

# SOFTWARE QUALITY MODELS

# McCall's Quality Model (1977)

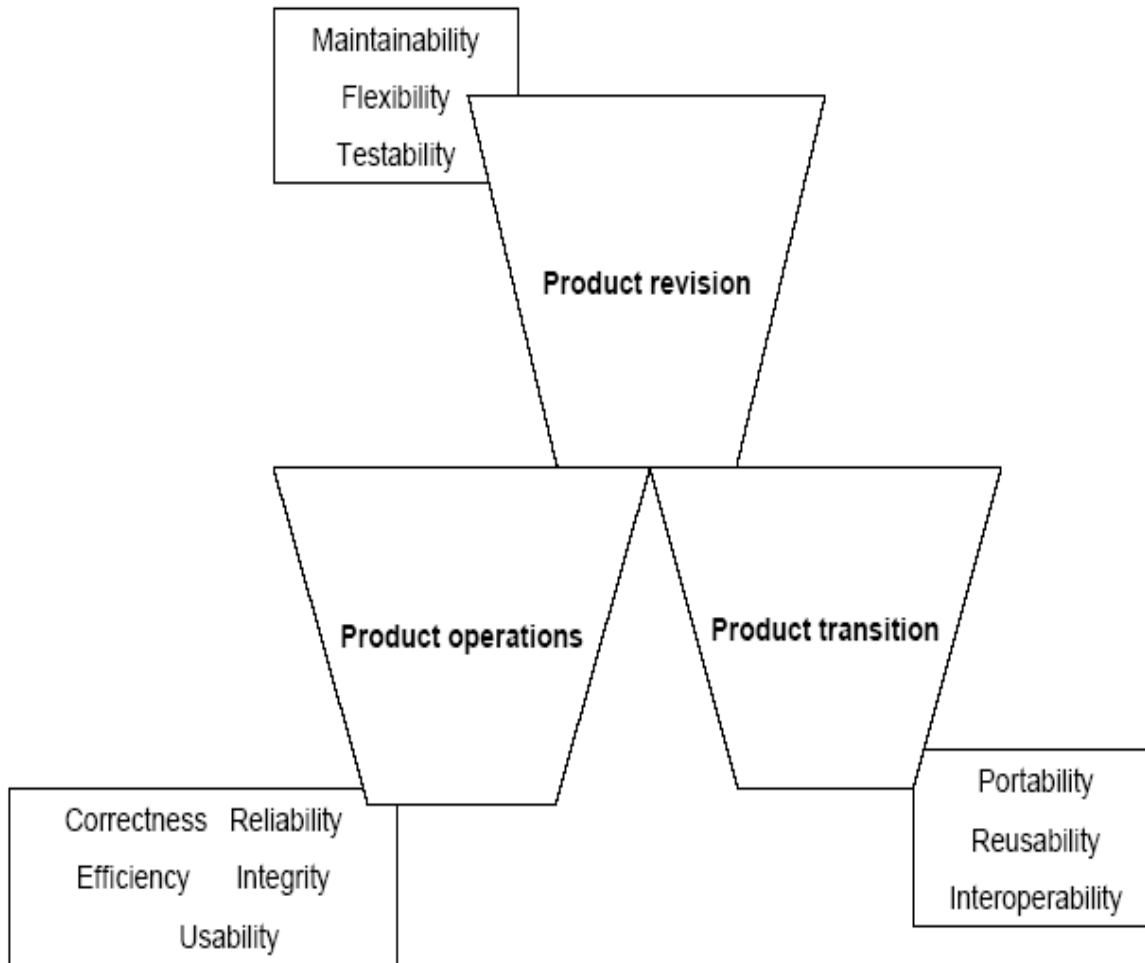
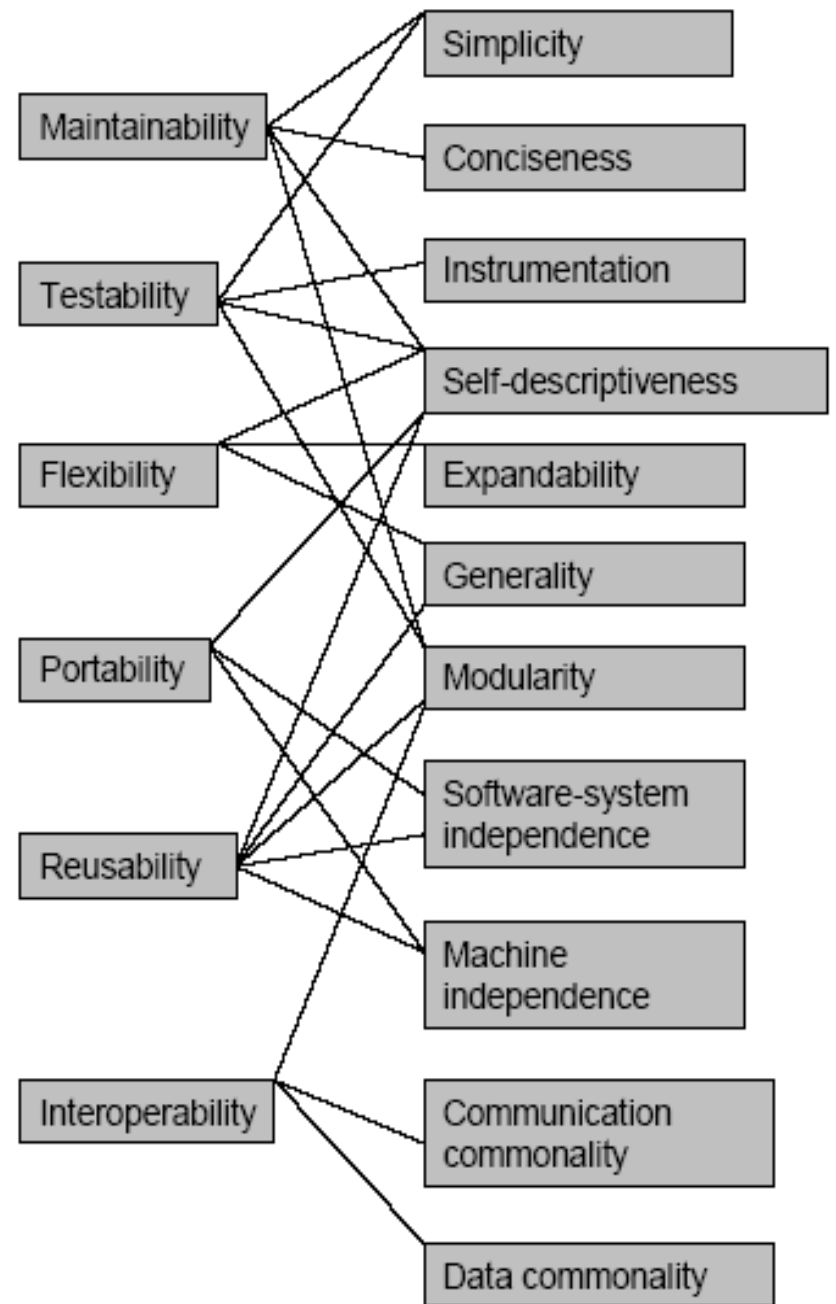
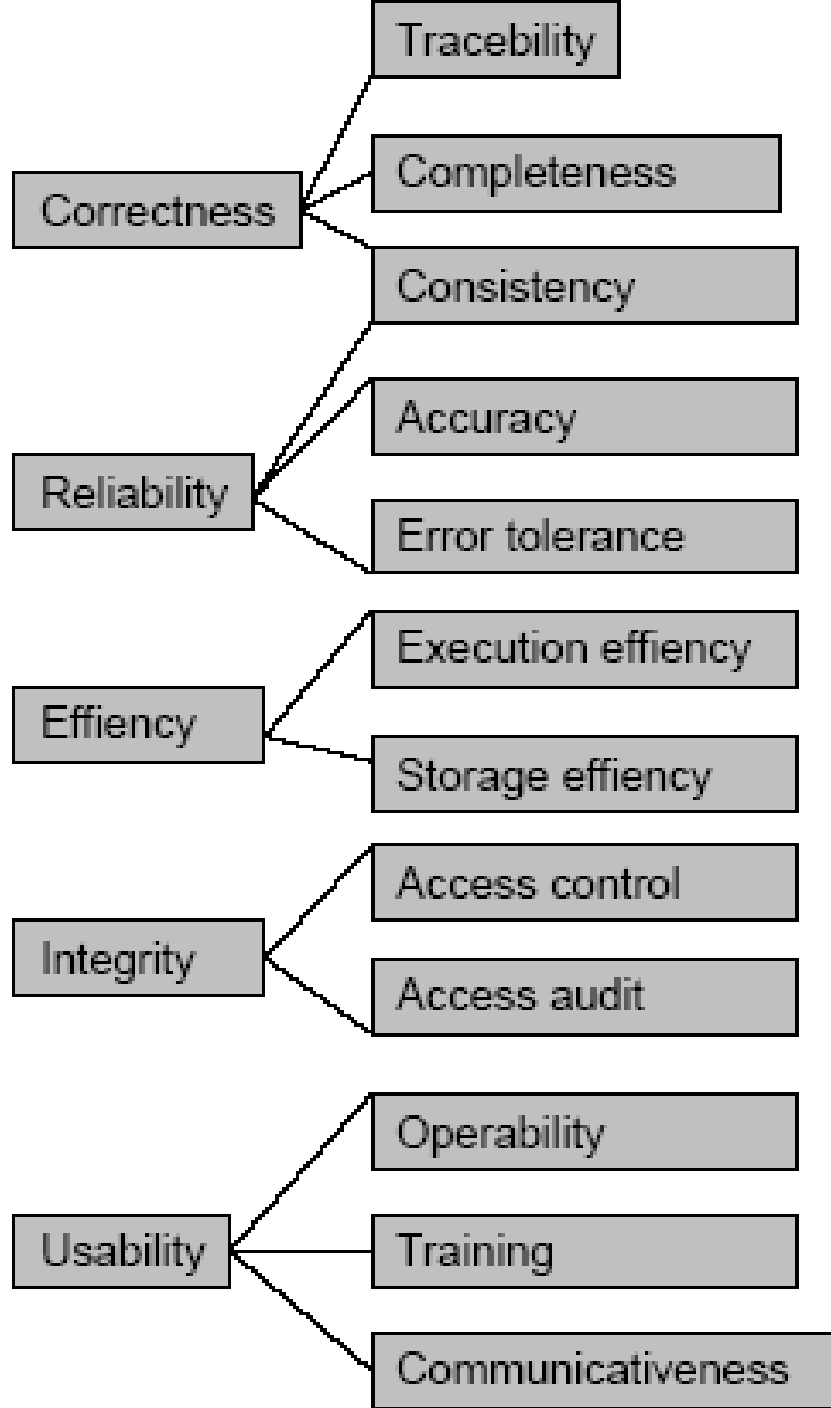


Figure 1: The McCall quality model (a.k.a. McCall's Triangle of Quality) organized around three types of quality characteristics.



# PRODUCT REVISION

- Product revision includes maintainability (the effort required to locate and fix a fault in the program within its operating environment), flexibility (the ease of making changes required by changes in the operating environment) and testability (the ease of testing the program, to ensure that it is error-free and meets its specification).

# PRODUCT TRANSITION

- Product transition is all about portability (the effort required to transfer a program from one environment to another), reusability (the ease of reusing software in a different context) and interoperability (the effort required to couple the system to another system).

# PRODUCT OPERATIONS

- Quality of product operations depends on correctness (the extent to which a program fulfils its specification), reliability (the systems ability not to fail), efficiency (further categorized into execution efficiency and storage efficiency and generally meaning the use of resources, e.g. processor time, storage), integrity (the protection of the program from unauthorized access) and usability (the ease of the software).



# MAIN OBJECTIV OF MC CALL MODEL

- The idea behind McCall's Quality Model is that the quality factors synthesized should provide a complete software quality picture

# Boehm's Quality Model (1978)

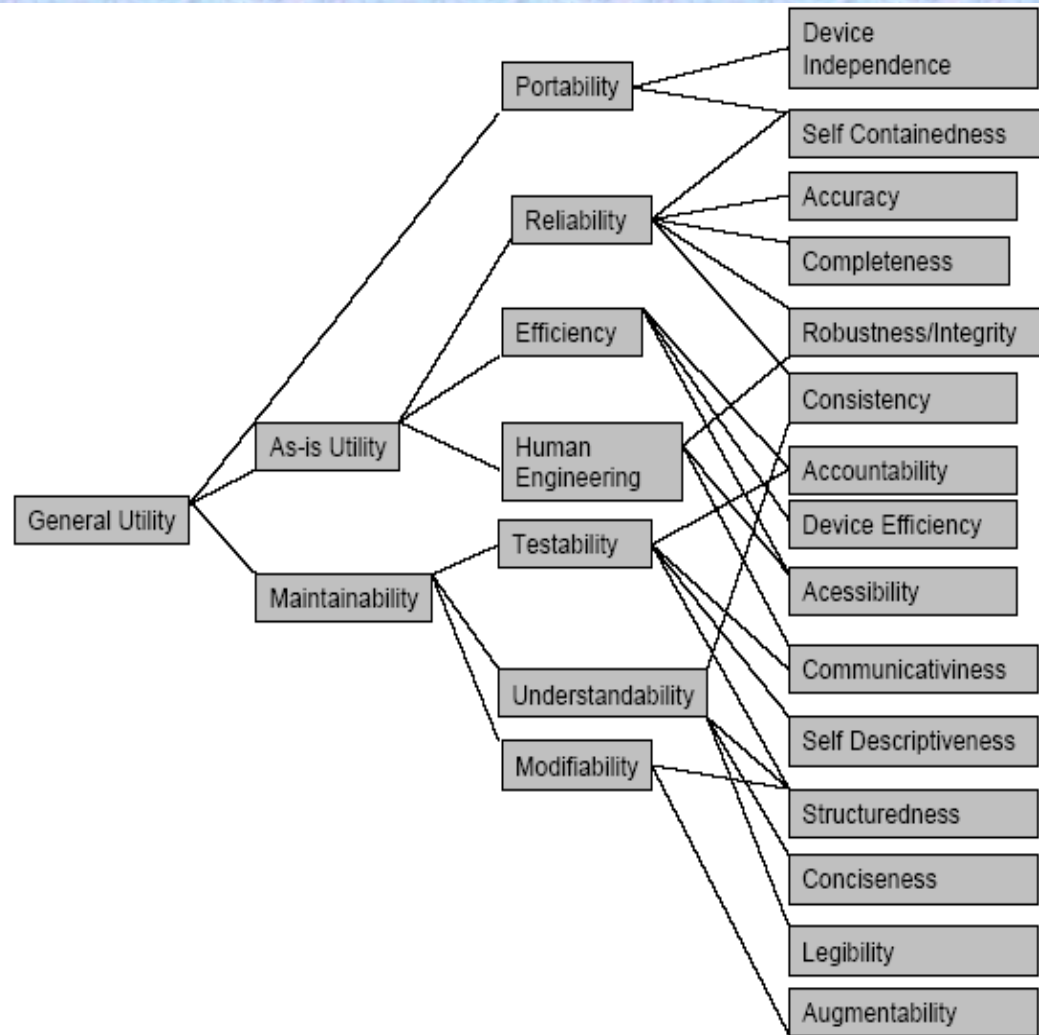


Figure 4: Boehm's Software Quality Characteristics Tree [13]. As-is Utility, Maintainability, and Portability are necessary (but not sufficient) conditions for General Utility. As-is Utility requires a program to be Reliable and adequately Efficient and Human-Engineered. Maintainability requires that the user be able to understand, modify, and test the program, and is aided by good Human-engineering



# SIMILARITY TO MC CALL'S MODEL

- Boehm's model is similar to the McCall Quality Model in that it also presents a hierarchical quality model structured around high-level characteristics, intermediate level characteristics, primitive characteristics - each of which contributes to the overall quality level.

# HIGH LEVEL CHARACTERISTICS

- The high-level characteristics address three main questions that a buyer of software has:
- **As-is utility:** How well (easily, reliably, efficiently) can I use it as-is?
- **Maintainability:** How easy is it to understand, modify and retest?
- **Portability:** Can I still use it if I change my environment?

# INTERMEDIATE LEVEL CHARACTERISTICS

The intermediate level characteristic represents Boehm's 7 quality factors that together represent the qualities expected from a software system:

- Portability (General utility characteristics)
- Reliability (As-is utility characteristics)
- Efficiency (As-is utility characteristics)
- Usability (As-is utility characteristics, Human Engineering)
- Testability (Maintainability characteristics)
- Understandability (Maintainability characteristics)
- Flexibility (Maintainability characteristics, Modifiability)

# ISO 9126

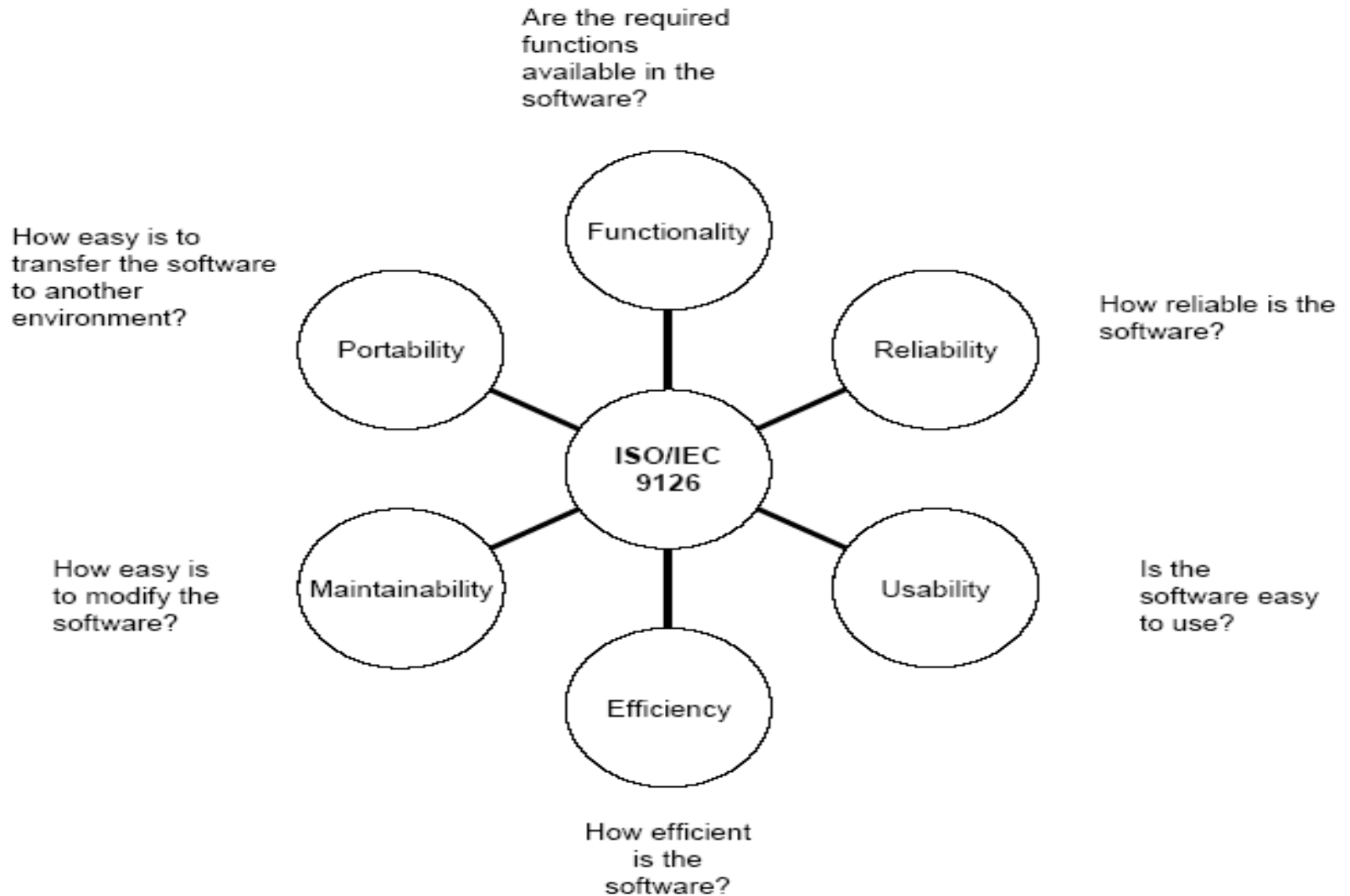


Figure 8: The ISO 9126 quality model



# ISO 9126

- Besides the famous ISO 9000, ISO has also release the ISO 9126: Software Product Evaluation: Quality Characteristics and Guidelines for their Use-standard models.
- Besides being structured in basically the same manner as these models,ISO 9126 also includes functionality as a parameter, as well as identifying both internal and external quality characteristics of software products.

# DETAILED VIEW OF ISO-9126

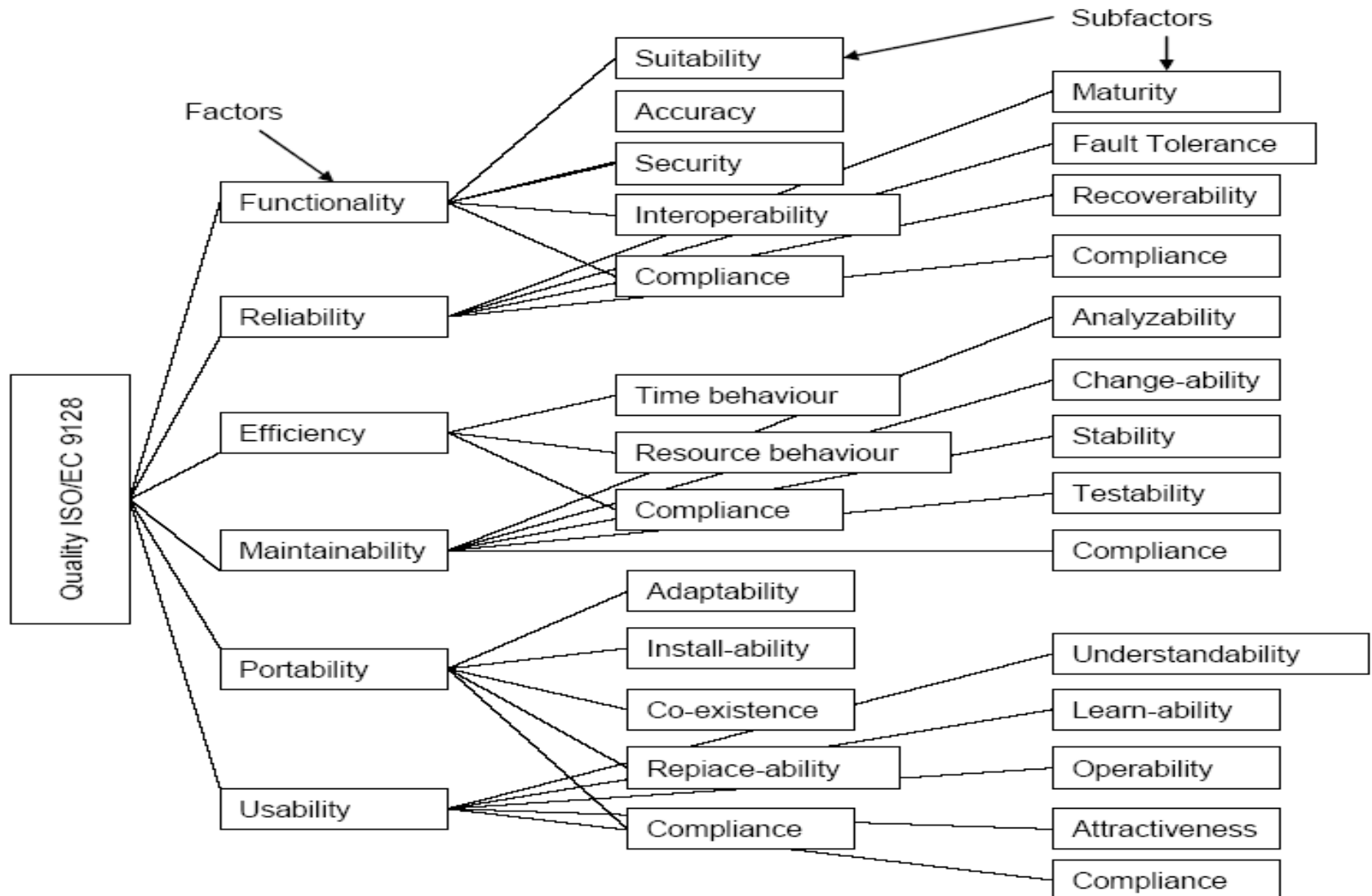


Figure 10: ISO 9126: Software Product Evaluation: Quality Characteristics and Guidelines for their Use



# CAPABILITY MATURITY MODEL

- The CMM/SW-CMM depicted in Figure below addresses the issue of software quality from a process perspective.

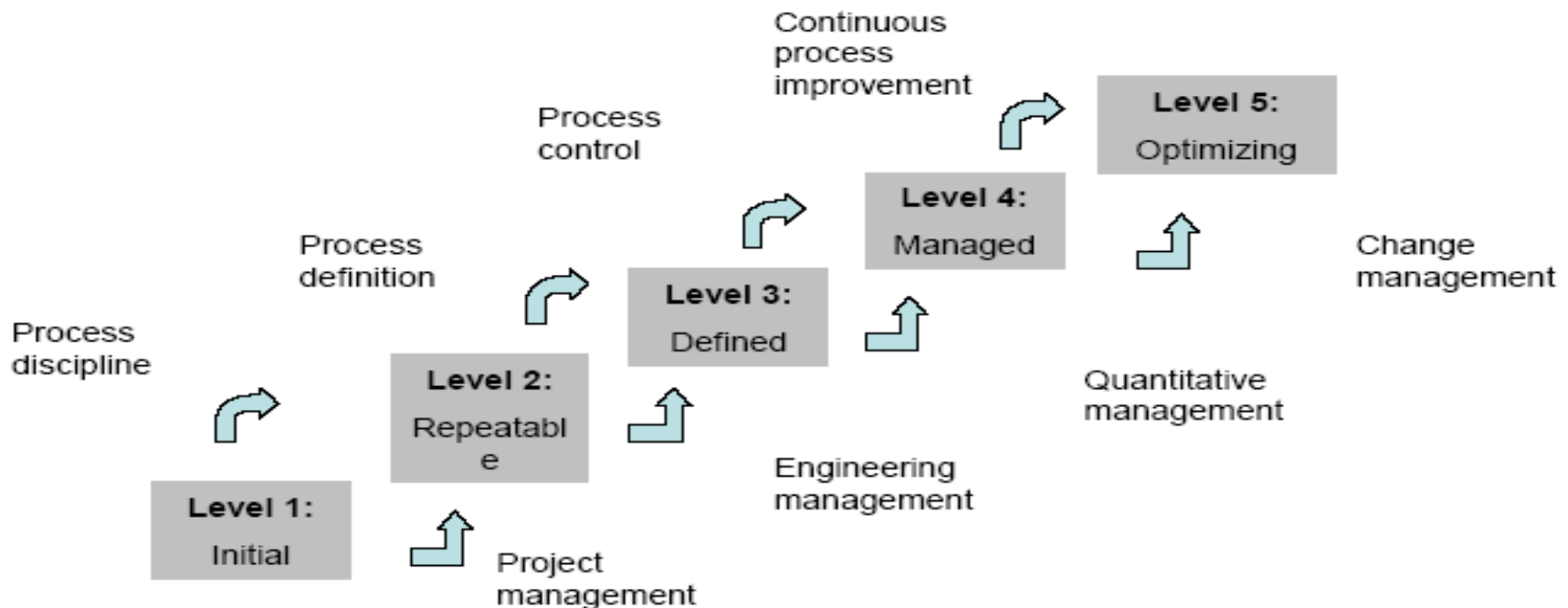


Figure 11: Maturity Levels of (SW-)CMM

# LEVELS OF CMM

- Maturity level 5: Optimizing - Focus on process improvement
- Maturity level 4: Quantitatively managed - Process measured and controlled.
- Maturity level 3: Defined - Process characterized for the organization and is proactive.
- Maturity level 2: Managed - Process characterized for projects and is often reactive.
- Maturity level 1: Initial - Process unpredictable, poorly controlled and reactive.