

ISO 9126

ISO 9126 is the software product evaluation standard from the International Organization for Standardization. This international standard defines six characteristics that describe, with minimal overlap, software quality.

Business Benefit

Specifying software quality for a product that has still to be developed is difficult for the purchaser or supplier. The purchaser needs to understand clearly and be able to communicate his/her requirements for the product to be developed. The supplier needs to be certain he/she understands the requirement, and is able to assess with confidence whether it is possible to provide the product with the right level of software quality.

Consequently, ISO 9126 will serve to eliminate any misunderstanding between purchaser and supplier. This improvement in communication will do away with any rework required as a result of the software product not meeting the purchaser's requirements. Both the time taken to deliver the specified software product and the cost of development will be lower as a result of adherence to the ISO 9126 standard.

How is it used?

ISO 9126 provides the definition of the characteristics and associated quality evaluation process to be used when specifying the requirements for and evaluating the quality of software products throughout their life cycle. (Note: This standard does not provide subcharacteristics and metrics, nor the method for measurement, rating and assessment) . ISO 9126 sets out six quality characteristics, which are intended to be exhaustive. From this it follows that each quality characteristic is very broad.

***Functionality** is the set of attributes that bear on the existence of a set of functions and their specified properties. The functions are those that satisfy stated or implied needs.*

Notes:

- 1. This set of attributes characterizes what the software does to fulfil needs, whereas the other sets mainly characterize when and how it does so.*

2. *For the stated and implied needs in this characteristic, the note to the definition of quality applies (see 3.6).*
3. *In a contractual environment, needs are specified, whereas in other environments, implied needs should be identified and defined (ISO 8402:1986, note 1).*

Reliability is the set of attributes that bear on the capability of software to maintain its level of performance under stated conditions for a stated period of time.

Usability is the set of attributes that bear on the effort needed for use, and on the individual assessment of such use, by a stated or implied set of users.

Notes:

1. *“Users” may be interpreted as most directly meaning the users of interactive software. Users may include operators, and users and indirect users who are under the influence of or dependent on the use of the software. Usability must address all of the different user environments that the software may affect, which may include preparation for usage and evaluation of results.*
2. *Usability defined in this International Standard as a specific set of attributes of a software product differs from the definition from an ergonomic point of view, where other characteristics such as efficiency and effectiveness are also seen as constituents of usability.*

Efficiency is the set of attributes that bear on the relationship between the level of performance of the software and the amount of resources used, under stated conditions.

Maintainability is the set of attributes that bear on the effort needed to make specified modifications.

Portability is the set of attributes that bear on the ability of software to be transferred from one environment.

Key Points

A key point here is that quality characteristics are the top level of an hierarchical organization of attributes: each characteristic may be broken down into quality sub-characteristics, which may themselves be further broken down. Specific evaluations or specific views of software quality may imply that some attributes are considered to be more important than others. **ISO mentions the views of the user, the developer and the manager.**

Manager's View

A manager may be more interested in the overall quality rather than in a specific quality characteristic, and for this reason will need to assign weights, reflecting business requirements, to the individual characteristics.

The manager may also need to balance the quality improvement with management criteria such as schedule delay or cost overrun, because he wishes to optimize quality within limited cost, human resources and time-frame.

Users' View

Users are mainly interested in using the software, its performance and the effects of using the software. Users evaluate the software without knowing the internal aspects of the software, or how the software is developed. Users' questions may include:

- Are the required functions available in the software?
- How reliable is the software?
- How efficient is the software?
- Is the software easy to use?
- How easy is it to transfer the software to another environment?

Developers' View

The process of development requires the user and the developer to use the same software quality characteristics, since they apply to requirement and acceptance. When developing off-the-shelf software, the implied needs must be reflected in the quality requirement.

Since developers are responsible for producing software which will satisfy quality requirements they are interested in the intermediate product quality as well as in the final product quality. In order to evaluate the intermediate product quality at each phase of the development cycle, the developers have to use different metrics for the same characteristics because the same metrics are not applicable to all phases of the cycle.

The quality characteristics are accompanied by guidelines for their use. As we shall see, each attribute is associated with one or more metrics, which allow a value for that attribute to be determined for a particular system. As ISO 9126 points out:

Currently only a few generally accepted metrics exist for the characteristics described in this International Standard. Standards groups or organizations may establish their own evaluation process models and methods for creating and validating metrics associated with these characteristics to cover different areas of application and lifecycle stages. In those cases where appropriate metrics are unavailable and cannot be developed, verbal descriptions or "rule of thumb" may sometimes be used.

The guidelines nonetheless suggest an evaluation process model, which breaks down into three stages.

Quality requirements definition

First comes the *quality requirements definition*, which takes as input a set of stated or implied needs, relevant technical documentation and the ISO Standard itself and produces a quality requirement specification.

Evaluation preparation

The second stage is that of *evaluation preparation*, which involves the selection of appropriate metrics, a rating level definition and the definition of assessment criteria. *Metrics*, in ISO 9126, typically give rise to quantifiable measures mapped on to scales. The *rating levels definition* determines what ranges of values on those scales count as satisfactory or unsatisfactory. Since quality refers to given needs, which vary from one evaluation to another, no general levels for rating are possible: they must be defined for each specific evaluation. Similarly, the *assessment criteria definition* involves preparing a procedure for summarizing the results of the evaluation and takes, as input, management criteria specific to a particular environment which may influence the relative importance of different quality characteristics and sub-characteristics. This definition, too, is therefore specific to the particular evaluation.

Evaluation procedure

The final stage is the *evaluation procedure*, which is refined into three steps: measurement, rating and assessment. The first two are intuitively straightforward: in *measurement*, the selected metrics are applied to the software product and values on the scales of the metrics obtained. Subsequently, for each measured value, the *rating level* is determined. *Assessment* is the final step of the software evaluation process, where a set of rated levels are summarized. The result is a summary of the quality of the software product. The summarized quality is then compared with other aspects such as time and cost, and the final managerial decision is taken, based on managerial criteria.

Other things worth knowing

The software industry is entering a period of some maturing, while at the same time software is becoming a crucial component of many of today's products. This pervasive aspect of software makes it a major new factor in trade. Furthermore, with new global demands for safety and quality, the need for international agreements on software quality assessment procedures is becoming important.

There are essentially two approaches that can be followed to ensure product quality, one being assurance of the process by which a product is developed (ISO 9001, ISO 9000-3 provides guidelines for the application of the ISO 9001), and the other being the evaluation of the quality of the end product (ISO 9126). Both approaches are important and both require the presence of a system for managing quality.

Another approach is defined by CMM, that has been in use by many organizations long enough so that meaningful and positive return-on-investment statistics are appearing. The CMM provides a framework for process improvement that consists of "key process areas", to be influential in various aspects of the development process and resultant software quality.