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Ergonomics of human-system interaction —

Part 11: Usability: Definitions and concepts

Ergonomie de l'interaction homme-système —

Partie 11: Utilisabilité — Définitions et concepts

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 (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 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 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 159 *Ergonomics,* Subcommittee SC 4, *Ergonomics of human-system interaction*.

This second edition cancels and replaces the first edition (ISO 9241-11:1998), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the scope has been extended to include systems and services (consistent with other parts of ISO 9241 including ISO 9241-210, and with ISO 26800 and ISO 20282);

— a wider range of goals is considered, including personal outcomes and organizational outcomes;

— *efficiency* has been defined in relation to the results achieved rather than in relation to accuracy and completeness with which users achieve goals.;

— *satisfaction* has been clarified to include a wider range of issues.

A list of all parts in the ISO 9241 series can be found on the ISO website.

Introduction

The objective of designing and evaluating systems, products and services for usability is to enable users to achieve goals effectively, efficiently and with satisfaction, taking account of the context of use. This document explains how usability can be interpreted in terms of user performance and satisfaction, and emphasizes that usability is dependent on the specific circumstances in which a system, product or service is used.

This document explains how to interpret each component in the definition of usability: "the 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 In this document, usability relates to the outcome of interacting with a system, product or service. Usability, as defined in this document, is not an attribute of a product, although appropriate product attributes can contribute to the product being usable in a particular context of use.

NOTE 2 Usability is a more comprehensive concept than is commonly understood by "ease-of-use" or "user friendliness".

Usability is relevant to:

— regular ongoing use, to enable users to achieve their goals effectively, efficiently and with satisfaction;

— learning, to enable new users to be become effective, efficient and satisfied when starting to use a system, product or service;

— infrequent use, to enable users to be effective, efficient and satisfied, with the system on each reuse;

— use by people with the widest range of capabilities;

— minimizing the risk and the undesirable consequences of use errors; and

— maintenance, in that it enables maintenance tasks to be completed effectively, efficiently and with satisfaction.

Usability is relevant when designing or evaluating interactions with a system, product or service for the purposes of:

— development;

— procurement;

— review or comparison; and

— marketing and market research.

Annexes A and B in this document give an explanation of the relationship of usability to other concepts and disciplines such as human-centred design, ergonomics, human factors, human-centred quality, user experience and quality (as used in systems and software engineering), and explain how usability can be considered for different scopes of contexts of use and provide examples of usability measures.

Ergonomics of human-system interaction —

Part 11: Usability: Definitions and concepts

1 Scope

This document provides a framework for understanding the concept of usability and applying it to situations where people use interactive systems, and other types of systems (including built environments), and products (including industrial and consumer products) and services (including technical and personal services).

NOTE In this document, the phrase "object of interest" refers to the system, product or service for which usability is being considered (see 8.1).

This document:

— explains that usability is an outcome of use;

— defines key terms and concepts;

— identifies the fundamentals of usability; and

— explains the application of the concept of usability.

It does not describe specific processes or methods for taking account of usability in design development or evaluation.

The intended users of this document include:

— usability/ergonomics/human factors professionals;

— designers and developers of systems, products and services;

— quality assurance personnel;

— public and corporate purchasers; and

— consumer organizations.

The most common applications of this document are in design and evaluation.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 https://www.electropedia.org/

3.1 Usability

3.1.1
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: The "specified" users, goals and context of use refer to the particular combination of users, goals and context of use for which usability is being considered.

Note 2 to entry: The word "usability" is also used as a qualifier to refer to the design knowledge, competencies, activities and design attributes that contribute to usability, such as usability expertise, usability professional, usability engineering, usability method, usability evaluation, usability heuristic.

[SOURCE: ISO 9241-210:2010, 2.13, modified — Notes 1 and 2 were added.]

3.1.2
product
item that is made or created by a person or machine

3.1.3
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, 3.2]

3.1.4
system
combination of interacting elements organized to achieve one or more stated purposes

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

Note 2 to entry: A complete system includes all of the associated equipment, facilities, material, computer programs, firmware, technical documentation, services and personnel required for operations and support to the degree necessary for self-sufficient use in its intended environment.

Note 3 to entry: A system can be composed of a product, service, built environment or combination thereof, and people.

[SOURCE: ISO/IEC 15288:2015, 4.1.46, modified — Notes 2 and 3 have been replaced.]

3.1.5
interactive system
combination of hardware and/or software and/or services and/or people that users interact with in order to achieve specific goals

Note 1 to entry: This includes, where appropriate, packaging, user documentation, on-line and human help, support and training.

[SOURCE: ISO 9241-210:2010, 2.8, modified]

3.1.6
service
means of delivering value for the customer by facilitating results the customer wants to achieve

Note 1 to entry: Services can include both human-system interactions (e.g. accessing a word processor through the web) and human-human interactions (e.g. a citizen interacting with a clerk at the post office counter).

Note 2 to entry: The "customer" is a user, and does not necessarily have a financial relationship.

[SOURCE: ISO/IEC 20000-1:2011, 3.26, modified — The notes have been replaced.]

3.1.7
user
person who interacts with a system, product or service

Note 1 to entry: Users of a system, product or service include people who operate the system, people who make use of the output of the system and people who support the system (including providing maintenance and training).

[SOURCE: ISO 26800:2011, 2.10, modified — Note 1 has been replaced and Notes 2 and 3 were deleted.]

3.1.8
user group
subset of intended users who are differentiated from other intended users by characteristics of the users, tasks or environments that could influence usability

[SOURCE: ISO/TS 20282-2:2013, 4.24, modified — The wording of the definition has been modified and the note omitted.]

3.1.9
stakeholder
person or organization that can affect, be affected by, or perceive themselves to be affected by a decision or activity

Note 1 to entry: Stakeholders can include: users, purchasers, systems owners or managers and people who are indirectly affected by the operation of a system, product or service.

Note 2 to entry: Different stakeholders can have different needs, requirements or expectations.

[SOURCE: ISO 31000:2009, 2.13, modified — The original note has been replaced by Notes 1 and 2.]

3.1.10
goal
intended outcome

3.1.11
task
set of activities undertaken in order to achieve a specific goal

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

Note 2 to entry: While goals are independent of the means used to achieve them, tasks describe particular means of achieving goals.

3.1.12
effectiveness
accuracy and completeness with which users achieve specified goals

3.1.13
efficiency
resources used in relation to the results achieved

Note 1 to entry: Typical resources include time, human effort, costs and materials.

3.1.14
satisfaction
extent to which the user's physical, cognitive and emotional responses that result from the use of a system, product or service meet the user’s needs and expectations

Note 1 to entry: Satisfaction includes the extent to which the user experience that results from actual use meets the user’s needs and expectations.

Note 2 to entry: Anticipated use can influence satisfaction with actual use.

3.1.15
context of use
combination of users, goals and tasks, resources, and environment

Note 1 to entry: The "environment" in a context of use includes the technical, physical, social, cultural and organizational environments.

3.2 Related concepts and disciplines

3.2.1
human-centred quality
extent to which requirements for usability, accessibility, user experience and avoidance of harm from use are met

Note 1 to entry: Provision of the necessary technical functionality is a prerequisite for human-centred quality.

Note 2 to entry: Usability, accessibility, user experience and avoidance of harm from use can only be managed to the extent that they can be controlled by designed aspects of the interactive system.

Note 3 to entry: Human-centred quality is a collective term for the intended outcomes of interaction of the user with the system.

[SOURCE: ISO 9241-220:—[1)], 3.11]

3.2.2
accessibility
extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of user needs, characteristics and capabilities to achieve identified goals in identified contexts of use

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

3.2.3
user experience
user's perceptions and responses that result from the use and/or anticipated use of a system, product or service

Note 1 to entry: Users' perceptions and responses include the users' emotions, beliefs, preferences, perceptions, comfort, 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 a system, product or service. It also results from the user's internal and physical state resulting from prior experiences, attitudes, skills, abilities and personality; and from the context of use.

Note 3 to entry: The term "user experience" can also be used to refer to competence or processes such as user experience professional, user experience design, user experience method, user experience evaluation, user experience research, user experience department.

Note 4 to entry: Human-centred design can only manage those aspects of user experience that result from designed aspects of the interactive system.

[SOURCE: ISO 9241-210:2010, 2.15, modified — The definition has been reworded for clarification, Note 3 to entry has been replaced and Note 4 to entry has been added.]

3.2.4
harm from use
negative consequences regarding health, safety, finances or the environment that result from use of the system

Note 1 to entry: The negative consequences can be for the user or for any other stakeholder.

1) Under preparation. (Stage at the time of publication: ISO/FDIS 9241-220.)

[SOURCE: ISO 9241-220:—, 3.9]

3.2.5
ergonomics
human factors
scientific discipline concerned with the understanding of interactions among human and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance

[SOURCE: ISO 26800:2011, 2.2, modified — The note has been omitted.]

3.2.6
human-centred design
HCD
approach to system design and development that aims to make interactive systems more usable by focussing on the use of the system; applying human factors, ergonomics and usability knowledge and techniques

Note 1 to entry: The term "human-centred design" is used rather than "user-centred design" in order to emphasize that this document also addresses impacts on a number of stakeholders, not just those typically considered as users. However, in practice, these terms are often used synonymously.

Note 2 to entry: Usable systems can provide a number of benefits including improved productivity, enhanced user well-being, avoidance of stress, increased accessibility, and reduced risk of harm.

[SOURCE: ISO 9241-210:2010, 2.7, modified]

3.3 Other definitions

3.3.1
built environment
external and internal environments and any element, component or fitting that is commissioned, designed, constructed and managed for use by people

[SOURCE: ISO 21542:2011, 3.10]

3.3.2
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 24765:2010, 3.2506 definition 2, modified — The note has been omitted.]

3.3.3
use error
user action or lack of user action while using the system, product or service 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: A malfunction of an interactive system that causes an unexpected result is not considered a use error.

Note 5 to entry: The term use error is used in preference to user error or human error in order to avoid the implied assignment of responsibility for the error to the user.

[SOURCE: IEC 62366-1:2015, 3.21, modified — The term *medical device* was replaced by *interactive system*, Notes 4 and 5 have been replaced and Note 6 was omitted.]

4 Rationale and benefits of usability

Usability is the effectiveness, efficiency and satisfaction of the user's interaction with the object of interest.

When designing a system, product or service:

— where usability is lower than expected, the intended users might not be able or willing to use the system, product or service;

— where usability is sufficient, the system, product or service will provide the intended personal, social and economic benefits for users, employers and suppliers;

— where usability is higher than expected, the system, product or service can have a competitive advantage (e.g. customer retention, or customers who are willing to pay a premium).

Specific benefits provided by appropriate usability include the following:

— contributing to meeting targets for the operational efficiency of organizations;

— making systems, products and services easier to understand and to learn how to use, thus increasing uptake and reducing support costs such as help desks;

— increasing usability for people with a wider range of capabilities (see 6.6.2);

— improving the user experience (see 6.6.3);

— contributing towards sustainability objectives (see ISO 26000 and ISO 27500);

— reducing the risks of the undesirable personal, social or business consequences (see A.6.4);

— providing a competitive advantage, for example by improving brand image.

This document provides a basis for identifying the relevant components of effectiveness, efficiency and satisfaction, and the components of the context of use. When specifying, designing or evaluating the usability that results from use of a system, product or service, the objective is to achieve the intended level of effectiveness, efficiency and satisfaction. The estimation of the potential impacts of particular levels of usability (whether these are business, organizational, personal or social impacts) can be used to justify the development efforts needed (see ISO 9241-210 and ISO 9241-220).

NOTE Reference[32] provides information on cost-justification of the development effort for usability.

5 Usability in a context of use

5.1 Concept of usability

Usability is the 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.

Figure 1 shows the system, product or service, which represents the object of interest. The object of interest is shown within the context of use, which is composed of the users, the goals and tasks, the resources, and the environment. Usability, which is composed of effectiveness, efficiency and satisfaction, is shown as an outcome of use. There are also other outcomes of use that include accessibility, user experience and avoidance of harm from use.

NOTE The components of usability are described in detail in 6.2, 6.3, and 6.4, and the other outcomes in 6.6.

