Measurement of Software Quality

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Agenda

- Recap of Software quality views
- Measurement on User's View
- Measurement on Manufacture's View
- Why to Measure Defect count?
- Quality and Cost
- Case Study
- SQALE(Software Quality Assessment based on Lifecycle Expectation) Model

Measurement of User's View

Key terms to Measure:

1. Functionality
2. Reliability
3. Usability

Identify the external quality attributes of a system. Examples: functionality, Usability and reliabilty.

- How many Functionality of a product delivers ? Is a metric to measure.
- It is measured through the following mannner: Number of test cases passed by the functionalities / Total number of test cases designed to verify the functionalities
- Reliability : measured by counting the number of faults or the failure rate of a system.

Measurement on Manufacture's View

- Defect count (During Development + During Operation)
- Rework cost : how much it costs to fix the defects. pre-release (development) rework cost: is a measure of development efficiency post-release (oparation) rework cost: is a measure of delivered quality.

Why to measure defects

- Defect density is useful to quantify the various phases involved in the software development.
- Let us assume that a large fraction of the defects are introduced in the requirements gathering phase, and those are discovered during system testing. Then, we can conclude thatrequirement analysis was not adequately performed.

- Defect density is useful measure to compare defects across modules.
- if a large number of defects are found in a communication module in a distributed application, more resource could be allocated to train developers in the details of the communication system.

- The ratio of the number of defects found during the operation of the end product to the total number of defects is a measure of the effectiveness of the entire gamut of test activities.

Cost and Quality

- Cost and schedule can be predicted and controlled by mature organizational processes.
- However, process maturity does not translate automatically into product quality.
- Poor quality eventually affects cost and schedule because software requires tuning, recoding, or even redesign to meet original requirements.

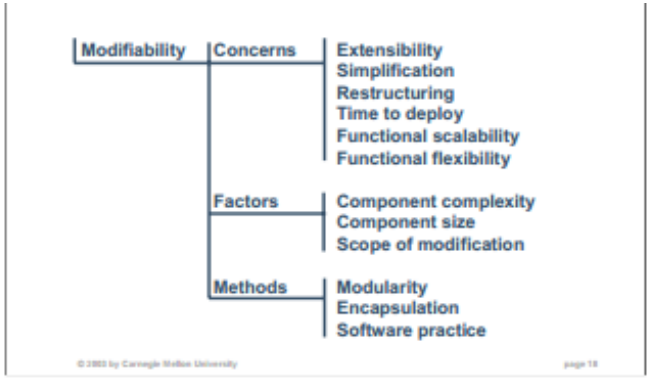
Cost and Quality

- The earlier a defect occurs in the development process, if not detected, the more it will cost to repair.
- The longer a defect goes undetected the more it will cost to repair.

Cost and Quality

- Is Quality product cost more production?
- Is Quality directly propositional to Sales?
- Is Quality is related to maintanence?
- Is Quality is related to process standarad?

Quality attribute Modifiability



Concerns

- Extensibility - adding/enhancing/repairing functionality
- Simplification - streamlining/simplifying functionality
- Restructuring - rationalizing services, modularizing/optimizing/creating reusable components
- Time to deploy - time taken from specifying a requirement for new capability to the availability of that capability
- Functional scalability - ability to scale both up/down in terms of users, system throughput, availability, etc.
- Functional flexibility - turning an existing capability to new uses, new locations, or unforeseen situations

Factors

- Component complexity - in general the more complex the components, the more difficult they are to change
- Component size - smaller components are generally easier to modify than large ones
- Scope of modification - architecture level modifications are more difficult; may involve a complete redesign with different components and interactions

Methods

- Modularity - partition a system into distinct modules representing separate areas of functionality; a classical modifiability technique

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Figure : First Level

Case Study

A failure in updating the software to reflect the new fee structure for various services under the Motor Vehicles Act brought work at Regional Transport Offices (RTOs) in the city to a grinding halt. A senior official of the Transport Department said all the services, including vehicle registration and issue of fitness certificates and driving licences had to be stopped because of the change in the fee structure announced by the Central government. Earlier, the fee for getting a driving licence was 350 but now, the fee has been increased to 640. Similarly, the vehicle registration fee has also seen a hike in the range of 500 -1,000. According to officials, all transactions are carried out digitally and the failure to update the software with the new fee structure has led to all work getting stopped, affecting thousands of people.The new fee structure announced by the Centre came into effect on December 29, but the Transport Commissioner here issued a circular about the fee hike only on January 5.

Questions

- What is the Quality Attribute affected ?
- What are the causes for the problem ?
- How it can be solved in future ?
- Will the rework cost more ?

SQALE - Quality Framework or Model

Principles

- quality of the source code is a non-functional requirement
- Formalising requirements in relation to the quality of the source code
- Assessing the quality of a source code
- Cost remediation to meet the Quality
- assesses the importance of a non-conformity quality
- SQALE Methods Quality Model is orthogonal
- SQALE Method uses addition for aggregating the remediation costs, the non-remediation costs and for calculating its indicators

SQALE

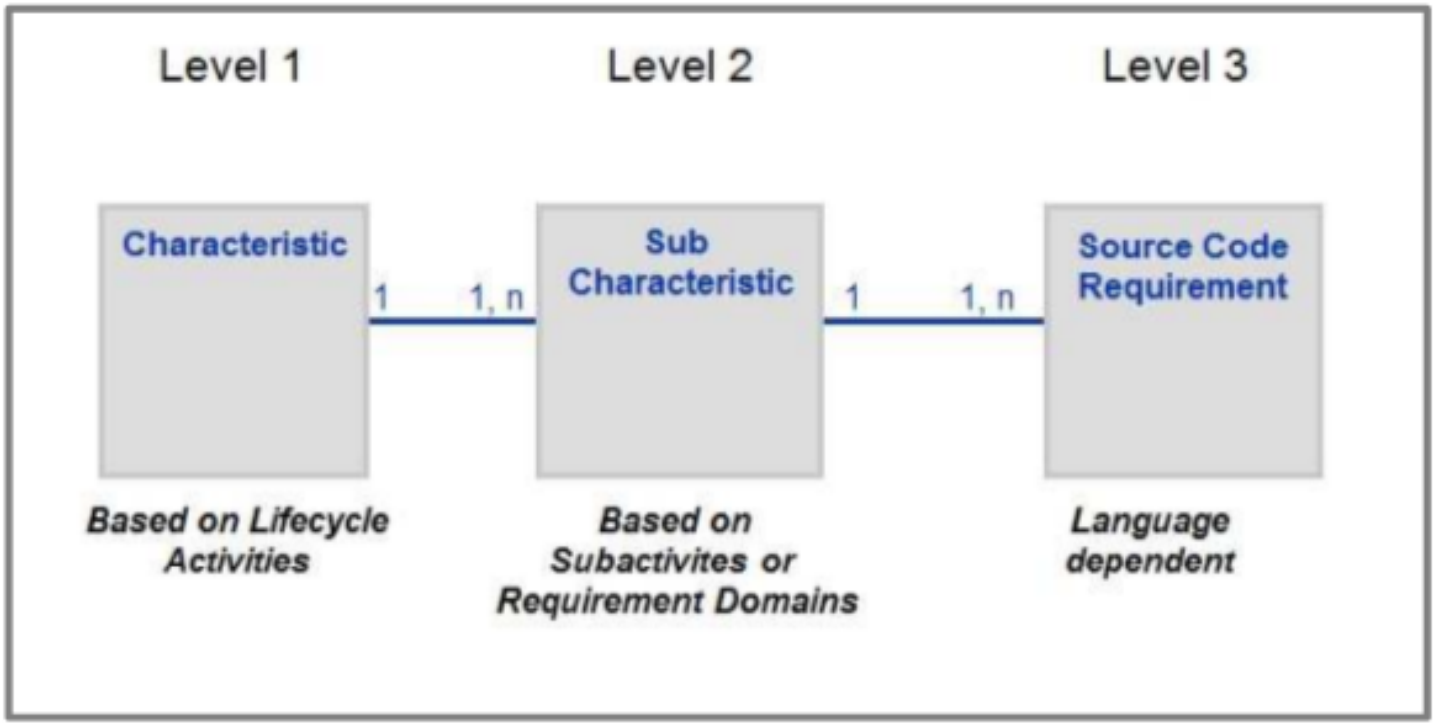

Figure : Classification

Figure : First Level

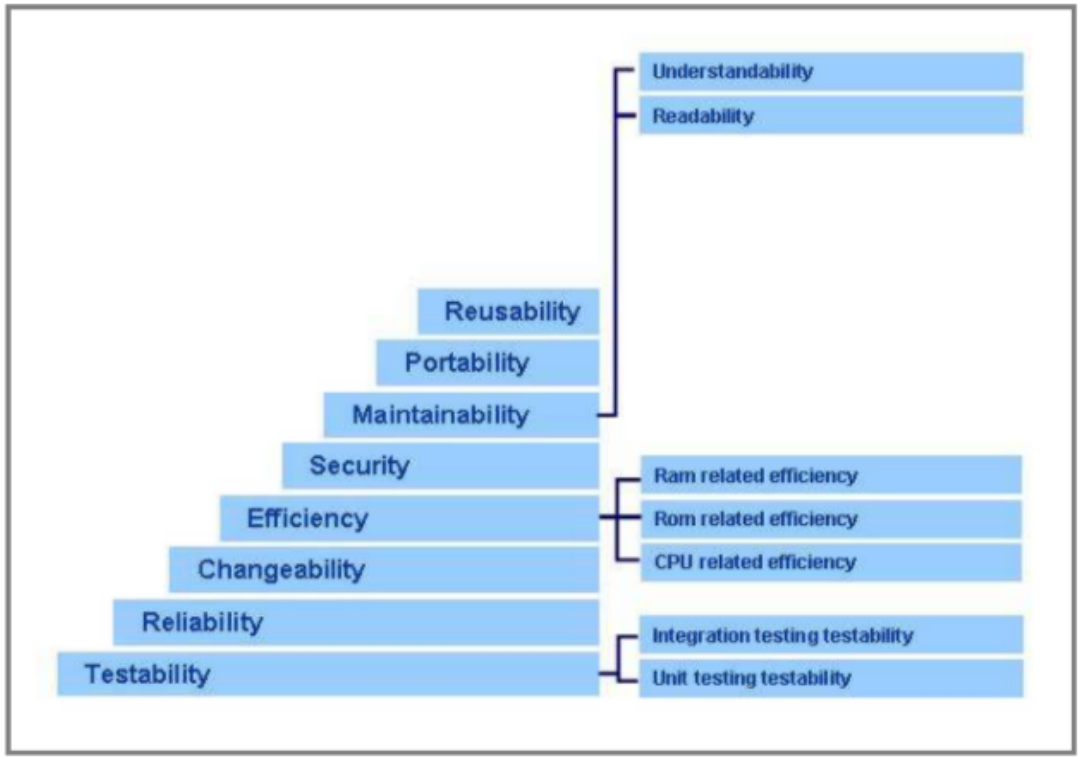

Figure : Second Level

References I

[1] K.Naik, *"Software Testing and Quality Assurance Theory and Practice"*, Chapter 17

Thank you