

Software Quality Factors

Software quality factors

- **The need for comprehensive software quality requirements**
- **Classification of requirements into software quality factors**
- **Product operation factors**
- **Product revision factors**
- **Product transition factors**
- **Alternative models of software quality factors**
- **Who is interested in defining quality requirements?**
- **Software compliance with quality factors**

SQ. Factors

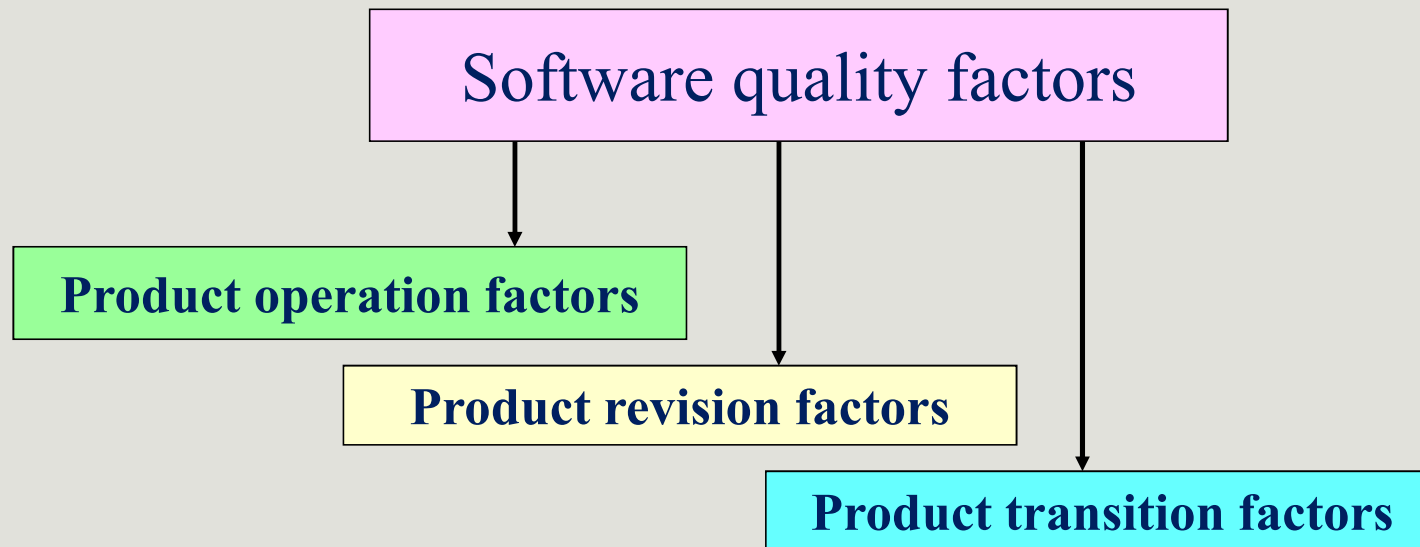
- From the previous chapters we have already established that the *requirements document* is one of the most important elements for achieving SQ.
- What is a “Good” SQ requirements document ?

There are some characteristics common to all these but :

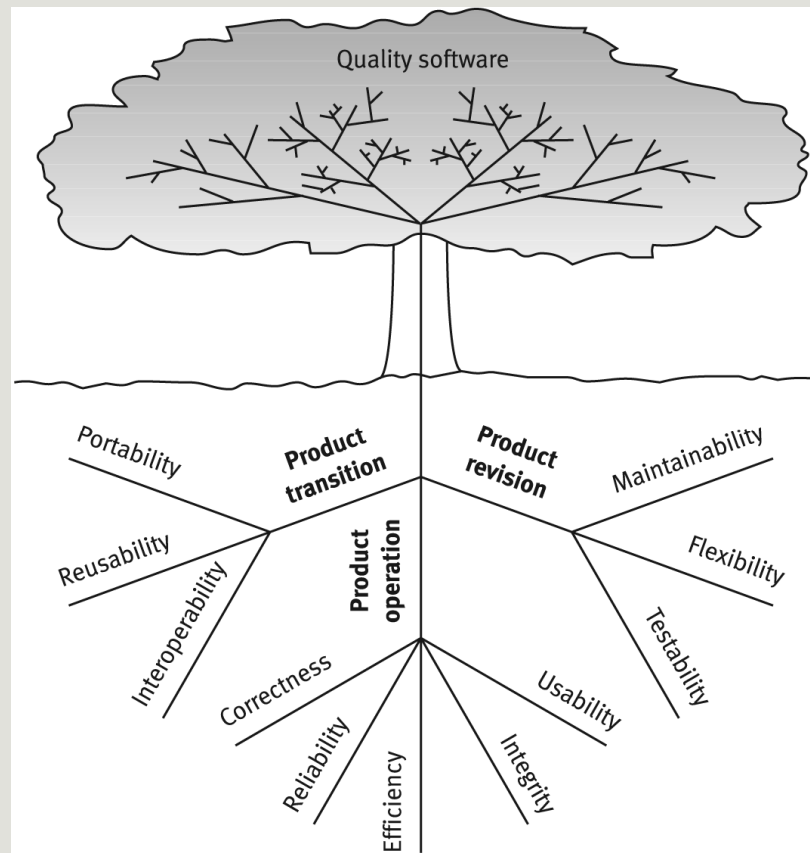
- All SW projects satisfactorily fulfilled the basic requirements for correct calculations.
- All SW projects suffered from poor performance in important areas such as maintenance, reliability, SW reuse, or training.
- The cause for poor performance of the developed SW projects in these areas was lack of predefined requirements to cover these important aspects of the SW functionality.
- The solution is :
The need for a comprehensive definition of requirements

(SQ Factors)

McCall's software quality factors model



McCalls factor model tree



Product operation factors

Correctness

Reliability

Efficiency

Integrity

Usability

Product operation factors - correctness

- **Correctness:** Output specifications are usually multidimensional ; some common include:
 - The output mission
 - The required accuracy
 - The completeness
 - The up-to-dateness of the info.
 - The availability of the info.(the reaction time)
 - The standards for coding and documenting the SW system
 - See Example page 39.

Product operation factors - Reliability

- **Reliability:**

Deals with failures to provide service. They determine the maximum allowed SW system failure rate, and can refer to the entire system or to one or more of its separate functions.

See examples page 39 (heart-monitoring unit)

Product operation factors – Efficiency - Integrity

- **Efficiency:**

Deals with the HW resources needed to perform all the functions of the SW system in conformance to all other requirements.

See examples page 40 (CPU speed .. etc)

- **Integrity:**

Deals with the SW system security, that is requirements to prevent access to unauthorized persons.

See examples page 40

Product operation factors – Usability

- **Usability:**

Deals with the scope of staff resources needed to train a new employee and to operate the SW system.

See examples page 41

Product revision factors

Maintainability

Flexibility

Testability

Product revision factors - Maintainability

- **Maintainability :**

Maintainability requirements determine the efforts that will be needed by users and maintenance personnel to identify the reasons for SW failures, to correct the failure, and to verify the success of the corrections.

Example : Typical maintainability requirements:

1. The size of a SW module will not exceed 30 statements
2. The programming will adhere to the company coding standards and guidelines.

Product revision factors - Flexibility

- **Flexibility :**

The capabilities and efforts required to support adaptive maintenance activities are covered by flexibility requirements. This factor's requirements also support perfective maintenance activities, such as changes and additions to the SW in order to improve its service and adapt it to changes in the firm's technical or commercial environment.

Example :page 42

Product revision factors - Testability

- **Testability :**
 - Deal with the testing of an IS as well as with its operation.
 - Providing predefined intermediate results and log files.
 - Automatic diagnostics performed by the SW system prior starting the system, to find out whether all components of SW system are in working order.
 - Obtain a report about detected faults.

Example :page 42, 43

Product transition factors

Portability

Reusability

Interoperability

Product revision factors - Portability

- **Portability :**

- Tend to the adaptation of a SW system to other environments consisting :
 - Different HW
 - Different OS

Example : SW designed to work under windows 2000 env. Is required to allow low-cost transfer to Linux.

Product revision factors - Reusability

- **Reusability :**
 - Deals with the use of SW modules originally designed for one project in a new SW project currently begin developed.
 - The reuse of SW is expected to save resources., shorten the project period, and provide higher quality modules. These benefits of higher quality are based on the assumption that most SW faults have already been detected by SQA activities performed previously on it.

Product revision factors - Interoperability

- **Interoperability :**
 - Focus on creating interfaces with other SW systems or with other equipment firmware.
 - Example:
 - The firmware of medical lab. equipment is required to process its results according to a standard data structure that can be then serve as input for a number of standard laboratory IS.

Alternative Models Of SW Quality Factors

- Two other models for SQ factors:
 - Evans and Marciniak 1987(12 factors)
 - Deutsch and Willis 1988. (15 factors)
- Five new factors were suggested
 - Verifiability
 - Expandability
 - Safety
 - Manageability
 - Survivability

McCall's factor model and alternative models

No.	Software quality factor	McCall's classic model	Alternative factor models	
			Evans and Marciniak model	Deutsch and Willis model
1	Correctness	+	+	+
2	Reliability	+	+	+
3	Efficiency	+	+	+
4	Integrity	+	+	+
5	Usability	+	+	+
6	Maintainability	+	+	+
7	Flexibility	+	+	+
8	Testability	+		
9	Portability	+	+	+
10	Reusability	+	+	+
11	Interoperability	+	+	+
12	Verifiability		+	+
13	Expandability		+	+
14	Safety			+
15	Manageability			+
16	Survivability			+

Alternative Models Of SW Quality Factors

- Five new factors were suggested
 - **Verifiability**: define design and programming features that enable efficient verification of the design and programming (modularity, simplicity, adherence to documentation and prog guidelines.)
 - **Expandability**: refer to future efforts that will be needed to serve larger populations, improve services, or add new applications in order to improve usability.
 - **Safety**: meant to eliminate conditions hazardous to equipment as a result of errors in process control SW.
 - **Manageability**: refer to the admin. tools that support SW modification during the SW development and maintenance periods.
 - **Survivability**: refer to the continuity of service. These define the minimum time allowed between failures of the system, and the maximum time permitted for recovery of service.

Who is interested in the definition of quality requirements ?

- The client is not the only party interested in defining the requirements that assure the quality of the SW product.
- The developer is often interested also specially :
 - Reusability
 - Verifiability
 - Portability
- Any SW project will be carried out according to 2 requirements document :
 - The client's requirements document
 - The developer's additional requirements document.

Review questions

1. What are the three factors categories belonging to McCall's factor model?
2. What factors included in each of the categories?
3. Some people claim that testability and verifiability are actually different names for the same factor

4. (a) Do you agree?
5. (b) If not, could you explain why?

Reference:

- Galin, SQA from Theory to Implementation @Pearson Education Limited 2004