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Software Quality Factors

The most important elements for achieving software quality is the requirements document.

All the software projects satisfactorily fulfilled the basic requirements for correct calculations.

All the software projects suffered from poor performance in important areas such as maintenance, reliability, software reuse, or training.

The cause for the poor performance of the developed software projects in these areas was the lack of predefined requirements to cover these important aspects of the software's functionality.

Software Quality Factors

There is a need for a comprehensive requirements definition that will cover all attributes of software and aspects of the use of software, including usability aspects, reusability aspects, maintainability aspects, and so forth in order to assure the full satisfaction of the users.

The great variety of issues related to the various attributes of software and its use and maintenance, as defined in software requirements documents, can be classified into content groups called quality factors.

McCall's Quality Factor Model

The classic model of software quality factors, suggested by McCall, consists of 11 factors.

McCall's factor model classifies all software requirements into 11 software quality factors.

McCall's Quality Factor Model

Product Operation Factors

Correctness, Reliability, Efficiency, Integrity, Usability

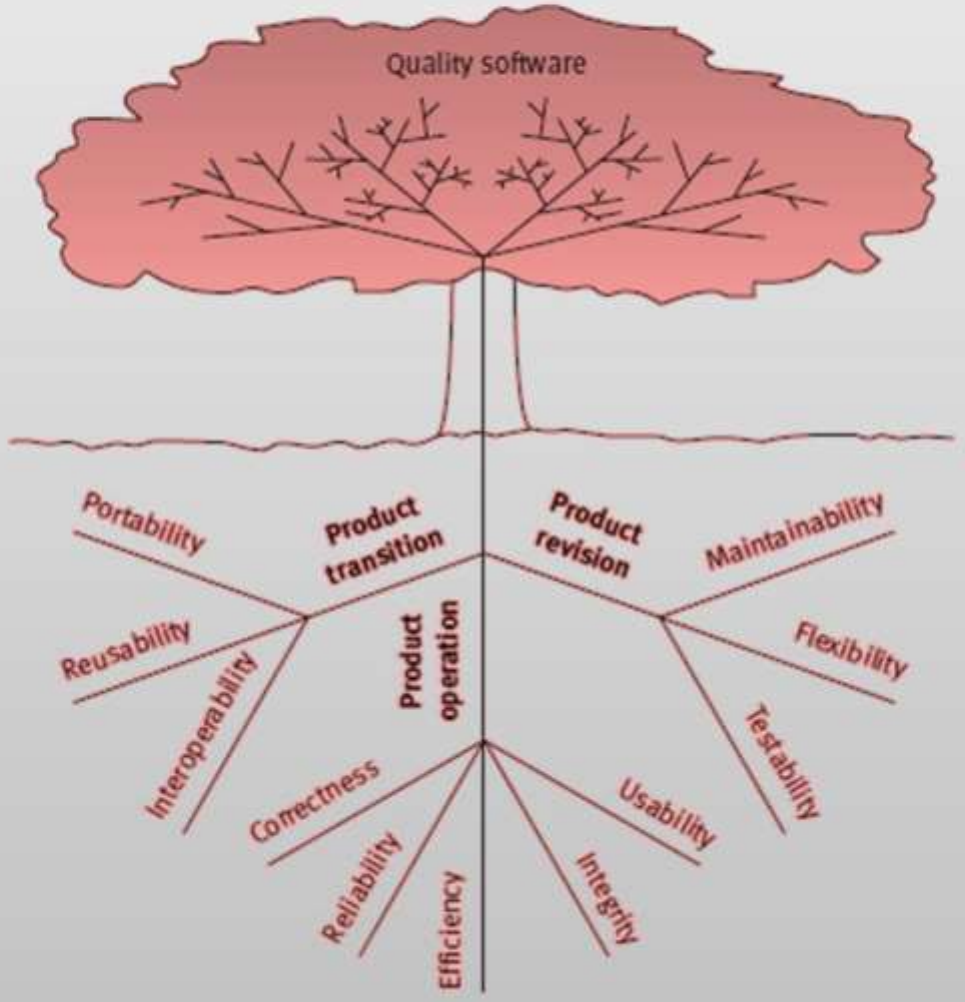
Product Revision Factors

Maintainability, Flexibility, Testability

Product Transition Factors

Portability, Reusability, Interoperability

McCall's Quality Factor Model



McCall's Quality Factor Model

Product Operation Factors Directly affect the daily operation of the software.

1. Correctness

Correctness requirements deals with a list of the software system's required outputs, such as a query display.

- The output mission - different types of report
- The accuracy of those outputs
- The completeness of the output information
- The up-to-date ness of the information
- The availability of the information - the reaction time
- The standards for coding and documenting the software system

McCall's Quality Factor Model

Product Operation Factors Directly affect the daily operation of the software.

2. Reliability

Reliability requirements deal with failures to provide service.

They determine the maximum allowed software system failure rate of

- The entire system
- Its separate functions

McCall's Quality Factor Model

Product Operation Factors Directly affect the daily operation of the software.

3. Efficiency

Efficiency requirements deal with the hardware resources needed to perform all the functions of the software system.

The main hardware resources to be considered are the computer's

- Processing capabilities
- Data storage capability
- Data communication capability

McCall's Quality Factor Model

Product Operation Factors Directly affect the daily operation of the software.

4. Integrity

Integrity requirements deal with the software system security - requirements to prevent access to unauthorized persons.

5. Usability

Usability requirements deal with the scope of staff resources needed to train a new employee and to operate the software system.

McCall's Quality Factor Model

Product Revision Factors Deal with the software maintenance activities.

Corrective Maintenance

Adaptive Maintenance

Perfective Maintenance

McCall's Quality Factor Model

Product Revision Factors — Deal with the software maintenance activities.

Corrective Maintenance

Correction of software faults and failures

McCall's Quality Factor Model

Product Revision Factors — Deal with the software maintenance activities.

Adaptive Maintenance

Adapting the current software to additional circumstances and customers without changing the software

McCall's Quality Factor Model

Product Revision Factors — Deal with the software maintenance activities.

Perfective Maintenance

Enhancement and improvement of existing software with respect to locally limited issues

McCall's Quality Factor Model

Product Revision Factors	Deal with the software maintenance activities.

6. Maintainability

- Maintainability deals the efforts that will be needed by users and maintenance personnel to identify the reasons for software failures, to correct the failures, and to verify the success of the corrections.
- The main factors considered are the modular structure of software, the internal program documentation, and the programmer's manual.

McCall's Quality Factor Model

Product Revision Factors — Deal with the software maintenance activities.

7. Flexibility

- Deals with the efforts required to support adaptive maintenance activities
- These include the resources required to adapt a software package to a variety of customers.
- Also support perfective maintenance activities, such as changes and additions to the software in order to improve its service.

McCall's Quality Factor Model

Product Revision Factors	Deal with the software maintenance activities.

8. Testability

- Testability deal with the testing of an information system and its operation.
- To find out whether all components of the software system are working in order.
- Also support automatic diagnostic checks to detect the causes of software failures.

McCall's Quality Factor Model

Product Transition Factors Deals with the adaptation of software to other environments and its interaction with other software systems

9. Portability

- Portability requirements deals with the adaptation of a software system to other environments consisting of different hardware, different operating systems.
- These requirements make it possible to continue using the same basic software in different situations or to use it simultaneously in different hardware and operating systems.

McCall's Quality Factor Model

Product Transition Factors Deals with the adaptation of software to other environments and its interaction with other software systems

10. Reusability

- Reusability deal with the use of software modules originally designed for one project in a new software project currently being developed.
- They may also enable future projects to make use of a given module or a group of modules of the currently developed software.
- The reuse of software is will save development resources, shorten the development period, and provide higher quality modules.

McCall's Quality Factor Model

Product Transition Factors Deals with the adaptation of software to other environments and its interaction with other software systems

11. Interoperability

Interoperability requirements focus on creating interfaces with other software systems or with other equipment firmware

McCall's Quality Factor Model Summary

Factor model	Software quality factors	Sub-factors
McCall's model: Product operation category	Correctness	Accuracy Completeness Up-to-dateness Availability (response time) Coding and documentation guidelines compliance (consistency)
	Reliability	System reliability Application reliability Computational failure recovery Hardware failure recovery
	Efficiency	Efficiency of processing Efficiency of storage Efficiency of communication Efficiency of power usage (for portable units)
	Integrity	Access control Access audit
	Usability	Operability Training

McCall's Quality Factor Model Summary

Factor model	Software quality factors	Sub-factors
McCall's model: Product revision category	Maintainability	Simplicity Modularity Self-descriptiveness Coding and documentation guidelines compliance (consistency) Document accessibility
	Flexibility	Modularity Generality Simplicity Self-descriptiveness
	Testability	User testability Failure maintenance testability Traceability
McCall's model: Product transition category	Portability	Software system independence Modularity Self descriptive
	Reusability	Modularity Document accessibility Software system independence Application independence Self descriptive Generality Simplicity
	Interoperability	Commonality System compatibility Software system independence Modularity

Summary

Software Quality Factors?

McCall's Quality Factor Model?

Maintenance Activities?