TECHNICAL SPECIFICATION

ISO/IEC TS 25025

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Information technology — Systems and software Quality Requirements and Evaluation (SQuaRE) — Measurement of IT service quality

Technologies de l'information — Exigences de qualité et évaluation des systèmes et du logiciel (SQuaRE) — Mesure de la qualité du service informatique

Contents

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members _experts/refdocs).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/ iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national -committees.

Introduction

0.1 General

This document is a part of the Systems and software Quality Requirements and Evaluation(SQuaRE) series of documents, which provides a set of measures for the quality characteristics of IT service that are defined in ISO/IEC TS 25011. It can be used for specifying requirements, measuring and evaluating the IT service quality, in conjunction with other SQuaRE series of documents.

The set of quality measures in this document are selected based on their practical value. They are not intended to be exhaustive, therefore users of this document are encouraged to refine them if necessary.

0.2 Quality measurement division

This document is a part of the ISO/IEC 2502n division that currently consists of the following documents:

— ISO/IEC 25020 — Quality measurement framework: provides a reference model and guideline for measuring the quality characteristics defined in ISO/IEC 2501n quality model division.

— ISO/IEC 25021 — Quality measure elements: provides a format for specifying quality measure elements and some examples of quality measure elements that can be used to construct software quality measures.

— ISO/IEC 25022 — Measurement of quality in use: provides measures including associated measurement functions for the quality characteristics in the quality in use model.

— ISO/IEC 25023 — Measurement of system and software product quality: provides measures including associated measurement functions for the quality characteristics in the product quality model.

— ISO/IEC 25024 — Measurement of data quality: provides measures including associated measurement functions for the quality characteristics in the data quality model.

— ISO/IEC TS 25025 — Measurement of IT service quality: provides quality measures useful for requirements and evaluation of IT service quality.

Figure 1 depicts the relationship between this document and the other documents in the ISO/IEC 2502n division.
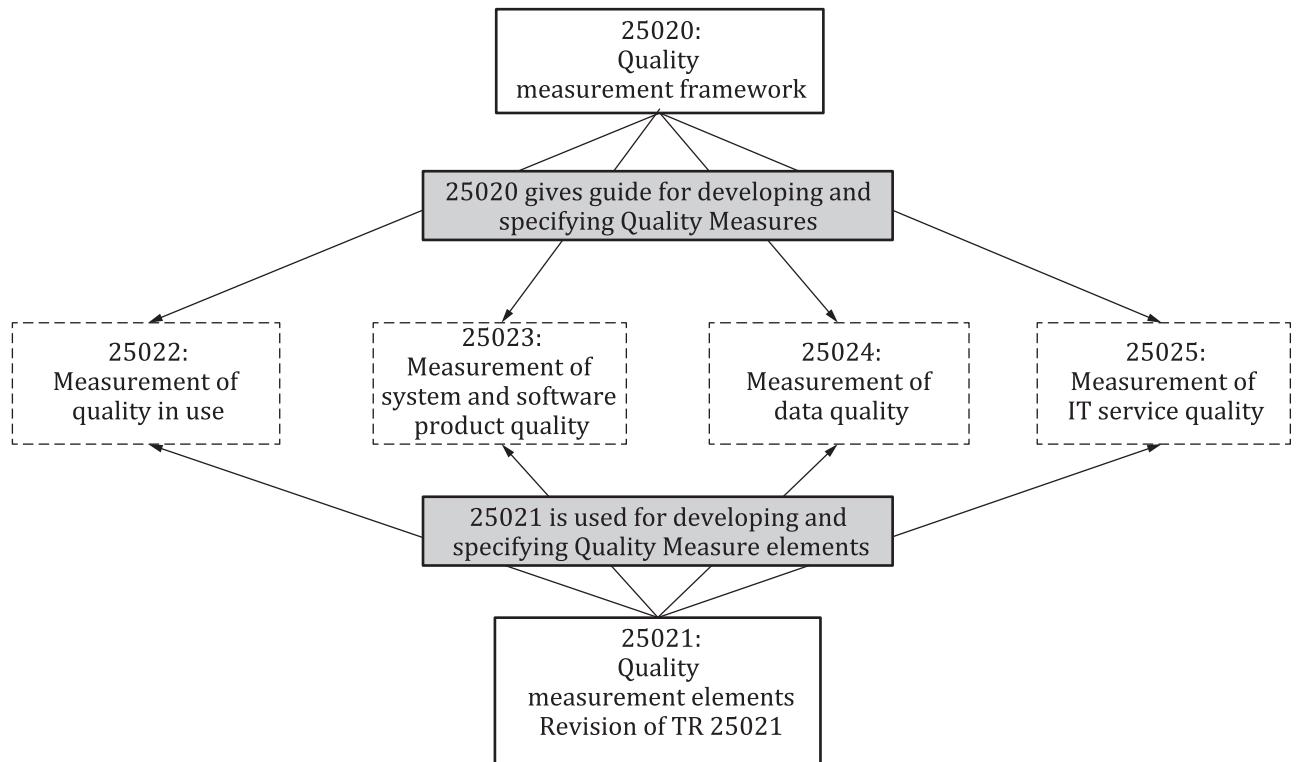
Figure 1 — Structure of the quality measurement division

0.3 Outline and organization of SQuaRE series

The SQuaRE series consists of five main divisions and an extension division. An outline of each division within the SQuaRE series is as follows:

— ISO/IEC 2500n — Quality management division. The standards that form this division define all common models, terms and definitions referred further by all other standards from the SQuaRE series. The division also provides requirements and guidance for the planning and management of a project.

— ISO/IEC 2501n — Quality model division. The standards that form this division provide quality models for system/software products, quality in use, data and IT service. Practical guidance on the use of the quality model is also provided.

— ISO/IEC 2502n — Quality measurement division. The standards that form this division include a system/software product quality measurement reference model, definitions of quality measures, and practical guidance for their application. This division presents internal measures of software quality, external measures of software quality, quality in use measures, data quality measures and IT service quality measures. Quality measure elements forming foundations for the quality measures are defined and presented.

— ISO/IEC 2503n — Quality requirements division. The standards that form this division help to specify quality requirements. These quality requirements can be used in the process of quality requirements elicitation for a system/software product to be developed, designing a process for achieving necessary quality, or as inputs for an evaluation process.

— ISO/IEC 2504n — Quality evaluation division. The standards that form this division provide requirements, recommendations and guidelines for system/software product evaluation, whether performed by independent evaluators, acquirers or developers. The support for documenting a measure as an Evaluation Module is also presented.

ISO/IEC 25050 to ISO/IEC 25099 are reserved for SQuaRE extension International Standards, Technical Specifications, Publicly Available Specifications (PAS) and/or Technical Reports.

Information technology — Systems and software Quality Requirements and Evaluation (SQuaRE) — Measurement of IT service quality

1   Scope

This document defines quality measures useful for requirements and evaluation of IT service quality in terms of characteristics and sub-characteristics defined in ISO/IEC TS 25011.

This document contains a basic set of quality measures for each characteristic and sub-characteristic.

This document does not assign ranges of values of the quality measures to rated levels or to grades of compliance. Such values are defined based on the nature of the IT service, and so depends on factors such as category of the IT service or users' needs. Some attributes can have a desirable range of values, which does not depend on specific user needs but generic factors, for example, service downtime. This document includes, in Annex A, considerations for the selection and application of quality measures.

The quality measures in this document are primarily intended to be used for quality evaluation and improvement of IT services during or after the development life cycle.

The main users of this document are people carrying out quality requirements specification and evaluation activities for IT services as part of the following:

— development: including requirements analysis, design, implementation, testing and deployment during the development life cycle;

— quality management: monitoring activities of quality assurance and performing quality control of an IT service;

— supply: making a contract with the user for supplying an IT service under the terms of a contract;

— acquisition: including IT service selection, when acquiring or procuring an IT service from a service provider;

— maintenance: improvement of an IT service based on quality measurement.

The relationship of this document to domain-specific IT service quality model and its precedence over this document is determined by the user in a specific context of use.

2   Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 25000, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Guide to SQuaRE*

ISO/IEC TS 25011:2017, *Information technology — Systems and software Quality Requirements and Evaluation (SQuaRE) — Service quality models*

ISO/IEC 25021:2012, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality measure elements*

3   Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 25000 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
quality measure
derived measure that is defined as a *measurement function* (3.5) of two or more values of quality measure elements

[SOURCE: ISO/IEC 25021:2012, 4.13]

3.2
IT service
information technology service
service that makes use of IT systems as tools to provide value to an individual user or a business by facilitating results the user or business wants to achieve

Note 1 to entry: IT services can be delivered remotely by people, or by an IT application that could be in a local or remote location.

[SOURCE: ISO/IEC TS 25011:2017, 3.3.2, modified — "information technology service" has been changed from a preferred term to an admitted term.]

3.3
IT service quality
degree to which an *IT service* (3.2) satisfies stated and implied needs when used under specified conditions

[SOURCE: ISO/IEC TS 25011:2017, 3.3.10]

3.4
IT service function
collection of related steps performed as a part of an *IT service* (3.2), or features provided by an IT system

EXAMPLE   The service status monitoring or data backup of an internet banking service.

Note 1 to entry: ISO/ IEC has software functionality identification, classification and sizing standard methods that provides consistency identifying unique IT service functions; these include: ISO/IEC 20926 (IFPUG method), ISO/IEC 19761 (COSMIC method), ISO/IEC 29881 (FiSMA method), ISO/IEC 20968 (MarkII method), ISO/IEC 24570 (NESMA method).

3.5
measurement function
algorithm or calculation performed to combine two or more quality measure elements

[SOURCE: ISO/IEC 25021:2012, 4.7, modified — Note 1 to entry has been removed.]

3.6
service provider
organization that manages and delivers a service or services to customers

[SOURCE: ISO/IEC 20000-1:2018, 3.2.24]

3.7
service level agreement
SLA
documented agreement between the *IT service* (3.2) provider and the user that identifies services and their agreed performance

Note 1 to entry: A service level agreement can be included in a contract or another type of documented agreement.

[SOURCE: ISO/IEC 20000-1:2018, 3.2.20, modified — "the organization and the customer" has been changed to "the IT service provide and the user"; the original note 1 to entry has been removed; the original note 2 to entry has become note 1 to entry.]

4 Conformance

Any quality requirements specification or quality evaluation that conforms to this document shall:

a) select the quality characteristics and/or sub-characteristics to be specified or evaluated as defined in ISO/IEC TS 25011;

b) provide the rationale for any modifications of quality measures;

c) define any additional quality measures and quality measure elements from ISO/IEC 25021 that are not included in this document.

5 Use of IT service quality measures

5.1 IT service quality measurement concepts

This document provides quality measures for the characteristics and sub-characteristics of the service quality model defined in ISO/IEC TS 25011. IT service quality characteristics are defined in ISO/IEC TS 25011 that categorizes IT service quality into 8 characteristics.

The quality of an IT service is the degree of satisfying the stated and implied needs of its users and thus provides value. These stated and implied needs are represented in the SQuaRE series of standards by quality models that categorize IT service quality into characteristics, which in most cases are further subdivided into sub-characteristics.

The quality characteristic and sub-characteristic can be quantified by applying measurement functions. The measurement function of a quality measure is defined using a mathematical formula by combining quality measure elements. Quality measures enable us to quantify the quality of an IT service. More than one quality measure can be used for the measurement of quality characteristics and sub-characteristics.

5.2 Approach to IT service quality measurement

This document provides a possible, suggested set of IT service quality measures to be used with the quality model in ISO/IEC TS 25011. The user of this document can select suitable quality measures for a specific service and assign different weighting to these quality measures for different types of IT services.

When selecting the appropriate IT service quality measures, the factors which can influence the selection can include the following:

— the importance of the property to quantify;

— the type of the target IT service;

— the user requirements.

If necessary, the user can modify the quality measures defined in this document and can also define new measures or use ones from the other documents.

When using a newly defined or modified quality measure, the user should specify how the measure relates to the ISO/IEC TS 25011 quality model or any other substitute quality model that is being used.

Most of the quality measures defined in this document use measurement functions which provide normalized values ranging from 0 to 1. The users can change the value range, for example, low or high, if it is desirable.

6 Format used for documenting the IT service quality measures

The following information is given for each quality measure in Tables 1 to 27:

a) ID: identification code of the quality measure. Each ID consists of the following two parts:

  — abbreviated alphabetic code representing the quality characteristics as one capital X and sub-characteristics as one capital X followed by lower-case x (for example, "UUe" denotes "User error protection" measures for "Usability");

  — serial number in sequential order within quality sub-characteristic.

b) Name: quality measure name.

c) Description: the information provided by the quality measure.

d) Measurement function: mathematical formula showing how the quality measure elements are combined to produce the quality measure.

7 IT service quality measures

7.1 General

The quality measures in this clause are listed by quality characteristics and sub-characteristics, in the order used in ISO/IEC TS 25011; and the word "measures" in this clause means quality measures.

NOTE 1   The list of quality measures shown in Table 1 is not final, and can be revised in future editions of this document. Users of this document are invited to provide feedback.

Table 1 — IT service quality measures

Characteristics	Sub-characteristics	Measures
Suitability	Completeness	Functional coverage
		Goals and objectives achievement
		Data items populated
	Correctness	IT service function correctness
		Compliance of defined process
	Appropriateness	IT service function appropriateness for context of use
		IT service function appropriateness to service users
	Consistency	IT service consistency
		IT service process quality consistency

Table 1 *(continued)*

Characteristics	Sub-characteristics	Measures
Usability	Appropriateness recognizability	Description completeness
		Demonstration coverage
	Learnability	User guide completeness
		User guide effectiveness
		User guide efficiency
	Operability	Message clarity
		Understandable categorization of service
		IT service automation
		Effort time estimability
	User error protection	Avoidance of user operation error
		User error correction
	Accessibility	Accessibility for users with disabilities
		Language supportability
	Courtesy	Courteous service language, behaviour and attitude
Security	Confidentiality	Access controllability
		Completeness of access control methods to protect confidential information
		Effectiveness of confidentiality protection
	Integrity	Data integrity
	Traceability	User audit trail completeness
		Traceability completeness
IT service reliability	Continuity	Coverage of IT service continuity plan
		Completeness of IT service risk prevention actions
		Completeness of IT service risk mitigation actions
		Effectiveness of IT service risk mitigation actions
	IT service recoverability	Effectiveness of recovery
		Timely recovery
	Availability	IT service availability
Tangibility	Visibility	Visibility of IT service functions delivery
		Visibility of IT service functions progress
	professionalism	Process adaption maturity
		Personnel qualification
		IT service developer professionalism
	IT service interface appearance	User interface appearance satisfaction
		IT service interface satisfaction
Responsiveness	Timeliness	IT service delivery timeliness
	Reactiveness	Response timeliness
		Responsiveness of request for modification and enhancement

Table 1 *(continued)*

Characteristics	Sub-characteristics	Measures
IT service adaptability	Customizability	IT service function customizability
		User interface customizability
	Initiative	Satisfaction of users' goals
		Proactive change suggestion
		Change suggestion acceptance
		Effectiveness of implementing accepted change suggestions
IT service maintainability	Analysability	IT service analysis effectiveness
	Modifiability	IT service function modifiability
	Testability	Completeness of testing criteria
		Testing completion

7.2 Suitability measures

7.2.1 General

Suitability measures are used to assess the degree to which an IT service meets stated and implied needs when used in a specified context of use.

7.2.2 Completeness measures

Completeness measures are used to assess the degree to which an IT service supports all the specified goals, objectives and data specified by the user.

Table 2 — Completeness measures

ID	Name	Description	Measurement function
SCp-1[a,b]	Functional coverage	What proportion of specified functions has been implemented?	$X = 1 - A/B$ A = Number of IT service functions missing B = Number of IT service functions specified
SCp-2	Goals and objectives achievement	What proportion of specified goals and objectives has been achieved?	$X = 1 - A/B$ A = Number of goals and objectives that have not been achieved B = Number of goals and objectives intended to be supported by the fully implemented service
SCp-3[c]	Data items Populated	What proportion of the specified data items has been populated with data?	$X = A/B$ A = Number of data items populated B = Number of data items specified
[a] Functions can be specified in SLA (service level agreement), the design specification, the user manual or all of these.			
[b] Missing service functions are detected when the service does not have the ability to perform a function that is specified.			
[c] "populated data" means a set of data to be inserted into database for each data item required to provide IT services.			

7.2.3 Correctness measures

Correctness measures are used to assess the degree to which an IT service uses the correct process and produces the correct results with accurate data.

Table 3 — Correctness measures

ID	Name	Description	Measurement function
SCr-1[a,b,c]	IT service function correctness	What proportion of IT service functions produces correct results?	$X = 1 - A/B$ A = Number of IT service functions that produce incorrect data B = Number of IT service functions considered
SCr-2	Compliance of defined process	What proportion of IT service functions uses the defined process?	$X = A/B$ A = Number of IT service functions using the defined process B = Number of IT service functions

[a]　The service function is incorrect if it does not provide reasonable and acceptable results to achieve the specific intended objective.

[b]　The service functions considered for evaluation can be all the functions provided by an IT service or a specific set of functions required for a particular usage.

[c]　Service provider possibly examines an individual function by reviewing or testing and determines whether the function successfully provides suitable outcomes to specific objectives as defined in the requirements specification or not.

7.2.4　Appropriateness measures

Appropriateness measures are used to assess the degree to which an IT service provides results that are appropriate for the user needs.

Table 4 — Appropriateness measures

ID	Name	Description	Measurement function
SAp-1	IT service function appropriateness for context of use	What proportion of IT service functions provided is appropriate for context of use?	$X = A/B$ A = Number of IT service functions satisfied by service users B = Number of IT service functions provided
SAp-2	IT service function appropriateness to service users	What proportion of IT service functions is appropriate to the level of education, skills, expertise and qualifications of users receiving the IT service?	$X = A/B$ A = Number of IT service functions appropriate to the level of education, skills, expertise and qualifications of users receiving the IT service B = Number of IT service functions

7.2.5　Consistency measures

Consistency measures are used to assess the degree to which repeated or similar related IT services provided consistent quality.

Table 5 — Consistency measures

ID	Name	Description	Measurement function
SCs-1[a]	IT service process consistency	What proportion of repeated or similar IT service subprocesses is performed in a consistent manner?	$X = A/B$ A = Number of IT service subprocesses that are repeated or similar across the IT service functions which perform in a consistent manner B = Number of IT service subprocesses that are repeated and similar across the IT service functions

[a]　The process of IT service would consist of several subprocesses, and the subprocess should be provided in the same or similar manner.

Table 5 *(continued)*

ID	Name	Description	Measurement function
SCs-2[a]	IT service outcome quality consistency	What proportion of repeated or similar IT service subprocesses is performed in a consistent level of outcome quality?	$X = A/B$ A = Number of IT service subprocesses that are repeated or similar across the IT service functions which produce a consistent level of outcome quality B = Number of IT service subprocesses that are repeated or similar across the IT service functions
[a] The process of IT service would consist of several subprocesses, and the subprocess should be provided in the same or similar manner.			

7.3   Usability measures

7.3.1   General

Usability measures are used to assess the degree to which an IT service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

7.3.2   Appropriateness recognizability measures

Appropriateness recognizability measures are used to assess the degree to which users can recognize whether an IT service is appropriate for their needs.

Table 6 — Appropriateness recognizability measures

ID	Name	Description	Measurement function
UAr-1[a]	Description completeness	What proportion of IT service functions is described in the service artifacts?	$X = A/B$ A = Number of IT service functions described in the service artefacts B = Number of IT service functions specified
UAr-2	Demonstration coverage	What proportion of IT service functions is covered by demonstration features to help users understand the appropriateness of the service functions to their needs?	$X = A/B$ A = Number of IT service functions that are covered by demonstration features B = Number of IT service functions requiring demonstration features to help users understand the appropriateness of the service functions to their needs
[a] Service artifacts include service plan, service report etc.			

7.3.3   Learnability measures

Learnability measures are used to assess the degree to which an IT service can be learned by users to achieve a specified level of effectiveness, efficiency, freedom from risk and satisfaction within a specified amount of time and context of use.

Table 7 — Learnability measures

ID	Nam Name	Description	Measurement function
ULe-1	User guide completeness	What proportion of IT service functions is described in a user guide?	$X = A/B$ A = Number of IT service functions described in a user guide B = Number of IT service functions that should be described in a user guide
ULe-2	User guide effectiveness	What proportion of user guide is effective for users to operate IT systems by themselves without the support of an IT service provider?	$X = A/B$ A = Number of IT service functions in a user guide which enables users to operate IT systems by themselves without the support of an IT service provider B = Number of IT service functions described in a user guide
ULe-3	User guide efficiency	What proportion of IT service functions can users learn in a specified time period using a user guide?	$X = A/B$ A = Number of IT service functions that users can learn in a specified time period B = Number of IT service functions described in a user guide

7.3.4 Operability measures

Operability measures are used to assess the degree to which an IT service has attributes that make it easy to operate and control.

Table 8 — Operability measures

ID	Name	Description	Measurement function
UOp-1[a]	Message clarity	What proportion of messages from IT service functions is clearly described which enables user to operate and control the service without trial and error?	$X = A/B$ A = Number of messages which are described clearly enough to enable users to operate and control the service without making trial and error B = Number of messages implemented
UOp-2	Understandable categorization of service	To what extent is the service categorization understandable to the intended users	$X = A/B$ A = Number of service categories that are understandable to the intended users B = Number of service categories used
UOp-3	IT service automation	What proportion of automatable IT service functions is fully-automated without intervention of the service provider or human support?	$X = A/B$ A = Number of fully-automated IT service functions B = Number of automatable IT service functions
UOp-4	Effort time estimability	What proportion of IT service functions provides the information of human effort time estimates needed to complete the functions by users?	$X = A/B$ A = Number of IT service functions providing the information of human effort time estimates to complete the functions by users B = Number of IT service functions
[a] Messages should provide all possible information that enables users to understand how to operate and control.			

7.3.5 User error protection measures

User error protection measures are used to assess the degree to which an IT service protects users against making errors.

Table 9 — User error protection measures

ID	Name	Description	Measurement function
UUe-1	Avoidance of user operation error	What proportion of user actions and inputs is protected against causing any error?	$X = A/B$ A = Number of user actions and inputs that are actually protected from causing any errors B = Number of user actions and inputs that should be protected from causing any errors
UUe-2	User error correction	What proportion of user errors can be corrected?	$X = A/B$ A = Number of user error which are corrected B = Number of user error which could occur during operation

7.3.6 Accessibility measures

Accessibility measures are used to assess the degree to which an IT service can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.

Table 10 — Accessibility measures

ID	Name	Description	Measurement function
UAc-1[a,b,c]	Accessibility for users with disabilities	To what extent can intended users with specific disabilities successfully use the services (with assistive technology if appropriate)?	$X = A/B$ A = Number of IT service functions successfully usable by users with specific disabilities B = Number of IT service functions provided
UAc-2[d]	Language supportability	What proportion of languages required is supported?	$X = A/B$ A = Number of languages actually supported B = Number of languages specified in the specifications to be supported

[a]   Specific disabilities include cognitive disability, motor disability, hearing/voice disability, visual disability and so on.

[b]   The range of capabilities includes disabilities associated with age.

[c]   Any person becomes possibly a user with limited cognitive, physical, hearing or visual ability under specific situations or environments, for example, in darkness, in low atmospheric pressure at high altitude, in water and so on.

[d]   When users use an IT service in a language from other than native one, they often experience operational errors and sometimes give up without achieving their intended goals. Such a case is one example of decreasing accessibility and causes misunderstanding of the service outputs. Therefore, language support should be considered, specified and implemented for users from various countries.

7.3.7 Courtesy measures

Courtesy measures are used to assess the degree to which the IT service is provided in a polite, respectful and friendly way.

Table 11 — Courtesy measures

ID	Name	Description	Measurement function
UCo-1	Courteous service language, behaviour and attitude	What proportion of the IT service functions is delivered using language, behaviour and attitudes that are courteous to the user?	$X = A/B$ A = Number of IT service functions that are delivered using language, behaviour and attitude that are courteous to the user B = Number of IT service functions
NOTE 1 'Courteous service language, behaviour, and attitude' can be measured through user satisfaction surveys.			
NOTE 2 'Courteous service language' means using user-friendly words instead of IT specific terminologies.			

7.4 Security measures

7.4.1 General

Security measures are used to assess the degree to which an IT service protects both user's assets and access to their information so that users have the degree of information access appropriate to their levels of authorization.

NOTE   This document focuses on security measures of the IT service, and security measures for software product are in ISO/IEC 25023.

7.4.2 Confidentiality measures

Confidentiality measures are used to assess the degree to which an IT service ensures that data are accessible only by authorized users.

NOTE   This explanation is modified from ISO/IEC TS 25011 to clarify its meaning.

Table 12 — Confidentiality measures

ID	Name	Description	Measurement function
SCo-1	Access controllability	What proportion of confidential data items is protected from unauthorized accesses?	$X = A/B$ A = Number of confidential data items protected from unauthorized accesses B = Number of confidential data items that require access control
SCo-2[a]	Completeness of access control methods to protect confidential information	What proportion of the methods for accessing confidential data has access controls?	$X = A/\text{B}$ A = Number of methods for accessing confidential information that has access controls B = Number of methods for accessing confidential information specified
SCo-3	Effectiveness of confidentiality protection	What proportion of the accesses of confidential data is not made by unauthorized people trying to access that data?	$X = 1 - A/B$ A = Number of accesses of confidential information made by people who are not authorized to access that information B = Number of accesses of confidential information
[a] Examples of access controls include login, biometric authentication, etc.			

7.4.3   Integrity measures

Integrity measures are used to assess the degree to which an IT service prevents unauthorized access to or modification of data whether accidently or intentionally.

NOTE   The definition of integrity in ISO/IEC TS 25011 is different from the definition in ISO/IEC 27001.

Table 13 — Integrity measures

ID	Name	Description	Measurement function
SIn-1	Data integrity	What proportion of the data items is not modified accidentally or maliciously?	$X = 1 - A/B$ A = Number of data items that are modified accidentally or maliciously B = Number of data items which require integrity

7.4.4   Traceability measures

Traceability measures are used to assess the degree to which the IT service outcomes can be traced to or from the user needs.

Table 14 — Traceability measures

ID	Name	Description	Measurement function
STr-1[a]	User audit trail completeness	How complete is the audit trail concerning the user access to the system and data?	$X = A/B$ A = Number of accesses recorded in all logs B = Number of accesses to system or data required to be traced
STr-2	Traceability completeness	What proportion of outcomes of the service functions can be traced back to or from user needs?	$X = A/B$ A = Number of IT service functions where outcomes can be traced back to or from user needs B = Number of IT service functions
[a] Traceability is the sub-characteristic of security, "user audit trail completeness" measure is defined in the security point of view.			

7.5   IT service reliability measures

7.5.1   General

IT service reliability measures are used to assess the degree to which an IT service provides consistent and stable IT service outcomes.

7.5.2   Continuity measures

Continuity measures are used to assess the degree to which the IT service is provided under all foreseeable circumstances, including mitigating the risks resulting from interruption to an acceptable level.

Table 15 — Continuity measures

ID	Name	Description	Measurement function
RCo-1	Coverage of IT service continuity plan	What proportion of the risks that could cause IT service interruption is specified in the IT service continuity plan?	$X = A/B$ A = Number of risks that are addressed in the IT service continuity plan B = Number of risks that could cause interruptions to IT services
RCo-2	Completeness of IT service risk prevention actions	What proportion of the risks listed in the IT services continuity plan is addressed with defined prevention actions?	$X = A/B$ A = Number of risks addressed in the IT service continuity plan that are addressed with defined prevention actions B = Number of risks addressed in the IT service continuity plan
RCo-3	Completeness of IT service risk mitigation actions	What proportion of the risks listed in the IT services continuity plan is addressed with defined mitigation actions?	$X = A/B$ A = Number of risks listed in the IT services continuity plan that is addressed with risk mitigation actions B = Number of risks listed in the IT services continuity plan
RCo-4	Effectiveness of IT service risk mitigation actions	What proportion of IT service mitigation actions reduces subsequent IT service interruptions?	$X = 1 - A/B$ A = Number of mitigation actions that failed to prevent subsequent IT service interruptions during simulation training B = Number of mitigation actions in the IT services continuity plan
NOTE	Examples of risk can be the interruption of service, the delay of service function completion, etc.		

7.5.3 IT service recoverability measures

IT service recoverability measures are used to assess the degree to which, in the event of an interruption or a failure or disaster, the original IT service and its functions and data can be re-established and made accessible.

Table 16 — IT service recoverability measures

ID	Name	Description	Measurement function
RRc-1	Effectiveness of recovery	What proportion of functions of the IT service is recovered to original state after interruption or failure, or disaster events listed in the IT service recovery plan has occurred?	$X = A/B$ A = Number of functions of the IT service recovered to the original state after the interruption or failure/disaster events have occurred B = Number of functions of the IT service that have been stopped
RRc-2	Timely recovery	What proportion of interruption or failure, or disaster events is resolved within the time requirement specified in the service level agreement and service contract?	$X = A/B$ A = Number of interruption or failure/disaster events that are resolved within the time requirement of the service level agreement and service contract B = Number of interruption or failure/disaster events

7.5.4 Availability measures

Availability measures are used to assess the degree to which an IT service is available to users when needed.

Table 17 — Availability measures

ID	Name	Description	Measurement function
RAv-1	IT service availability	How much of IT service satisfy the availability requirements specified in an SLA?	$X = 1 - A/B$ A = Time duration of IT service not available due to interruption, failure or disaster events B = Availability requirements specified in an SLA
NOTE Example of availability requirements can be described as service downtime, MTTF (mean time to failure), etc.			

7.6 Tangibility measures

7.6.1 General

Tangibility measures are used to assess the degree to which the tangible aspects of the IT service effectively communicate and support the service.

NOTE   The term tangibility is newly defined and is different from the definition in ISO/IEC 20000-1.

7.6.2 Visibility measures

Visibility measures are used to assess the degree to which users have insight into the capabilities of the IT service, how they will be delivered and progress toward their completion during delivery.

Table 18 — Visibility measures

ID	Name	Description	Measurement function
TVi-1	Visibility of IT service functions delivery	What proportion of IT service functions provides adequate information to users about when and how the service function is to be delivered?	$X = A/B$ A = Number of IT service functions which have provided adequate information about when and how the service functions will be delivered B = Number of IT service functions which need information when user using the service
TVi-2	Visibility of IT service functions progress	What proportion of service functions provides adequate information to let users know the progress toward completion?	$X = A/B$ A = Number of IT service functions which provide adequate information to let users know the progress toward completion B= Number of IT service functions which can provide the progress information when using the service
NOTE Information can be about when the IT service output is delivered, how the IT service functions are provided, etc.			

7.6.3 Professionalism measures

Professionalism measures are used to assess the degree to which the content of the IT service is based on appropriate education, skill, expertise and qualification.

Table 19 — Professionalism measures

ID	Name	Description	Measurement function
TPr-1	Process conformance maturity	To what extent does the IT service function personnel follow the defined process?	$X = A/B$ A = Number of IT service function persons following the defined process B = Number of IT service function persons
TPr-2[a]	Personnel qualification	What proportion of the people providing IT services has appropriate credentials or experience for the services they deliver?	$X = A/B$ A = Number of the people providing IT services who have appropriate credentials or experience for the services they deliver B = Number of the people providing IT services
TPr-3[b]	IT service developer professionalism	What proportion of IT service developers has appropriate credentials for the services they develop?	$X = A/B$ A = Number of the IT service developers who have appropriate credentials for the services they develop B = Number of the IT service developers
[a] Appropriate credentials mean the education, expertise and qualification appropriate for an IT service.			
[b] A service developer is an individual who is involved in the specification, development, or testing of an IT service.			

7.6.4   IT service interface appearance measures

IT service interface appearance measures are used to assess the degree to which the interface of the service has an appearance or other physical properties that are pleasing and satisfying for the user.

Table 20 — IT service interface appearance measures

ID	Name	Description	Measurement function
TIa-1[a]	User interface appearance satisfaction	What proportion of user interfaces has an appearance that is pleasing and satisfying to users?	$X = A/B$ A = Number of user interfaces having appearance that is pleasing and satisfying to users B = Number of user interfaces described in the service requirement
TIa-2[b]	IT service interface satisfaction	What proportion of service interface is pleasing and satisfying to users?	$X = A/B$ A = Number of service interfaces that are pleasing and satisfying to users B = Number of service interfaces through which users interact
[a] The user interface can be described in the design documents, user interface prototype, etc.			
[b] The service interface implies the interaction point between users and IT service providers.			

7.7   Responsiveness measures

7.7.1   General

Responsiveness measures are used to assess the degree to which an IT service responds and provides outcomes in a prompt and timely way.

7.7.2 Timeliness measures

Timeliness measures are used to assess the degree to which an IT service delivers outcomes within time limits.

Table 21 — Timeliness measures

ID	Name	Description	Measurement function
RTi-1	IT service delivery timeliness	What proportion of service functions is delivered within time limits required by a service level agreement and service contract?	$X = A/B$ A = Number of IT service functions delivered on time as required by service level agreement and service contract B = Number of IT service functions to be delivered

7.7.3 Reactiveness measures

Reactiveness measures are used to assess the degree to which the IT service promptly responds to user requests.

Table 22 — Reactiveness measures

ID	Name	Description	Measurement function
RRe-1[a]	Response timeliness	What proportion of service requests is processed within the response time requirements specified in the service level agreement and service contract?	$X = A/B$ A = Number of the service requests that are processed within the response time specified in the service level agreement and service contract B = Number of the service requests
RRe-2[b,c]	Responsiveness of request for modification and enhancement	What proportion of requests for modifications or enhancements to service functions is responded to within time limits specified in the service level agreement and the service contract?	$X = A/B$ A = Number of requests for modifications or enhancements to service functions that are responded to within time limits specified in service level agreement and the service contract B = Number of requests for modifications or enhancements by users

[a] The response time requirements can be specified in the SLA and service contract or decided by discussion with stakeholders.

[b] A user request should be within the scope of the SLA and service contract.

[c] Response methods and time limits depend on the SLA and service contract.

7.8 IT service adaptability measures

7.8.1 General

IT service adaptability measures are used to assess the degree to which an IT service can configure itself or be modified to meet new needs.

7.8.2 Customizability measures

Customizability measures are used to assess the degree to which the IT service can be customized at the request of users.

Table 23 — Customizability measures

ID	Name	Description	Measurement function
ACu-1	IT service function customizability	What proportion of the service functions is customized by users for their needs?	$X = A/B$ A = Number of IT service functions that can be customized B = Number of IT service functions that need to be customized
ACu-2[a]	User interface customizability	What proportion of graphical user interface elements can be customized by users?	$X = A/B$ A = Number of graphical user interface elements which can be customized by users B = Number of graphical user interface elements which need to be customized by users
[a] Graphical user interface means a form of user interface that allows users to interact with the functions of the IT services through graphical icons.			

7.8.3   Initiative measures

Initiative measures are used to assess the degree to which the IT service recognizes users' goals and service suggests changes to meet users' needs.

Table 24 — Initiative measures

ID	Name	Description	Measurement function
AIn-1	Satisfaction of users' goals	How do the service functions satisfy users' goals?	$X = A/B$ A = Number of IT service functions satisfying users' goals B = Number of IT service functions
AIn-2	Proactive change Suggestion	How proactively does the service provider suggest changes to meet users' needs?	$X = A/B$ A = Number of IT service functions that the service provider suggests to change B = Number of IT service functions required to be changed to meet users' needs
AIn-3	Change suggestion acceptance	What proportion of suggestions is accepted by users?	$X = A/B$ A = Number of change suggestions accepted by users B = Number of change suggestions by the service provider
AIn-4	Effectiveness of implementing accepted change suggestions	What proportion of accepted change suggestions is actually implemented?	$X = A/B$ A = Number of change suggestions implemented B = Number of change suggestions accepted for implementation
NOTE 1 Change suggestions mean here proposal by IT service providers to improve the service.			
NOTE 2 The initiative can derive not only from the service itself but from internal assessments, evaluations, lessons learned and other sources of improvement recommendations.			

7.9 IT service maintainability measures

7.9.1 General

IT service maintainability measures are used to assess the degree of effectiveness and efficiency with which the IT service can be modified by the service provider.

7.9.2 Analysability measures

Analysability measures are used to assess the degree of effectiveness and efficiency with which an IT service can be analysed for deficiencies, gaps and failures.

Table 25 — Analysability measures

ID	Name	Description	Measurement function
MAn-1	IT service analysis effectiveness	How effective is the analysis of deficiencies, gaps and failures of IT service functions performed?	$X = A/B$ A = Number of service functions that can analysis deficiencies, gaps or failures to find the root cause of the dissatisfaction B = Number of service functions that need to be analysed to resolve the dissatisfaction of the service level agreement and service contract
NOTE The gaps mean the differences between the user expectations of IT service functions and the IT service functions that the service providers provide.			

7.9.3 Modifiability measures

Modifiability measures are used to assess the degree to which an IT service can be effectively and efficiently modified without introducing defects or degrading existing IT service quality.

Table 26 — Modifiability measures

ID	Name	Description	Measurement function
MMo-1	IT service function modifiability	What proportion of IT service functions is modified according to user's requests without introducing defects or degrading existing quality?	$X = A/B$ A = Number of service functions actually modified without introducing defects or degrading existing quality B = Number of service functions which are requested to be modified by users

7.9.4 Testability measures

Testability measures are used to assess the degree of effectiveness and efficiency with which test criteria can be established for an IT service and tests can be performed to determine whether those criteria have been met.

Table 27 — Testability measures

ID	Name	Description	Measurement function
MTe-1	Completeness of test criteria	What proportion of testing criteria is defined to satisfy SLA and service contract?	$X = A/B$ A = Number of test criteria defined B = Number of test criteria required to satisfy SLA and service contract

Table 27 *(continued)*

ID	Name	Description	Measurement function
MTe-2	Testing completion	What proportion of testing is completed for the defined criteria?	$X = A/B$ A = Number of tests performed B = Number of tests to determine whether defined test criteria is meet

Annex A
(Informative)

Context of using the model and different IT service types

This annex deals with a number of considerations in the selection and application of quality measures.

First, each quality measure defined in Clause 7 can be classified according to the IT service types description defined in ISO/IEC TS 25011, the two types are:

a)   services completely automated provided by an IT system;

b)   services provided by a human using an IT system.

In addition, the quality measures can be classified according to the recommendation levels such as

— HR: highly recommended, which means "use this quality measure always",

— R: recommended, which means "use this quality measure when appropriate", and

— UD: used at users' discretion, which means "use this quality measure as a reference when developing a new quality measure" because the measure has unknown reliability.

Table A.1 represents this kind of considerations related to usage of each quality measure.

Table A.1 — Summary table for the usage of quality measures

Characteristics	Sub-characteristics	Measures	Type a/b/ Both	Recommendation level
Suitability	Completeness	Functional coverage	Both	HR
		Goals and objectives achievement	Both	HR
		Data items populated	b	UD
	Correctness	IT service function correctness	Both	HR
		Compliance of defined process	b	R
	Appropriateness	IT service function appropriateness for context of use	b	HR
		IT service function appropriateness to service users	b	HR
	Consistency	IT service consistency	Both	HR
		IT service process quality consistency	Both	HR

Table A.1 *(continued)*

Characteristics	Sub-characteristics	Measures	Type a/b/ Both	Recommendation level
Usability	Appropriateness recognizability	Description completeness	Both	HR
		Demonstration coverage	Both	UD
	Learnability	User guide completeness	Both	HR
		User guide effectiveness	Both	HR
		User guide efficiency	Both	HR
	Operability	Message clarity	Both	R
		Understandable categorization of service	Both	R
		IT service automation	a	R
		Effort time estimability	Both	UD
	User error protection	Avoidance of user operation error	Both	HR
		User error correction	Both	R
	Accessibility	Accessibility for users with disabilities	Both	R
		Language supportability	Both	UD
	Courtesy	Courteous service language, behaviour and attitude	Both	R
Security	Confidentiality	Access controllability	Both	HR
		Completeness of access control methods to protect confidential information	Both	HR
		Effectiveness of confidentiality protection	Both	HR
	Integrity	Data integrity	Both	HR
	Traceability	User audit trail completeness	Both	HR
		Traceability completeness	b	R
IT service reliability	Continuity	Coverage of IT service continuity plan	b	R
		Completeness of IT service risk prevention actions	b	R
		Completeness of IT service risk mitigation actions	b	R
		Effectiveness of IT service risk mitigation actions	b	UD
	IT service recoverability	Effectiveness of recovery	Both	HR
		Timely recovery	Both	HR
	Availability	IT service availability	Both	HR
Tangibility	Visibility	Visibility of IT service functions delivery	b	R
		Visibility of IT service functions progress	Both	R
	professionalism	Process adaption maturity	b	HR
		Personnel qualification	b	HR
		IT service developer professionalism	b	HR
	IT service interface appearance	User interface appearance satisfaction	Both	R
		IT service interface satisfaction	b	R

Table A.1 *(continued)*

Characteristics	Sub-characteristics	Measures	Type a/b/ Both	Recommendation level
Responsiveness	Timeliness	IT service delivery timeliness	Both	R
	Reactiveness	Response timeliness	Both	HR
		Responsiveness of request for modification and enhancement	b	HR
IT service adaptability	Customizability	IT service function customizability	Both	UD
		User interface customizability	a	R
	Initiative	Satisfaction of users' goals	Both	UD
		Proactive change suggestion	b	UD
		Change suggestion acceptance	b	UD
		Effectiveness of implementing accepted change suggestions	b	UD
IT service maintainability	Analysability	IT service analysis effectiveness	Both	R
	Modifiability	IT service function modifiability	Both	HR
	Testability	Completeness of testing criteria	Both	R
		Testing completion	Both	R

Bibliography

[1]   ISO/IEC/IEEE 12207, *Systems and software engineering — Software life cycle processes*

[2]   ISO/IEC 19761, *Software engineering — COSMIC: a functional size measurement method*

[3]   ISO/IEC 20000-1:2018, *Information technology — Service management — Part 1: Service management system requirements*

[4]   ISO/IEC 20926, *Software and systems engineering — Software measurement — IFPUG functional size measurement method 2009*

[5]   ISO/IEC 20968, *Software engineering — Mk II Function Point Analysis — Counting Practices Manual*

[6]   ISO/IEC 24570, *Software engineering — NESMA functional size measurement method — Definitions and counting guidelines for the application of function point analysis*

[7]   ISO/IEC 25010, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models*

[8]   ISO/IEC 25012, *Software engineering — Software product Quality Requirements and Evaluation (SQuaRE) — Data quality model*

[9]   ISO/IEC 25020, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality measurement framework*

[10]   ISO/IEC 25022, *Systems and software engineering — Systems and software quality requirements and evaluation (SQuaRE) — Measurement of quality in use*

[11]   ISO/IEC 25023, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Measurement of system and software product quality*

[12]   ISO/IEC 25024, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Measurement of data quality*

[13]   ISO/IEC 27001, *Information technology — Security techniques — Information security management systems — Requirements*

[14]   ISO/IEC 29881, *Information technology — Systems and software engineering — FiSMA 1.1 functional size measurement method*

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