.0306
	Testability	0.0294
	Changeability	0.0226
	Trackabilty	**0.0321**
Portability	Installability	0.0186
	Conformance	0.0203
	Replaceability	0.0217
	Adaptability	0.0220
	Reusability	0.0231

CONCLUSIONS

Different studies conducted in recent time's show that the number of software products built using Component Based Development is rapidly increasing. So, a model which ensures its Quality Characteristics becomes a necessity. The most critical task in it is to identify and evaluate the suitable quality characteristics for CBS. Although, there're several quality models but none of them is entirely dedicated to the CBS.

In this thesis, a detailed study of already available quality models is done and described. Features of these models have been studied, analyzed and outlined. Specifically, Functionality of a software product was not considered directly by McCall's model. No suggestion about measuring the quality characteristics has been found in Boehm's model. FURPS model fails to take account of the software product's Portability. ISO 9126 has the limitation of not showing very clearly how certain quality aspects can be measured. The disadvantage of Dromey's model is associated with Reliability and Maintainability. It is not feasible to judge these two attributes of a system before it is actually operational in the production area.

Among all the existing models that have been studied, we found the ISO 9126 is the most appealing model, irrespective of some limitations. For this reason, I based the new model on the ISO 9126. I followed a three step methodology for building the new model that is specialized in evaluating COTS components. In step 1, the study of what the components are, CBSE, its development life cycle is done which is followed by the step 2, various attributes are calculated and studied based on the study of various existing quality models for general systems and CBS. When describing the quality of a software component one will have to choose a suitable set of quality attributes for the description of the system (or components). After the study of various quality attributes and quality models, a new quality model for CBS is proposed and its attributes are evaluated using one of the evaluation techniques: Analytic Hierarchy Process (AHP).

With increasing the software applications and the critical risks due to the low quality software, the importance of high quality software development has been getting more important than ever. Therefore, for quality evaluation it is necessary to remove subjective and traditional evaluation patterns and to accept an objective approach that develops software considering quality characteristics from the beginning stage and performs each step's quality evaluation thoroughly.

In this paper, Analytic Hierarchy Process is used to evaluate the quality characteristics of the proposed quality model. This process is also useful because it evaluated the quality characteristics which have been added so that their importance can be known. This is done by assigning weights to the attributes.

Here, this is done with AHP technique where expert groups decide weights of quality characteristics. And then, we show weights of quality characteristics and sub characteristics based on questionnaire given to the expert groups which include all personnel in software development. This result makes a step forward in presenting the quantitative relationships among quality characteristics rather than qualitative one among them. The result of the evaluation shows that the attributes added for CBS are also desired by the professionals and given their due importance

The Quality Model proposed is accepted by the 20 professionals who are working in software industry in the field of J2EE, .NET and other CBS techniques.

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