

Definitionen der Qualitätsmerkmale gemäß ISO 25010:2011

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4 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

NOTE Definitions of quality characteristics and subcharacteristics are given in 4.1 and 4.2, general definitions in 4.3 and the essential definitions from ISO/IEC 25000 are reproduced in 4.4.

4.1 Quality in Use Model

Quality in use is the degree to which a product or system can be used by specific users to meet their needs to achieve specific goals with effectiveness, efficiency, freedom from risk and satisfaction in specific contexts of use.

The properties of quality in use are categorized into five characteristics: effectiveness, efficiency, satisfaction, freedom from risk and context coverage (Table 3).

Quality in Use [ISO 25010:2011]	Qualität im Einsatz (dt. Übersetzung: H. Mayr)
Characteristic Subcharacteristic	Merkmal Submerkmal
Effectiveness	Effektivität
Efficiency	Effizienz
Satisfaction	Zufriedenheit
Usefulness	Nützlichkeit
Trust	Vertrauen
Pleasure	Vergnügen
Comfort	Bequemlichkeit
Freedom from risk	Risikofreiheit
Economic risk mitigation	Minderung von Wirtschaftsrisiken
Health and safety risk mitigation	Minderung von Gesundheits- und Sicherheitsrisiken
Environmental risk mitigation	Minderung von Umweltrisiken
Context coverage	Abdeckung des Einsatzgebiets (Nutzungskontexts)
Context completeness	Kontext-Vollständigkeit
Flexibility	Flexibilität

Table 3 — Quality in use characteristics and subcharacteristics

NOTE Usability (4.2.4) is defined as a subset of quality in use consisting of effectiveness, efficiency and satisfaction, for consistency with its established meaning.

4.1.1 Effectiveness

accuracy and completeness with which users achieve specified goals [ISO 9241-11]

4.1.2 Efficiency

resources expended in relation to the accuracy and completeness with which users achieve goals [ISO 9241-11]

NOTE Relevant resources can include time to complete the task (human resources), materials, or the financial cost of usage.

4.1.3 Satisfaction

degree to which user needs are satisfied when a product or system is used in a specified context of use

NOTE 1 For a user who does not directly interact with the product or system, only purpose accomplishment and trust are relevant.

NOTE 2 Satisfaction is the user's response to interaction with the product or system, and includes attitudes towards use of the product.

4.1.3.1 Usefulness

degree to which a user is satisfied with their perceived achievement of pragmatic goals, including the results of use and the consequences of use

4.1.3.2 Trust

degree to which a user or other stakeholder has confidence that a product or system will behave as intended

4.1.3.3 Pleasure

degree to which a user obtains pleasure from fulfilling their personal needs

NOTE Personal needs can include needs to acquire new knowledge and skills, to communicate personal identity and to provoke pleasant memories.

4.1.3.4 Comfort

degree to which the user is satisfied with physical comfort

4.1.4 Freedom from Risk

degree to which a product or system mitigates the potential risk to economic status, human life, health, or the environment

NOTE Risk is a function of the probability of occurrence of a given threat and the potential adverse consequences of that threat's occurrence.

4.1.4.1 Economic Risk Mitigation

degree to which a product or system mitigates the potential risk to financial status, efficient operation, commercial property, reputation or other resources in the intended contexts of use

4.1.4.2 Health and Safety Risk Mitigation

degree to which a product or system mitigates the potential risk to people in the intended contexts of use

4.1.4.3 Environmental Risk Mitigation

degree to which a product or system mitigates the potential risk to property or the environment in the intended contexts of use

4.1.5 Context Coverage

degree to which a product or system can be used with effectiveness, efficiency, freedom from risk and satisfaction in both specified contexts of use and in contexts beyond those initially explicitly identified

NOTE Context of use is relevant to both quality in use and some product quality (sub)characteristics (where it is referred to as “specified conditions”).

4.1.5.1 Context Completeness

degree to which a product or system can be used with effectiveness, efficiency, freedom from risk and satisfaction in all the specified contexts of use

NOTE Context completeness can be specified or measured either as the degree to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, freedom from risk and satisfaction in all the intended contexts of use, or by the presence of product properties that support use in all the intended contexts of use.

EXAMPLE The extent to which software is usable using a small screen, with low network bandwidth, by a non-expert user; and in a fault-tolerant mode (e.g. no network connectivity).

4.1.5.2 Flexibility

degree to which a product or system can be used with effectiveness, efficiency, freedom from risk and satisfaction in contexts beyond those initially specified in the requirements

NOTE 1 Flexibility can be achieved by adapting a product (see 4.2.8.1) for additional user groups, tasks and cultures.

NOTE 2 Flexibility enables products to take account of circumstances, opportunities and individual preferences that had not been anticipated in advance.

NOTE 3 If a product is not designed for flexibility, it might not be safe to use the product in unintended contexts.

NOTE 4 Flexibility can be measured either as the extent to which a product can be used by additional types of users to achieve additional types of goals with effectiveness, efficiency, freedom from risk and satisfaction in additional types of contexts of use, or by a capability to be modified to support adaptation for new types of users, tasks and environments, and suitability for individualization as defined in ISO 9241-110.

4.2 Product Quality Model

The product quality model categorizes product quality properties into eight characteristics (functional suitability, reliability, performance efficiency, usability, security, compatibility, maintainability and portability). Each characteristic is composed of a set of related subcharacteristics (Table 4).

Product Quality [ISO 25010:2011]	Produktqualität (dt. Übersetzung: H. Mayr)
Characteristic	Merkmal
Subcharacteristic	Submerkmal
Functional suitability	Funktionale Eignung
Functional completeness	Funktionale Vollständigkeit
Functional correctness	Funktionale Korrektheit
Functional appropriateness	Funktionale Angemessenheit
Performance efficiency	Leistungseffizienz
Time behaviour	Zeitverhalten
Resource utilisation	Ressourcennutzung
Capacity	Kapazität
Compatibility	Kompatibilität
Co-existence	Ko-Existenz
Interoperability	Interoperabilität
Usability	Usability
Appropriateness recognizability	Erkennbarkeit der Angemessenheit
Learnability	Erlernbarkeit
Operability	Bedienbarkeit
User error protection	Schutz vor Anwenderfehlern
User interface aesthetics	Ästhetik der Benutzerschnittstelle
Accessibility	Barrierefreiheit
Reliability	Zuverlässigkeit
Maturity	Reife
Availability	Verfügbarkeit
Fault tolerance	Fehlertoleranz
Recoverability	Wiederherstellbarkeit
Security	Sicherheit
Confidentiality	Vertraulichkeit
Integrity	Integrität
Non-repudiation	Nichtabstreitbarkeit (Nachweisbarkeit)
Accountability	Rechenschaftspflicht
Authenticity	Authentizität

Maintainability	Wart- und Pflegbarkeit
Modularity	Modularität
Reusability	Wiederverwendbarkeit
Analysability	Analysierbarkeit
Modifiability	Modifizierbarkeit
Testability	Testbarkeit
Portability	Übertragbarkeit
Adaptability	Anpassungsfähigkeit (Adaptierbarkeit)
Installability	Installierbarkeit
Replaceability	Austauschbarkeit

Table 4 — Product quality characteristics and subcharacteristics

4.2.1 Functional Suitability

degree to which a product or system provides functions that meet stated and implied needs when used under specified conditions

NOTE Functional suitability is only concerned with whether the functions meet stated and implied needs, not the functional specification (see C.6).

4.2.1.1 Functional Completeness

degree to which the set of functions covers all the specified tasks and user objectives

4.2.1.2 Functional Correctness

degree to which a product or system provides the correct results with the needed degree of precision

4.2.1.3 Functional Appropriateness

degree to which the functions facilitate the accomplishment of specified tasks and objectives

EXAMPLE A user is only presented with the necessary steps to complete a task, excluding any unnecessary steps.

NOTE Functional appropriateness corresponds to suitability for the task in ISO 9241-110.

4.2.2 Performance Efficiency

performance relative to the amount of resources used under stated conditions

NOTE Resources can include other software products, the software and hardware configuration of the system, and materials (e.g. print paper, storage media).

4.2.2.1 Time Behaviour

degree to which the response and processing times and throughput rates of a product or system, when performing its functions, meet requirements

4.2.2.2 Resource Utilization

degree to which the amounts and types of resources used by a product or system, when performing its functions, meet requirements

NOTE Human resources are included as part of **efficiency** (4.1.2).

4.2.2.3 Capacity

degree to which the maximum limits of a product or system parameter meet requirements

NOTE Parameters can include the number of items that can be stored, the number of concurrent users, the communication bandwidth, throughput of transactions, and size of database.

4.2.3 Compatibility

degree to which a product, system or component can exchange information with other products, systems or components, and/or perform its required functions, while sharing the same hardware or software environment

NOTE Adapted from ISO/IEC/IEEE 24765.

4.2.3.1 Co-existence

degree to which a product can perform its required functions efficiently while sharing a common environment and resources with other products, without detrimental impact on any other product

4.2.3.2 Interoperability

degree to which two or more systems, products or components can exchange information and use the information that has been exchanged

NOTE Based on ISO/IEC/IEEE 24765.

4.2.4 Usability

degree to which a product or system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

NOTE 1 Adapted from ISO 9241-210.

NOTE 2 Usability can either be specified or measured as a product quality characteristic in terms of its subcharacteristics, or specified or measured directly by measures that are a subset of quality in use.

4.2.4.1 Appropriateness Recognizability

degree to which users can recognize whether a product or system is appropriate for their needs cf. **functional appropriateness** (4.2.1.3).

NOTE 1 Appropriateness recognizability will depend on the ability to recognize the appropriateness of the product or system's functions from initial impressions of the product or system and/or any associated documentation.

NOTE 2 The information provided by the product or system can include demonstrations, tutorials, documentation or, for a web site, the information on the home page.

4.2.4.2 Learnability

degree to which a product or system can be used by specified users to achieve specified goals of learning to use the product or system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use

NOTE Can be specified or measured either as the extent to which a product or system can be used by specified users to achieve specified goals of learning to use the product or system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use, or by product properties corresponding to suitability for learning as defined in ISO 9241-110.

4.2.4.3 Operability

degree to which a product or system has attributes that make it easy to operate and control

NOTE Operability corresponds to controllability, (operator) error tolerance and conformity with user expectations as defined in ISO 9241-110.

4.2.4.4 User Error Protection

degree to which a system protects users against making errors

4.2.4.5 User Interface Aesthetics

degree to which a user interface enables pleasing and satisfying interaction for the user

NOTE This refers to properties of the product or system that increase the pleasure and satisfaction of the user, such as the use of colour and the nature of the graphical design.

4.2.4.6 Accessibility

degree to which a product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use

NOTE 1 The range of capabilities includes disabilities associated with age.

NOTE 2 Accessibility for people with disabilities can be specified or measured either as the extent to which a product or system can be used by users with specified disabilities to achieve specified goals with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use, or by the presence of product properties that support accessibility.

4.2.5 Reliability

degree to which a system, product or component performs specified functions under specified conditions for a specified period of time

NOTE 1 Adapted from ISO/IEC/IEEE 24765.

NOTE 2 Wear does not occur in software. Limitations in reliability are due to faults in requirements, design and implementation, or due to contextual changes.

NOTE 3 Dependability characteristics include availability and its inherent or external influencing factors, such as availability, reliability (including fault tolerance and recoverability), security (including confidentiality and integrity), maintainability, durability, and maintenance support.

4.2.5.1 Maturity

degree to which a system, product or component meets needs for reliability under normal operation

NOTE The concept of maturity can also be applied to other quality characteristics to indicate the degree to which they meet required needs under normal operation.

4.2.5.2 Availability

degree to which a system, product or component is operational and accessible when required for use [ISO/IEC/IEEE 24765]

NOTE Externally, availability can be assessed by the proportion of total time during which the system, product or component is in an up state. Availability is therefore a combination of maturity (which governs the frequency of failure), fault tolerance and recoverability (which governs the length of down time following each failure).

4.2.5.3 Fault tolerance

degree to which a system, product or component operates as intended despite the presence of hardware or software faults

NOTE Adapted from ISO/IEC/IEEE 24765.

4.2.5.4 Recoverability

degree to which, in the event of an interruption or a failure, a product or system can recover the data directly affected and re-establish the desired state of the system

NOTE Following a failure, a computer system will sometimes be down for a period of time, the length of which is determined by its recoverability.

4.2.6 Security

degree to which a product or system protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization

NOTE 1 As well as data stored in or by a product or system, security also applies to data in transmission.

NOTE 2 Survivability (the degree to which a product or system continues to fulfil its mission by providing essential services in a timely manner in spite of the presence of attacks) is covered by **recoverability** (4.2.5.4).

NOTE 3 Immunity (the degree to which a product or system is resistant to attack) is covered by **integrity** (4.2.6.2).

NOTE 4 Security contributes to **trust** (4.1.3.2).

4.2.6.1 Confidentiality

degree to which a product or system ensures that data are accessible only to those authorized to have access

4.2.6.2 Integrity

degree to which a system, product or component prevents unauthorized access to, or modification of,

computer programs or data [ISO/IEC/IEEE 24765]

4.2.6.3 Non-repudiation

degree to which actions or events can be proven to have taken place, so that the events or actions cannot be repudiated later

NOTE Adapted from ISO 7498-2:1989.

4.2.6.4 Accountability

degree to which the actions of an entity can be traced uniquely to the entity

NOTE Adapted from ISO 7498-2:1989.

4.2.6.5 Authenticity

degree to which the identity of a subject or resource can be proved to be the one claimed

NOTE Adapted from ISO/IEC 13335-1:2004.

4.2.7 Maintainability

degree of effectiveness and efficiency with which a product or system can be modified by the intended maintainers

NOTE 1 Modifications can include corrections, improvements or adaptation of the software to changes in environment, and in requirements and functional specifications. Modifications include those carried out by specialized support staff, and those carried out by business or operational staff, or end users.

NOTE 2 Maintainability includes installation of updates and upgrades.

NOTE 3 Maintainability can be interpreted as either an inherent capability of the product or system to facilitate maintenance activities, or the quality in use experienced by the maintainers for the goal of maintaining the product or system.

4.2.7.1 Modularity

degree to which a system or computer program is composed of discrete components such that a change to one component has minimal impact on other components [ISO/IEC/IEEE 24765]

4.2.7.2 Reusability

degree to which an asset can be used in more than one system, or in building other assets

NOTE Adapted from IEEE 1517-2004.

4.2.7.3 Analysability

degree of effectiveness and efficiency with which it is possible to assess the impact on a product or system of an intended change to one or more of its parts, or to diagnose a product for deficiencies or causes of failures, or to identify parts to be modified

NOTE Implementation can include providing mechanisms for the product or system to analyse its own faults and provide reports prior to a failure or other event.

4.2.7.4 Modifiability

degree to which a product or system can be effectively and efficiently modified without introducing defects or degrading existing product quality

NOTE 1 Implementation includes coding, designing, documenting and verifying changes.

NOTE 2 **Modularity** (4.2.7.1) and **analysability** (4.2.7.3) can influence modifiability.

NOTE 3 Modifiability is a combination of changeability and stability.

4.2.7.5 Testability

degree of effectiveness and efficiency with which test criteria can be established for a system, product or component and tests can be performed to determine whether those criteria have been met

NOTE Adapted from ISO/IEC/IEEE 24765.

4.2.8 Portability

degree of effectiveness and efficiency with which a system, product or component can be transferred from one hardware, software or other operational or usage environment to another

NOTE 1 Adapted from ISO/IEC/IEEE 24765.

NOTE 2 Portability can be interpreted as either an inherent capability of the product or system to facilitate porting activities, or the quality in use experienced for the goal of porting the product or system.

4.2.8.1 Adaptability

degree to which a product or system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments

NOTE 1 Adaptability includes the scalability of internal capacity (e.g. screen fields, tables, transaction volumes, report formats, etc.).

NOTE 2 Adaptations include those carried out by specialized support staff, and those carried out by business or operational staff, or end users.

NOTE 3 If the system is to be adapted by the end user, adaptability corresponds to suitability for individualization as defined in ISO 9241-110.

4.2.8.2 Installability

degree of effectiveness and efficiency with which a product or system can be successfully installed and/or uninstalled in a specified environment

NOTE If the product or system is to be installed by an end user, installability can affect the resulting functional appropriateness and operability.

4.2.8.3 Replaceability

degree to which a product can replace another specified software product for the same purpose in the same environment

NOTE 1 Replaceability of a new version of a software product is important to the user when upgrading.

NOTE 2 Replaceability can include attributes of both installability and adaptability. The concept has been introduced as a subcharacteristic of its own because of its importance.

NOTE 3 Replaceability will reduce lock-in risk: so that other software products can be used in place of the present one, for example by the use of standardized file formats.