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Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Common Industry Format (CIF) for Usability — Evaluation Report

Ingénierie des systèmes et du logiciel — Exigences de qualité et évaluation des systèmes et du logiciel (SQuaRE) — Format de l'industrie commune pour l'utilisation — Rapport d'évaluation

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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).

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).

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction* and Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and system engineering*.

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Introduction

The human-centred design approach of ISO 9241-210 is well established and focuses specifically on making systems usable. Usability can be achieved by applying human-centred design throughout the lifecycle. In order to enable a human-centred approach to be adopted, it is important that all the relevant types of information related to usability (information items) are identified and communicated. The identification and communication of relevant types of information related to usability enables the design and testing of the usability of a system.

This International Standard provides a framework and consistent terminology for reporting the evaluation of an interactive system. It is intended to assist usability specialists and developers in documenting and communicating usability-related information as part of the system development lifecycle.

The Common Industry Format (CIF) for Usability family of International Standards is described in ISO/IEC TR 25060 and is part of the SQuaRE (Systems and software Quality Requirements and Evaluation) series of standards on systems and software product quality requirements and evaluation (ISO/IEC 25000[1)], ISO/IEC 25001, ISO/IEC 25021[2)], ISO/IEC 25023[3)], ISO/IEC 25040, ISO/IEC 25041 and ISO/IEC 25051).

The CIF family of standards uses definitions that are consistent with the ISO 9241 series of standards (Ergonomics of human-system interaction), as this is the terminology that is normally used for this subject matter. In some cases, these definitions differ from those in ISO/IEC 25000.

CIF standards are published or planned for the following information items:

— Common Industry Format (CIF) for usability test reports (ISO/IEC 25062);

NOTE ISO/IEC 25062 provides more detail for the content of a user observation report for performance measurement.

— Context of use description (ISO/IEC 25063);

— User needs report (ISO/IEC 25064);

— User requirements specification (ISO/IEC 25065);

— Evaluation reports (ISO/IEC 25066);

— User interaction specification (planned);

— User interface specification (planned);

— Field data report (planned).

The CIF standards are part of the “Extension Division” of the ISO/IEC 25000 SQuaRE series of International Standards. Table 1 presents an overview of the structure and the contents of the SQuaRE series of International Standards.

1) Withdrawn.

2) Withdrawn.

3) Under development.

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Table 1 — Organization of SQuaRE series of International Standards

<table>
<tr><th colspan="3">SQuaRE Architecture and Sub-projects</th></tr>
<tr><td rowspan="3">ISO/IEC 2503n: Quality Requirement Division</td><td>ISO/IEC 2501n: Quality Model Division</td><td rowspan="3">ISO/IEC 2504n: Quality Evaluation Division</td></tr>
<tr><td>ISO/IEC 2500n: Quality Management Division</td></tr>
<tr><td>ISO/IEC 2502n: Quality Measurement Division</td></tr>
<tr><td colspan="3">ISO/IEC 25050 – 25099 SQuaRE Extension Division</td></tr>
<tr><td colspan="2">ISO/IEC 25051: Requirements for quality of Ready to Use Software Product (RUSP) and instructions for testing</td><td>ISO/IEC 2506n Common Industry Format Division</td></tr>
</table>

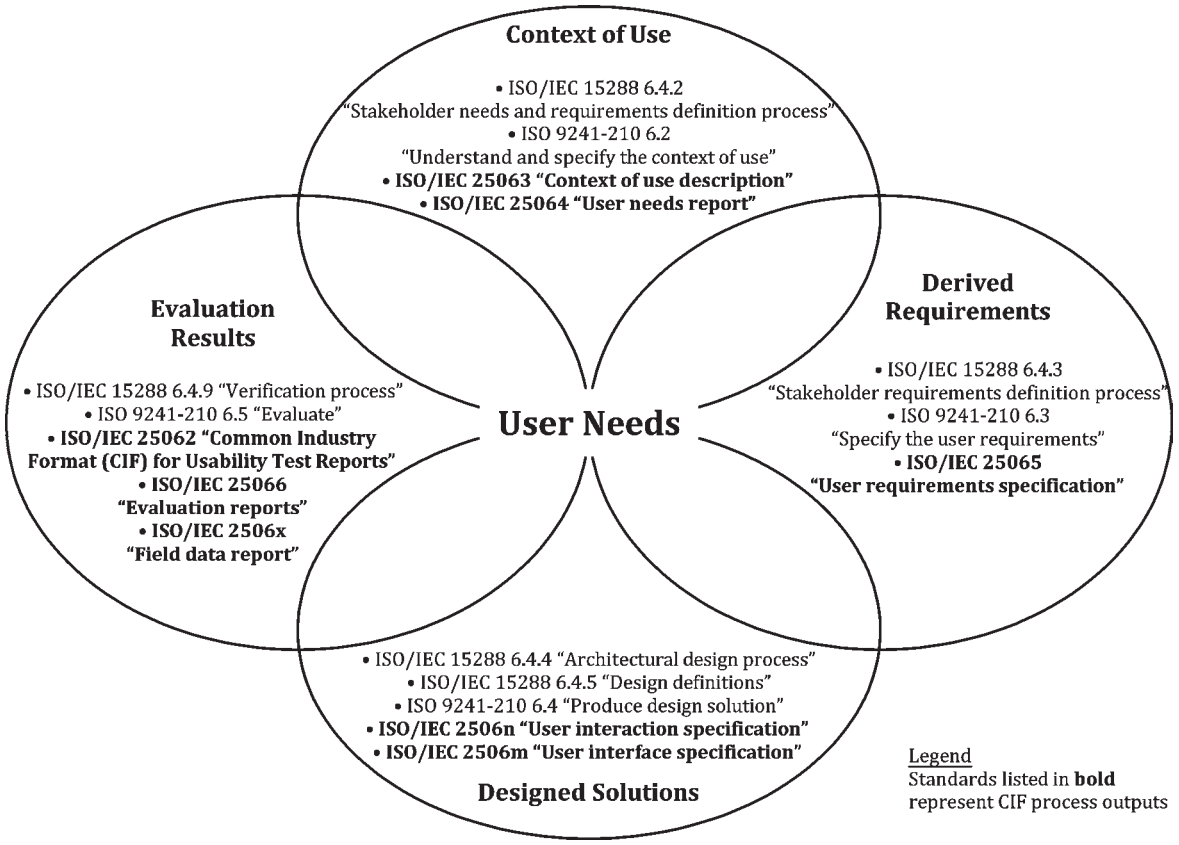


Figure 1 — Relationship of CIF documents to human-centred design in ISO 9241-210 and system lifecycle processes in ISO/IEC 15288

Figure 1 illustrates the interdependence of these information items with the human-centred design activities described in ISO 9241-210, as well as the corresponding System Life Cycle processes described in ISO/IEC 15288 [4].

The following discussion also serves as alternative text for the figure.

The figure depicts the activities as a set of intersecting circles. The circles overlap to represent that the activities are not separate, but rather overlapping in time and scope, and the outcome of each activity provides the input to one or more other activities. As each human-centred design activity can provide input to any other, no starting point, end point, or linear process is intended.

4) Withdrawn. Replaced with ISO/IEC/IEEE 15288:2015.

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The human-centred design is composed of four interacting activities represented as overlapping circles in the diagram where User Needs are at the centre.

The first activity involves Context of Use. Human-centred design relies on user needs that are first identified during of the Context of Use analysis. User needs are documented in the User needs report (ISO/IEC 25064), which is an intermediate deliverable that links the Context of Use Description (ISO/IEC 25063) that contains information about the users, their tasks and the organizational and physical environment, to the user requirements. These items are developed during the Stakeholders requirements definition process described in ISO/IEC 15288.

The second activity involves Derived Requirements. The User requirements specification (ISO/IEC 25065) provides the basis for design and evaluation of interactive systems to meet the user needs. User requirements are developed in conjunction with and from part of the overall requirements specification of an interactive system.

The third activity involves Designed Solutions. The “Produce design solutions” activity focuses on designing user interaction that meets user requirements. This activity takes place during the Architectural Design, Implementation, and Integration processes described in ISO/IEC 15288 and produces the information items “User interaction specification” and the “User interface specification”.

The fourth activity involves Evaluation Results. The “Evaluate” activity starts at the earliest stages in the project, evaluating design concepts to obtain a better understanding of the user needs. Design solutions can be evaluated multiple times as the interactive system is being developed and can produce various types of evaluation reports and usability data such as that described in ISO/IEC 25062. These evaluations can support the ISO/IEC 15288 Validation Process that confirms that the system complies with the stakeholders’ requirements.

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Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Common Industry Format (CIF) for Usability — Evaluation Report

1 Scope

This International Standard describes the Common Industry Format (CIF) for reporting usability evaluations. It provides a classification of evaluation approaches and the specifications for the content items (content elements) to be included in an evaluation report based on the selected evaluation approach(es). The intended users of the usability evaluation reports are identified, as well as the situations in which the usability evaluation report can be applied.

The usability evaluation reports in this International Standard are applicable to software and hardware systems, products or services used for predefined tasks (excluding generic products, such as a display screen or a keyboard). The content elements are intended to be used as part of system-level documentation resulting from development processes such as those in ISO 9241-210 and ISO/IEC JTC 1/SC 7 process standards.

The content elements for documenting evaluations can be integrated in any type of process model.

NOTE For the purpose of establishing process models, ISO/IEC TR 24774 and ISO/IEC 33020 specify the format and conformance requirements for process models, respectively. In addition, ISO/IEC 15289 defines the types and content of information items developed and used in process models for system and software lifecycle management. ISO/IEC 15504-5 and ISO/IEC 15504-6 (to be replaced by ISO/IEC 33060) define work products, including information items, for the purpose of process capability assessment. Process models and associated information items for human-centred design of interactive systems are contained in ISO/TR 18529 and ISO/TS 18152.

2 Conformance

An evaluation report conforms to this International Standard if it contains all the required content elements in Clause 5 that are applicable to the type(s) of evaluation, including:

— additional optional content elements that were selected to be part of the evaluation;

— the content elements for the conformity assessment (if used).

3 Terms and definitions

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

NOTE The CIF family of standards uses definitions that are consistent with the ISO 9241 series of standards, as this is the terminology that is normally used for this subject matter. In some cases, these definitions differ from those in ISO/IEC 25000.

3.1
accessibility
extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use

Note 1 to entry: Context of use includes direct use or use supported by assistive technologies.

[SOURCE: ISO 26800:2011, 2.1; modified, Note 2 to entry deleted]

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3.2
action
user behaviour that a system accepts as a request for a particular operation

[SOURCE: ISO/IEC TR 11580:2007, 2.3; modified, Example deleted]

3.3
conformity assessment
demonstration that specified requirements relating to a product, process, system, person or body are fulfilled

[SOURCE: ISO/IEC 17000:2004, 2.1; modified, Notes deleted]

3.4
context of use
users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used

[SOURCE: ISO 9241-11:1998, 3.5]

3.5
dialogue
interaction between a user and an interactive system as a sequence of user actions (inputs) and system responses (outputs) in order to achieve a goal

Note 1 to entry: User actions include not only entry of data but also navigational actions of the user.

Note 2 to entry: Dialogue refers to both the form (syntax) and the meaning (semantics) of interaction.

[SOURCE: ISO 9241-110:2006, 3.2]

3.6
effectiveness
accuracy and completeness with which users achieve specified goals

[SOURCE: ISO 9241-11:1998, 3.2]

3.7
efficiency
resources expended in relation to the accuracy and completeness with which users achieve goals

[SOURCE: ISO 9241-11:1998, 3.3]

3.8
goal
intended outcome

[SOURCE: ISO 9241-11:1998, 3.8]

3.9
information item
separately identifiable body of information that is produced and stored for human use during a system or software life cycle

[SOURCE: ISO/IEC/IEEE 15289:2011, 5.7]

3.10
inspection-based evaluation
evaluation based on the judgment of one or more evaluator(s) who examine or use a system to identify potential usability problems (including deviations from established criteria)

Note 1 to entry: The evaluators making the inspections typically are usability specialists but can also include end users and members of the design team.

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Note 2 to entry: Established criteria typically include user requirements, usability guidelines in standards, design conventions contained in manufacturer guidelines and style guides, task models to be supported, as well as standardized principles.

Note 3 to entry: The evaluation can be conducted with or without the help of reference documents.

Note 4 to entry: Inspection-based evaluation is a generic term for methods that include but are not limited to heuristic evaluation, cognitive walkthroughs, standards inspection, pluralistic walkthroughs, and consistency inspections.

Note 5 to entry: Inspection-based evaluation can be conducted by machines in some cases, e.g. when consistency with required terminology is being evaluated. In this case, the machine represents the evaluator.

3.11
requirement
condition or capability that must be met or possessed by a system, system component, product, or service to satisfy an agreement, standard, specification, or other formally imposed documents

[SOURCE: ISO/IEC/IEEE 24765:2010, 3.2506, Clause 4.]

3.12
satisfaction
freedom from discomfort, and positive attitudes towards the use of the product

[SOURCE: ISO 9241-11:1998, 3.4]

3.13
stakeholder
individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations

[SOURCE: ISO/IEC/IEEE 15288:2015, 4.1.44]

3.14
system
combination of interacting elements organized to achieve one or more stated purposes

Note 1 to entry: A system may be considered as a product or as the services it provides.

Note 2 to entry: In practice, the interpretation of its meaning is frequently clarified by the use of an associative noun, e.g. aircraft system. Alternatively, the word system may be substituted simply by a context dependent synonym, e.g. aircraft, though this may then obscure a system principles perspective.

[SOURCE: ISO/IEC/IEEE 15288:2015, 4.1.46; modified, Note 3 to entry deleted]

3.15
task
activities required to achieve a goal

Note 1 to entry: The term "task" is used here, as in ISO 9241-11:—[5)], in its widest sense, rather than in reference to the specifics of use of the dialogue system.

[SOURCE: ISO 9241-11:1998, 3.9; modified, Notes changed]

3.16
usability
extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

Note 1 to entry: According to ISO/IEC 25010, "Usability can either be specified or measured as a product quality characteristic in terms of its sub-characteristics, or specified or measured directly by measures that are a subset of quality in use." The definition of usability in this International Standard is consistent with the second approach.

5) Under preparation.

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[SOURCE: ISO 9241-210:2010, 2.13; modified, Notes changed]

3.17
usability defect
product attribute(s) that lead(s) to a mismatch between user intentions and/or user actions and the system attributes and behaviour

Note 1 to entry: Typical usability defects include the following:

— additional unnecessary steps not required as part of completing a task;

— misleading information;

— insufficient and/or poor information on the user interface;

— unexpected system responses;

— limitations in navigation;

— inefficient use error recovery mechanisms;

— physical characteristics of the user interface that are not suitable for the physical characteristics of the user.

Note 2 to entry: Deviations of product attributes of the object of evaluation from established criteria are also usability defects.

3.18
usability finding
identified usability defect and/or usability problem or positive usability-related attribute

3.19
usability problem
situation during use resulting in poor effectiveness, efficiency or satisfaction

3.20
use error
user action or lack of user action while using the interactive system that leads to a different result than that intended by the manufacturer or expected by the user

Note 1 to entry: Use error includes the inability of the user to complete a task.

Note 2 to entry: Use errors can result from a mismatch between the characteristics of the user, user interface, task, or use environment.

Note 3 to entry: Users might be aware or unaware that a use error has occurred.

Note 4 to entry: An unexpected physiological response of the patient is not by itself considered a use error.

Note 5 to entry: A malfunction of an interactive system that causes an unexpected result is not considered a use error.

[SOURCE: IEC 62366-1:2015, 3.21; modified, Medical device replaced by interactive system, Notes changed]

3.21
user
person who interacts with a system, product or service

Note 1 to entry: Users include people who operate a system, people who use the output provided by a system and people who conduct support tasks using the system (including maintenance and training).

Note 2 to entry: According to ISO/IEC 25010, User is defined as “individual or group that interacts with a system or benefits from a system during its utilization”.

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Note 3 to entry: Primary and secondary users interact with a system, and primary and indirect users can benefit from a system. This definition includes a broader understanding of individuals and organisations that act as users.

[SOURCE: ISO 26800:2011, 2.10; modified, Notes changed]

3.22
user-based evaluation
evaluation that involves representative users performing tasks with the system to enable identification of usability problems and/or measurements of efficiency, effectiveness, user satisfaction or other user experiences

3.23
user experience
a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service

Note 1 to entry: User experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use.

Note 2 to entry: User experience is a consequence of: brand image, presentation, functionality, system performance, interactive behaviour, and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use.

Note 3 to entry: Usability, when interpreted from the perspective of the users' personal goals, can include the kind of perceptual and emotional aspects typically associated with user experience. Usability criteria can be used to assess aspects of user experience.

[SOURCE: ISO 9241-210:2010, 2.15]

3.24
user need
prerequisite identified as necessary for an user, or a set of users, to achieve an intended outcome, implied or stated within a specific context of use

EXAMPLE 1 A presenter (user) needs to know how much time is left (prerequisite) in order to complete the presentation in time (intended outcome) during a presentation with a fixed time limit (context of use).

EXAMPLE 2 An account manager (user) needs to know the number of invoices received and their amounts (prerequisite), in order to complete the daily accounting log (intended outcome) as part of monitoring the cash flow (context of use).

Note 1 to entry: A user need is independent of any proposed solution for that need.

Note 2 to entry: User needs are identified based on various approaches including interviews with users, observations, surveys, evaluations, expert analysis, etc.

Note 3 to entry: User needs often represent gaps (or discrepancies) between what should be and what is.

Note 4 to entry: User needs are transformed into user requirements considering the context of use, user priorities, trade-offs with other system requirements and constraints.

[SOURCE: ISO/IEC 25064:2013, 4.19]

3.25
user requirements
usage requirements
requirements for use that provide the basis for design and evaluation of interactive systems to meet identified user needs

Note 1 to entry: User requirements are derived from user needs, characteristics and capabilities in order to make use of the system in an effective, efficient, safe and satisfying manner.

Note 2 to entry: User requirements specify the extent to which user needs, characteristics and capabilities are to be met when using the system. They are not requirements on the users.

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Note 3 to entry: In software-engineering terms, user requirements comprise both “functional” and “non-functional” requirements based on user needs and capabilities.

[SOURCE: ISO/IEC TR 25060:2010, 2.21]

4 Purpose and types of usability evaluations

4.1 Purpose of an evaluation

The content of a usability evaluation report varies based on the purpose of the evaluation. An evaluation could be performed to test whether specified user requirements have been implemented or to test whether specified accessibility recommendations have been implemented. Or an evaluation could be performed as the basis for a procurement decision. This International Standard describes the contents of usability evaluation reports produced for a broad range of usability evaluation objectives.

The purpose of ISO/IEC 25062 is to facilitate incorporation of usability as part of the procurement decision-making process for software to assist in judging if a product meets usability goals. Examples of decisions include purchasing, upgrading and automating. ISO/IEC 25062 is an example of a user observation report for performance measurement in accordance with Annex A. ISO/IEC 25062 provides a common format for human factors engineers and usability professionals in supplier companies to report the methods and results of usability tests to customer organizations. Since the procurement environment is the intended audience, ISO/IEC 25062 is more prescriptive in the format and the required elements.

4.2 Types of usability evaluations

Usability evaluation is a systematic process using one of the following types of evaluation approaches. The content of an evaluation report depends on the type of evaluation approach used.

The classification of evaluation approaches described below is used in Clause 2.

a) Inspection to identify usability defects and potential usability problems including:

— deviations of the object of evaluation from specified criteria such as user requirements, principles, design guidelines or established conventions;

— potential usability problems when attempting to complete one or more tasks with the object of evaluation.

b) Observation of users including:

— observing user behaviour to identify actual usability findings;

— measuring user performance and response (e.g. time taken to perform a task, number of use errors, skin conductance or eye pupil dilation).

NOTE 1 The observation of users can be carried out as an explicit usability test and/or conducted in a “real life” setting.

NOTE 2 The usability problems are either identified during the observation or are identified from subsequent analysis.

c) User surveys including:

— eliciting problems, opinions and impressions from users (qualitative user surveys);

— measuring level of user satisfaction or perception, e.g. rating scale values for satisfaction or for subjectively perceived effectiveness or efficiency (quantitative user surveys);

— other user reported data (e.g. data collected from an individual in conjunction with observation data).

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