TECHNICAL SPECIFICATION

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Usability of consumer products and products for public use —

Part 2: Summative test method

Facilité d'emploi des produits de consommation courante et des produits à usage public —
Partie 2: Méthode d'essai sommative

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Foreword

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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 ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

This second edition cancels and replaces the first editions of ISO/TS 20282-2:2006, ISO/PAS 20282-3:2007, and ISO/PAS 20282-4:2007, of which it constitutes a technical revision. The main changes are the following:

— clarification that the test method is only intended to be used when there are a limited number of goals to be tested and it is possible to identify typical contexts of use and criteria for successful goal achievement;

— provision for a wider range of methods to test achievement of goals;

— use of ISO 9241-11 terminology: usability, effectiveness, efficiency, and satisfaction;

— wider range of levels of confidence with a sample size as low as 10, using the Adjusted Wald statistic;

— wider range of purposes for use of the test method.

ISO/TS 20282 consists of the following parts, under the general title *Usability of consumer products and products for public use*:

— *Part 1: Design requirements for context of use and user characteristics*

— *Part 2: Summative test method* (Technical Specification)

Introduction

Many people find some consumer products and walk-up-and-use products, including consumer products provided for public use, difficult to install and use, particularly when using them for the first time or at infrequent intervals. This is clearly undesirable for the producers of such products, for organizations that use the products to provide a service, and for the people who use them. Information about the usability of a product would, therefore, be of great value to producers, as part of development and marketing, to service providers, and to potential purchasers making purchase decisions or comparing alternative products. This would provide an incentive for producing products that are easier to install and use and would enable potential purchasers to pay specific attention to usability when selecting a product to buy and use. It is difficult to judge usability in a purchase situation without available comparable usability test results.

Usability (see ISO 9241-11) is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use. Effectiveness is fundamental as it is about achieving the intended goal(s). Efficiency is about the resources (such as time or effort) needed by users to achieve their goals so it can be important. In addition, it is important that users are satisfied with their experience, particularly where users have discretion over whether to use a product and can readily choose some alternative means of achieving their goals. In this part of ISO/TS 20282, accessibility is operationalized as the extent to which a product can be used with effectiveness, efficiency, and satisfaction by people from a population with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.

Poor usability and/or accessibility can result in errors that can lead to several types of risks, for example, inconvenience resulting from not achieving a goal or achieving the wrong goal, incurring unexpected costs, or physical injury. In many countries, there are legal requirements to provide accessible products, services, and facilities.

EXAMPLE Calling the wrong person by mistake with a mobile phone may have the negative consequence of possible undesirable call charges either for the caller or the person called (who may have to pay for the call).

In addition to the risks of potential adverse consequences for the user as a result of failing to achieve their goal or achieving the wrong goal (poor effectiveness), there are other risks such as being late as a result of poor efficiency or users avoiding the use of a difficult-to-use product as a result of poor satisfaction.

Formative evaluation using expert inspection or user-based testing to provide feedback to improve the usability of the product is an integral part of the iterative human-centred design process recommended in ISO 9241-210. Summative evaluation can be used to validate usability and/or accessibility requirements, to provide a benchmark, or to provide a basis for comparison of different products. Although some types of expert inspection methods based on a checklist or a standard can provide summative data, the aspects of usability and/or accessibility that are measured are limited in comparison with the measures of effectiveness, efficiency, and satisfaction provided by user-based testing.

EXAMPLE One study found that only 50 % of the problems encountered on 16 websites by 32 blind users were covered by Success Criteria in the Web Content Accessibility Guidelines 2.0 (WCAG 2.0).[23]

Inspection can precede user-based testing to identify (and, if possible, eliminate) easily identifiable problems and to check that the product is capable of achieving the intended goals for the intended users (see 7.4).

To provide reliable data on effectiveness, efficiency, and satisfaction that can be compared, it is desirable to have a standard summative user-based test procedure. This part of ISO/TS 20282 specifies a summative user-based test method that can be used to provide an evaluation of the usability and/or accessibility and ease of unpacking, setting up, and installation of consumer products, and the usability and/or accessibility of products for public use (including walk-up-and-use products). It can be applied to products that are used to achieve goals that have clear success criteria and relate to well-defined types of subject matter.

ISO/TS 20282-1 describes in more detail sources of variance in user characteristics that form part of the context of use that needs to be taken into account when designing for usability. This information is also

needed to identify the elements of the context of use required for testing in this part of ISO/TS 20282. Further information about the characteristics of older people and people with disabilities can be found in ISO/TR 22411.

Usability of consumer products and products for public use —

Part 2: Summative test method

1 Scope

This part of ISO/TS 20282 specifies a user-based summative test method for the measurement of the usability and/or accessibility of consumer products and products for public use (including walk-up-and-use products) for one or more specific user groups. This test method treats accessibility as a special case of usability where the users taking part in the test represent the extremes of the range of characteristics and capabilities within the general user population. When the test method refers to usability, the method can also be used to test accessibility (unless otherwise specified).

This test method is for use when valid and reliable measures of effectiveness, efficiency, and satisfaction are needed.

NOTE 1 Products for public use include walk-up-and-use products that provide a service to the general public.

The test method can also be used to assess the usability and/or accessibility of achieving the goals of unpacking, installing, and setting up a consumer product.

This part of ISO/TS 20282 is intended to be used for testing the usability and/or accessibility of products when

— it is possible to identify typical contexts of use that are representative of the use of the product(s),

— it is possible to identify the criteria for the successful achievement of the users' goal, and

— there are a limited number of goals being tested at the same time.

While the test method is intended to test consumer products and products for public use, it can also be used to test other products, systems, and services with the characteristics described above.

If use of a product involves interaction with inputs, outputs, or environments that are highly variable and/or complex with variability or complexity that cannot be categorized in well-defined subsets, it is outside the scope as it would not be possible to obtain reliable results. See Annex A for examples of products and goals that are within the scope of this part of ISO/TS 20282.

EXAMPLE The method could be applied to an office photocopier, a website selling books or train tickets, or a legal advice service. The method would not be appropriate for a complex ecommerce website, a word processor, or a bicycle.

The method is primarily intended for use for assessing completed versions of products, but could also be used for internal purposes during development to judge, assess, and communicate the usability and/or accessibility of functional prototype versions.

The results of the summative test method can be used for the following purposes:

— to estimate the probability of achieving target values of effectiveness, efficiency, and satisfaction in actual use;

— to publish information about the usability and/or accessibility of a product;

— to compare the usability and/or accessibility of several products;

— to compare the results with a usability and/or accessibility requirements specification;

— to support procurement.

NOTE 2 Annex H lists the information to be included when specifying the procedure used to test whether the usability and/or accessibility requirements (Annex G) have been met.

The intended users of this part of ISO/TS 20282 are people with expertise in the design and management of testing usability and/or accessibility, working within or on behalf of manufacturers, suppliers, purchasing organizations, or third parties (such as test organizations or consumer organizations).

2 Conformity

A report of the values for the usability and/or accessibility of a product conforms to this part of ISO/TS 20282 if

— the test method used conforms to the requirements in Clauses 6, 7, 8, and 9 and Annexes C and D, and

— the report of the results contains the information specified in Annex F.

A statement of requirements for usability results conforms to this part of ISO/TS 20282 if it conforms to the requirements in Annex G.

The specification of a usability test procedure conforms to this part of ISO/TS 20282 if it conforms to the requirements in Annex H.

3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20282-1, *Ease of operation of everyday products — Part 1: Design requirements for context of use and user characteristics*

4 Terms and definitions

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

4.1
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, definition 2.1]

Note 2 to entry: When carrying out a summative user-based measurement of accessibility, all three components of usability (effectiveness, efficiency, and satisfaction) need to be considered.

4.2
actual users
group(s) of people who directly interact with a product

Note 1 to entry: Before a product is released, this is the intended user group, and after release this is based on what is known about the actual user group.

[SOURCE: ISO 20282-1:2006, definition 3.1]

4.3
consumer product
product that is intended to be acquired and used by an individual for personal rather than professional use

[SOURCE: ISO 20282-1:2006, definition 3.2]

4.4
context of evaluation
users, tasks, equipment (hardware, software, and materials), and the physical and social environments in which a product is evaluated

[SOURCE: ISO/TS 20282-2:2006, definition 4.3]

4.5
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, definition 3.5]

4.6
ease of interaction
usability of interaction with the user interface of a product

Note 1 to entry: Ease of interaction is the effectiveness, efficiency, and satisfaction with which the user can successfully interact with the interface of the product.

4.7
effectiveness
accuracy and completeness with which users achieve specified goals

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

4.8
efficiency
resources expended in relation to the accuracy and completeness with which users achieve goals

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

4.9
formative evaluation
evaluation designed and used to improve the object of evaluation, especially when it is still being developed

[SOURCE: ISO/TR 18152:2010, definition 4.6]

Note 1 to entry: A formative test method is used to perform a formative evaluation.

4.10
goal
intended outcome

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

Note 1 to entry: A goal is stated independently of the functionality used to achieve it.

4.11
intended users
group(s) of people for whom a product is designed

Note 1 to entry: In many cases, the actual user population is different from that originally intended by the manufacturer. The intended user group is based on realistic estimations of who the actual users of the product will be.

[SOURCE: ISO 20282-1:2006, definition 4.12]

4.12
interaction
bidirectional information exchange between users and equipment

[SOURCE: IEC/TR 61997:2001, definition 3.4]

Note 1 to entry: Equipment includes both hardware and software.

Note 2 to entry: Information exchange may include physical actions, resulting in sensory feedback.

4.13
main goal(s)
most frequent or important goal(s) that all or a large majority of users want to achieve when using a product

[SOURCE: ISO 20282-1:2006, definition 3.14]

Note 1 to entry: Main goals can depend on achieving sub-goals.

Note 2 to entry: Examples of main goals are given in Annex A.

4.14
satisfaction
freedom from discomfort, and positive attitudes towards the use of the product

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

4.15
stratified sample
sample established by a procedure in which the population is divided into subpopulations (strata), each one of which contributes with a specified number of randomly selected individuals

[SOURCE: ISO 15535:2006, definition 3.4]

4.16
success rate
<usability> percentage of users successfully achieving a goal

4.17
summative evaluation
evaluation designed to present conclusions about the merit or worth of the object of evaluation

Note 1 to entry: The results can be used to produce recommendations about whether it should be retained, altered, or eliminated.

Note 2 to entry: It is possible to design a method to provide a combined formative and summative evaluation.

Note 3 to entry: A summative test method is used to perform a summative evaluation.

[SOURCE: ISO/TS 18152:2010, definition 4.10, modified — Reference to recommendations has been removed and notes to entries have been added.]

4.18
task
activities required to achieve a goal

Note 1 to entry: These activities can be physical and/or cognitive.

[SOURCE: ISO 9241-11:1998, definition 3.9]

4.19
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

[SOURCE: ISO 9241-210:2010, definition 2.13]

Note 1 to entry: References to the term "usability" in the description of the user-based test method include the application of the test method to accessibility (unless otherwise specified).

4.20
usability requirement
required level of usability expressed in terms of measures of effectiveness, efficiency, and satisfaction in a specified context of use

4.21
usability testing
evaluation that involves representative users performing specific tasks with the system to enable the measurement of efficiency, effectiveness, and/or user satisfaction

[SOURCE: ISO/IEC 25060:2010, definition 2.17]

4.22
user
person who interacts with a system, product, or service

Note 1 to entry: The person who uses a service provided by a work system, such as a customer in a shop or passenger on a train, can be considered a user.

[SOURCE: ISO 26800:2011, 2.10, modified — Notes 1 and 3 have been omitted.]

4.23
user characteristics
attributes of a user that could influence usability

[SOURCE: ISO 20282-1:2006, 3.20, modified — The word "may" has been replaced with "could".]

4.24
user group
<usability> group of users differentiated by characteristics of the users, tasks, or environments that are expected to influence usability

Note 1 to entry: This could either be an intended user group or a user test group.

4.25
user interface
elements of a product used to control it and receive information about its status

Note 1 to entry: A list of operating instructions permanently displayed on the product is part of the user interface.

EXAMPLE The user interface of a shower tap is the water control lever, where the movement of the lever controls the temperature of the water and the position of the lever communicates the temperature to the user.

[SOURCE: ISO 20282-1:2006, definition 3.21, modified — The phrase "and the interaction that enables the user to use it for its intended purpose" has been deleted.]

4.26
user test group
group of persons selected to participate in a test of usability, sampled according to specific requirements

4.27
walk-up-and-use product
product that provides a service to the general public

Note 1 to entry: Walk-up-and-use products are designed to enable users to approach and use the product successfully without previous experience.

5 General principles

5.1 Type of usage of the product to be tested

This user-based test method can be used to measure the usability and accessibility of

— unpacking, installation, and setting up of consumer products,

— use of consumer products,

— products for public use, including walk-up-and-use products that provide a service to the general public, and

— other products that are used to achieve goals that have clear success criteria and relate to well-defined types of subject matter.

NOTE Accessibility is particularly important for walk-up-and-use products and for consumer products provided for public use.

The test method measures effectiveness, efficiency, and satisfaction when used by specified user groups in specified contexts of use. Accessibility is measured by the 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.

5.2 Purpose of the test

This part of ISO/TS 20282 can be used by product manufacturers to

a) test a single product to determine whether usability and/or accessibility requirements have been met,

b) test a single product to provide evidence of the usability and/or accessibility of a product for a customer or for marketing purposes,

c) test a single product to establish a benchmark against which future products can be compared,

d) make comparisons between different products,

e) make comparisons between versions of the same product, and

f) specify usability and/or accessibility requirements for a product to be developed (Annex G) and the scenarios to use when testing whether the requirements have been met (Annex H).

This part of ISO/TS 20282 can be used for procurement by corporate or public purchasers to

a) test a single product to decide whether it meets usability and/or accessibility requirements,

b) test a group of similar products to make comparisons to facilitate decisions on which is the most suitable,

c) ensure that tests of similar products use the same methodology so that information about usability and/or accessibility can be compared during the procurement process, and

d) specify usability and/or accessibility requirements for a product to be procured (for example, when products are to be used in a school, hotel, or homes for the elderly) (Annex G) and the scenarios to be used when testing whether the requirements have been met (Annex H).

NOTE 1 ISO/IEC 25062 provides a format for reporting this information for professional products.

This part of ISO/TS 20282 can be used by a third-party test organization or consumer advocate organization to

a) test a single or multiple product(s) to decide whether they meet the usability and/or accessibility requirements for a user group,

b) test a single or multiple product(s) to establish a benchmark against which future products can be compared,

c) compare alternative products to provide information to be included in reports, and

d) make comparisons between competing systems (testing the main goals of use of the type of product or system unless there are specific reasons for testing other goals).

EXAMPLE 1 A testing organization wants to find out how easy it is for new owners of mobile phones to make a call from the address book. The requirement is to be 80 % confident of an 80 % success rate. A representative group of 12 people who have not previously owned this brand of mobile phone are selected. To meet the requirement, 11 out of 12 users will have to be successful within a predefined time limit. Success rate and task time are recorded, and satisfaction is measured after each task using the system usability scale (SUS).

EXAMPLE 2 A manufacturer wants to demonstrate that a personal video recorder (PVR) is easy to program. The manufacturer has defined a requirement to be 95 % confident that 80 % of the user population can program the PVR. A representative sample of 30 people who have purchased a PVR with the intention of programming it to record programmes is recruited. They are selected to be representative in age, education, and ownership of different brands of PVR. Each session is expected to take a total of 15 min to 20 min and two PVRs are set up with TVs for programming. Each person is asked to program the PVR to record a specified programme. The test result is given as the measured success rate together with a confidence interval. The requirement is met when 28 of the 30 people tested are successful.

EXAMPLE 3 A manufacturer wants to demonstrate that a multifunction home printer/copier is easy to install for current users of other printers/copiers. The manufacturer has defined a requirement to be 95 % confident that 80 % of the user population can successfully install the printer. A sample of 30 people who own a printer/copier at home is recruited. They are selected to be representative in age, education, and ownership of different brands. Each session is expected to take a total of 10 min to 30 min and two kits are available. The printer/copier is returned to its default settings on completion of each test and repackaged as it would be received by the consumer. Each person is asked to install the printer/copier and print and copy a test page. The test result is given as the measured success rate together with a confidence interval and the geometric mean task time together with a confidence interval.

5.3 Scope of the goals used in the test

5.3.1 Selection of goals

Two decisions need to be made about the scope of the goals used in the test.

a) Which goal(s) are to be tested for achievement in which context(s) of use (see 5.3.2)?

b) Is goal achievement going to be assessed by whether interaction with the interface is successful (ease of interaction) or by whether the overall outcome resulting from the interaction meets the needs of the user (overall usability of the product)(see 5.3.3)?

5.3.2 Testing achievement of the main goals in the main context of use or specific goal(s) in specific context(s) of use

The scope of the test can be to

a) test the achievement of the main goals in the main context(s) of use in order to obtain measures of effectiveness, efficiency, and satisfaction that are representative of the overall usability or accessibility of the product. (When testing installation and setup, the main goal is to install the

most common configuration to obtain measures that are representative of the overall usability of the installation process.)

b) test the achievement of more specific goal(s) and/or using more specific context(s) of use to obtain measures that are representative of the usability of the product or installation process in specific context(s) of use (for example, for a specific user group (see 7.3.3), specific environment, or specific task).

5.3.3 Measuring installation and setup, the usability of the user interface, and interaction or overall usability

The prerequisites for usability of a product (i.e. the prerequisites for users to be effective, efficient, and satisfied) are

a) the specified users can successfully interact with the interface of the product in specified contexts of use (ease of interaction), and

b) the product is capable of producing results of acceptable technical quality as a result of the interaction.

While interaction with the product should enable the user to achieve their overall goals, the product also has to be capable of producing adequate results.

EXAMPLE 1 If the goal is to use a camera to take photographs that can be used for large prints, the user has to be able to successfully interact with the interface and the quality of the image generated by the camera needs to be adequate for a large print.

The scope of the test can be

a) unpacking, setting up, and installation of consumer products,

b) usability of the user interface and interaction ("ease of interaction"), or

NOTE If a product reliably produces results of acceptable technical quality, it is sufficient to just test the ease of interaction.

c) usability of the product as a whole ("overall usability": the extent to which the product enables the user to achieve their overall goal with effectiveness, efficiency, and satisfaction).

EXAMPLE 2 The effectiveness of achieving the goal of using an alarm clock to be woken in the morning could be decomposed.

Scope of test	Interactions	Goals (success criteria)	Assumptions
Unpacking, setting up, and installation	Unpack the clock and set the current time	Clock unpacked, working, and set to the correct time	None
Usability of the user interface and interaction (ease of interaction)	Set the alarm hours and minutes for a specified time and turn on the alarm on the clock	Alarm is correctly set (usability of the user interface)	When the alarm is correctly set, it will keep time and always sound at the specified time. Alarm is sufficiently loud to wake the user.
Usability of the product as a whole	Not specified	Alarm sounds at the specified time and wakes the user	None

The usability of an alarm clock for the goal of being woken in the morning could be tested by finding out whether, after setting the alarm, the user is woken at the specified time in the morning.

Alternatively, if it is known that when the alarm is correctly set, it will always sound at the specified time and will be sufficiently loud to wake the user, measuring the usability of interaction with the user