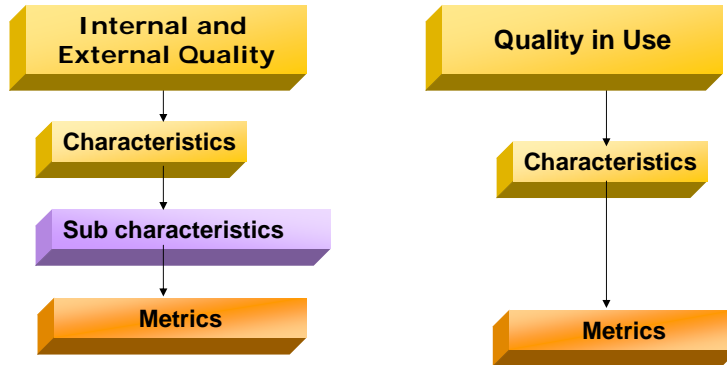# International Standard
ISO/IEC 9126

Software Engineering — Product quality

ISO 9126 - Content

- **Part 1: Quality model**
  - Product quality and the lifecycle
  - Quality models for:
    - Internal Quality, External Quality and Quality in Use
- **Part 2: External Metrics**
  - Guide to use metrics tables
  - External Quality Metrics
- **Part 3: Internal Metrics**
  - Guide to use metrics tables
  - Internal Quality Metrics
- **Part 4: Quality in use metrics**
  - Guide to use metrics tables
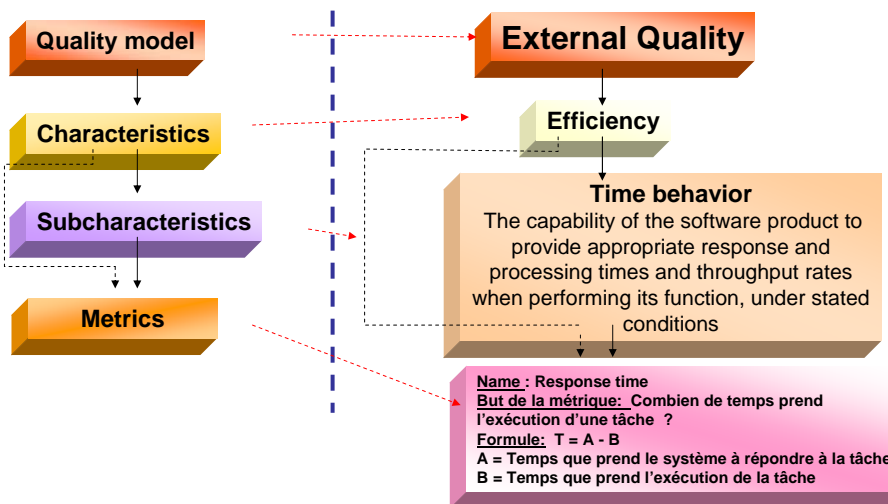 - Quality in Use Metrics

Quality Model

Internal and External Quality

↓

Characteristics

↓

Sub characteristics

↓

Metrics

Quality in Use

↓

Characteristics

↓

Metrics

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External Quality

Quality model

↓

Characteristics

↓

Subcharacteristics

↓

Metrics

External Quality

↓

Efficiency

↓

Time behavior
The capability of the software product to provide appropriate response and processing times and throughput rates when performing its function, under stated conditions

Name : Response time
But de la métrique: Combien de temps prend l'exécution d'une tâche ?
Formule: T = A - B
A = Temps que prend le système à répondre à la tâche
B = Temps que prend l'exécution de la tâche

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Internal and External Quality

Internal and External Quality

Functionality | Reliability | Usability | Efficiency | Maintainability | Portability

Maturity
Fault tolerance
Recoverability
Compliance

Time behavior
Resource utilization
Compliance

Adaptability
Installability
Co-existence
Replaceability
Compliance

Suitability
Accuracy
Interoperability
Security
Compliance

Understandability
Learnability
Operability
Attractiveness
Compliance

Changeability
Stability
Testability
Compliance

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Internal and External Quality

- **Internal quality**
  - Is the totality of characteristics of the software product from an internal view.
  - Internal quality is measured and evaluated against the internal quality requirements. Details of software product quality can be improved during code implementation, reviewing and testing, but the fundamental nature of the software product quality represented by internal quality remains unchanged unless redesigned
- **External Quality**
  - Is the totality of characteristics of the software product from an external view.
  - It is the quality when the software is executed, which is typically measured and evaluated while testing in a simulated environment with simulated data using external metrics.

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Functionality

- The capability of the software product to <u>provide functions which meet stated and implied needs</u> when the software is used under specified conditions.
  - **Suitability**
    - The capability of the software product to <u>provide an appropriate set of functions</u> for specified tasks and user objectives.
  - **Accuracy**
    - The capability of the software product to provide the <u>right or agreed results</u> or effects with the needed degree of precision.
  - **Interoperability**
    - The capability of the software product to <u>interact with one or more specified systems.</u>
  - **Security**
    - The capability of the software product to <u>protect information and data</u> so that unauthorised persons or systems cannot read or modify them and authorised persons or systems are not denied access to them.
  - **Functionality compliance**
    - The capability of the software product to <u>adhere to standards, conventions or regulations</u> in laws and similar prescriptions relating to functionality.

Reliability

- The capability of the software product to <u>maintain a specified level of performance</u> when used <u>under specified conditions</u>.
  - **Maturity**
    - The capability of the software product to <u>avoid failure as a result of faults</u> in the software.
  - **Fault tolerance**
    - The capability of the software product to maintain a specified level of <u>performance in cases of software faults</u> or of infringement of its specified interface.
  - **Recoverability**
    - The capability of the software product to <u>re-establish a specified level of performance and recover the data</u> directly affected in the case of a failure.
  - **Reliability compliance**
    - The capability of the software product to <u>adhere to standards,</u> conventions or regulations relating to reliability.

Usability

- The capability of the software product <u>to be understood, learned, used</u> and attractive to the user, when used under specified conditions.
  - **Understandability**
    - The capability of the software product to <u>enable the user to understand whether the software is suitable,</u> and <u>how it can be used</u> for particular tasks and conditions of use.
  - **Learnability**
    - The capability of the software product to <u>enable the user to learn</u> its application.
  - **Operability**
    - The capability of the software product to <u>enable the user to operate</u> and control it.
  - **Attractiveness**
    - The capability of the software product <u>to be attractive to the user.</u>
  - **Usability compliance**
    - The capability of the software product <u>to adhere to standards,</u> conventions, style guides or regulations relating to usability.

Efficiency

- The capability of the software product to <u>provide appropriate performance</u>, relative to the amount of resources used, under stated conditions.
  - **Time behaviour**
    - The capability of the software product to <u>provide appropriate response and processing times and throughput rates</u> when performing its function, under stated conditions.
  - **Resource utilisation**
    - The capability of the software product to <u>use appropriate amounts and types of resources</u> when the software performs its function under stated conditions.
  - **Efficiency compliance**
    - The capability of the software product to <u>adhere to standards</u> or conventions relating to efficiency.

Maintainability

- The capability of the software product <u>to be modified</u>. Modifications may include <u>corrections</u>, <u>improvements</u> or <u>adaptation</u> of the software to changes in environment, and in requirements and functional specifications.
  - **Changeability**
    - The capability of the software product <u>to enable a specified modification to be implemented.</u>
  - **Stability**
    - The capability of the software product <u>to avoid unexpected effects from modifications</u> of the software.
  - **Testability**
    - The capability of the software product <u>to enable modified software to be validated.</u>
  - **Maintainability compliance**
    - The capability of the software product <u>to adhere to standards</u> or conventions relating to maintainability.

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Portability

The capability of the software product to <u>be transferred from one environment to another</u>.
  - **Adaptability**
    - The capability of the software product <u>to be adapted for different specified environments</u> without applying actions or means other than those provided for this purpose for the software considered.
  - **Installability**
    - The capability of the software product <u>to be installed</u> in a specified environment.
  - **Co-existence**
    - The capability of the software product <u>to co-exist with other independent software in a common environment</u> sharing common resources.
  - **Replaceability**
    - The capability of the software product <u>to be used in place of another specified software product</u> for the same purpose in the same environment.
  - **Portability compliance**
    - The capability of the software product <u>to adhere to standards</u> or conventions relating to portability.

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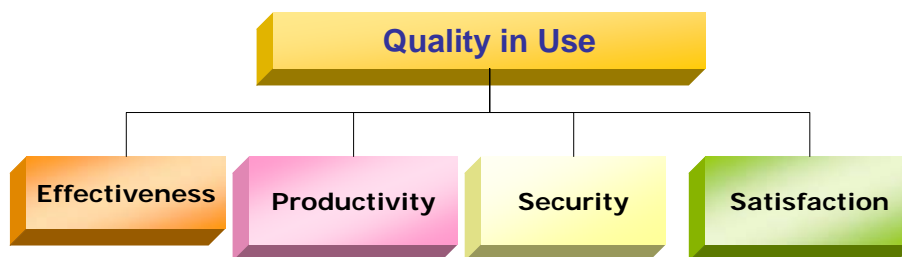# Quality in Use

- **Quality in Use**
  - Is the <u>user's view of the quality</u> of the software product <u>when it is used in a specific environment</u> and <u>a specific context of use</u>.
  - It measures the extent to which <u>users can achieve their goals</u> in a particular environment,

Quality in Use

Quality in Use

- **Effectiveness**
  - The capability of the software product to <u>enable users to achieve specified goals</u> with accuracy and completeness in a specified context of use.
- **Productivity**
  - The capability of the software product to enable users to <u>expend appropriate amounts of resources</u> in relation to the effectiveness achieved in a specified context of use.
- **Safety**
  - The capability of the software product to <u>achieve acceptable levels of risk</u> of harm to people, business, software, property or the environment in a specified context of use.
- **Satisfaction**
  - The capability of the software product to <u>satisfy users</u> in a specified context of use.

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Relationship to other standards

- ISO/IEC 14598 – Software Product Evaluation
- ISO 12119 – SW Packages – Quality Requirements and Testing
- ISO 12207 – Software Life Cycle Processes
- ISO 15288 – System Life Cycle (Processes)
- ISO 15939 – Software measurement process

Replaced by ISO/IEC 25000 SQuaRE – Software Product Quality Requirements and Evaluation

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