TECHNICAL REPORT

ISO/TR 9241-100

Second edition
2023-03

Ergonomics of human-system interaction —

Part 100: Overview of ISO 9241 software ergonomic standards

Ergonomie de l'interaction homme-système —

Partie 100: Vue d'ensemble des normes ISO 9241 relatives à l'ergonomie des logiciels

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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 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.

This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 122, *Ergonomics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO/TR 9241-100:2010), which has been technically revised.

The main changes are as follows:

— overview of the ISO 9241 series updated;

— text edited and added to;

— new Figure 1 added.

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

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.

Introduction

The purpose of this document is to provide concise descriptions of the parts of the ISO 9241 series that provide requirements and recommendations for the ergonomic design of software-based interactive systems. It includes descriptions of all the current parts in the ISO 9241-1XX family of documents, which are specifically directed at software, together with descriptions of ISO 9241-11, ISO 9241-210 and ISO 9241-220, which address the concept of usability, human-centred design and human-centred design processes, respectively.

It also informs the reader about upcoming documents that are currently under development.

The adoption of a human-centred approach to the development of products and systems and the application of the requirements and recommendations contained in the ISO 9241-1XX family of documents helps prevent users from experiencing usability problems, such as:

— additional unnecessary steps not required as part of the task;

— misleading information;

— insufficient and poor information on the user interface;

— navigational limitations during use;

— inefficient error recovery.

The documents contain guidance at the levels of:

— principles, e.g. “conformity with user expectations” (ISO 9241-110:2020, 5.3);

— general recommendations, e.g. “The interactive system should use cultural and linguistic conventions for presentation, input and control that the users are familiar with” (ISO 9241-110:2020, 5.3.3.1);

— guidance specific to a thematic subject, e.g. “If sounds need to be used in different countries or cultures, or will be presented to individuals speaking different languages, then the sounds should be culturally appropriate” (ISO/TS 9241-126:2019, 6.1.11).

NOTE Currently, when people phone someone whose line is in use, they hear a different signal in different countries.

The documents do not specify “standardized solutions” in terms of conventions, for example, “the title bar of a window in focus is coloured blue” or “the push button 'OK' is always placed to the left of the push button 'Cancel'.” Such “industry conventions” or even “industry regulations” are published by industry sources and can be found in literature. However, the guidance relating to presented information in ISO documents is intended to be applied when establishing or assessing industry conventions for user interfaces of interactive systems.

Ergonomics of human-system interaction —

Part 100: Overview of ISO 9241 software ergonomic standards

1 Scope

This document provides an overview of ISO 9241 software ergonomic standards in the form of executive summaries of these standards, in particular the parts in the ISO 9241-1XX family of documents. In addition, it provides executive summaries for ISO 9241-11, ISO 9241-210 and ISO 9241-220, which have specific relevance to the design of software-based interactive systems.

This document is intended for the following types of users:

— managers, who are involved in planning and managing product, system and/or service development projects, who are to be informed on the human-centred design approach and on guidance on software ergonomics;

— developers, who will apply the guidance in these documents during the development process (either directly, based on training, or by using tools and style guides which incorporate the guidance);

— user interface design roles (including interaction designers, information architects, user interface designers, visual designers and content creators), who will apply the guidance in these documents during the creation and design process (either directly, based on training, or by using tools and style guides which incorporate the guidance);

— user researchers, who are responsible for identifying user needs and inform context of use of a product, system or service;

— evaluators, who are responsible for ensuring that products, systems or services meet the recommendations contained in these documents;

— buyers, who will reference these documents in contracts during product procurement;

— designers of user interface development tools and style guides to be used by user interface designers and developers.

While the documents are applicable to all types of interactive systems, they do not cover the specifics of every context of use, such as safety critical systems and collaborative work.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology 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/

4 Overview of ISO 9241 software ergonomic standards

The ISO 9241 series provides requirements and recommendations that address the ergonomics issues that arise in the design and development of interactive systems. By applying and observing the theory, principles, data and methods of ergonomics presented in the series, people's wellbeing is increased and the overall system performance is optimized. Table 1 shows the structure of the ISO 9241 series and the way in which the numbering system is used to group the documents according the aspects of the interactive system that are being addressed. This document focuses on the description of the standards which address software ergonomics issues. The majority of the documents form part of the ISO 9241-1XX family of documents and are listed in Figure 1. Executive summaries for all the current 100 series parts are included in this document.

There are three further documents which are particularly relevant to the design of the software aspects of interactive systems, while also applying to the overall design. ISO 9241-11 provides the conceptual framework for addressing usability, while ISO 9241-210 and ISO 9241-220 provide guidance on the design activities within an organization that form the basis of a human-centred approach to designing interactive systems. Executive summaries for these parts are also included in this document. Information on additional guidance beyond the ISO 9241-1XX family of documents is given in Annex A, addressing topics such as accessibility, visual interfaces, audio interfaces and tactile interfaces.

Table 1 — Overview of ISO 9241 software ergonomic standards

Part of ISO 9241	Title	Revised	Pages	Core	Ref
100	Ergonomics of human-system interaction — Part 100: Overview of ISO 9241 software ergonomic standards	2022	19	13	–
Hardware and software usability					
11	Ergonomics of human-system interaction — Part 11: Usability: Definitions and concepts	2018	29	8	5.1
13	Ergonomic requirements for office work with visual display terminals (VDTs) — Part 13: User guidance	1998	32	13	5.2
14	Ergonomic requirements for office work with visual display terminals (VDTs) — Part 14: Menu dialogues	1997	57	20	5.3
General guidance on software ergonomics					
110	Ergonomics of human-system interaction — Part 110: Interaction principles	2020	43	20	5.4
112	Ergonomics of human-system interaction — Part 112: Principles for the presentation of information	2017	20	12	5.5
Input, output and interaction					
125	Ergonomics of human-system interaction — Part 125: Guidance on visual presentation of information	2017	42	34	5.6
126	Ergonomics of human-system interaction — Part 126: Guidance on the presentation of auditory information	2019	33	19	5.7
129	Ergonomics of human-system interaction — Part 129: Guidance on software individualization	2010	58	19	5.8
Performance support (currently no standards)					
Interaction techniques					
143	Ergonomics of human-system interaction — Part 143: Forms	2012	95	46	5.9
Topic specific guidance					
Key pages number of pages in main body of standard core number of pages that comprise the core of the standard ref. subclause where more detailed information is provided in this document					

Table 1 *(continued)*

Part of ISO 9241	Title	Revised	Pages	Core	Ref
154	Ergonomics of human-system interaction — Part 154: Interactive voice response (IVR) applications	2013	35	22	5.10
Interface control components					
161	Ergonomics of human-system interaction — Part 161: Guidance on visual user-interface elements	2016	63	54	5.11
Cross-topic guidance on accessibility					
171	Ergonomics of human-system interaction — Part 171: Guidance on software accessibility	2008	90	39	5.12
Process related guidance for human-centred design					
210	Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems	2019	33	15	5.13
220	Ergonomics of human-system interaction — Part 220: Processes for enabling, executing and assessing human-centred design within organizations	2019	104	42	5.14
Key pages number of pages in main body of standard core number of pages that comprise the core of the standard ref. subclause where more detailed information is provided in this document					

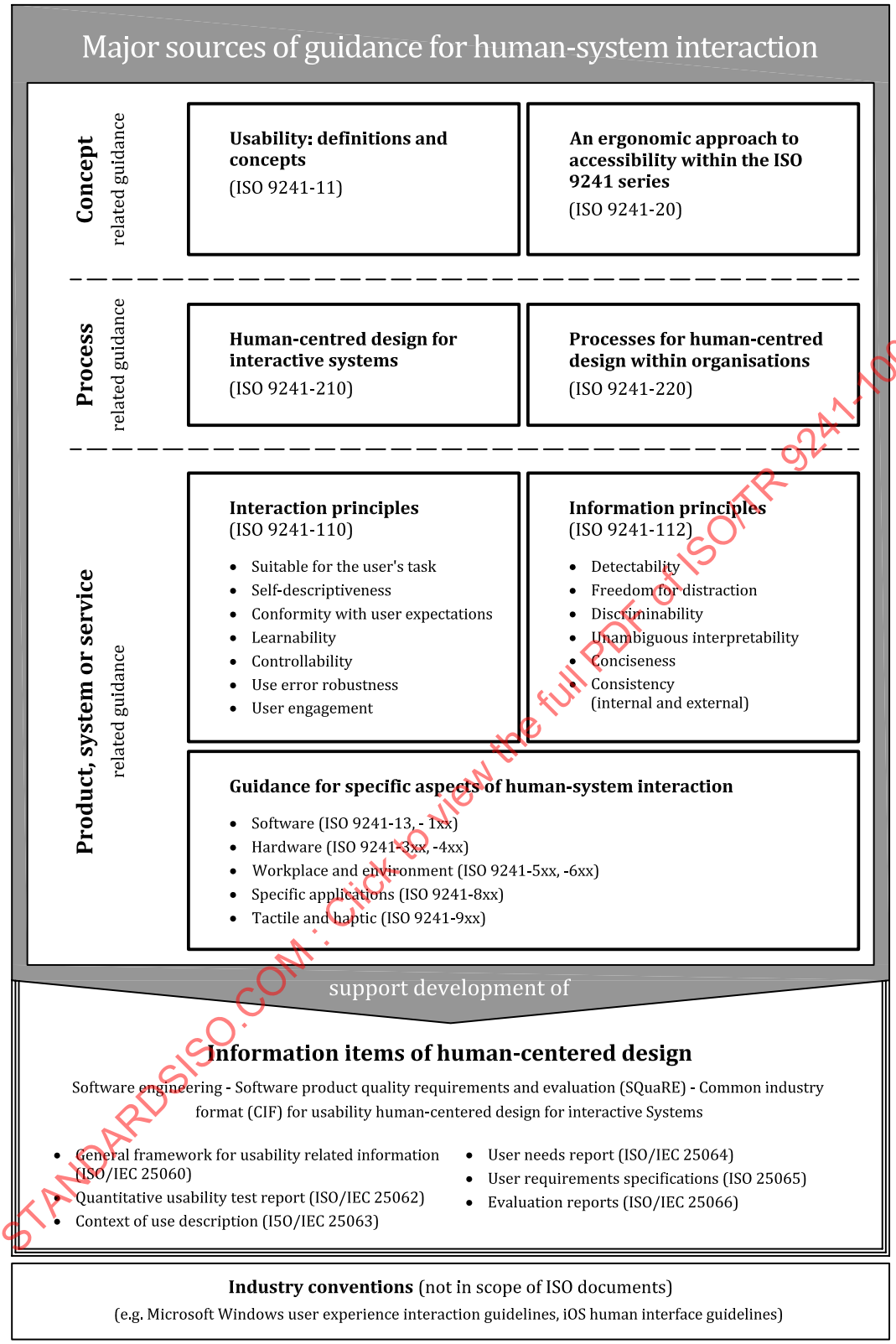

Figure 1 — The relationship between major sources of guidance for human-system interaction

5 Executive summaries of ISO software ergonomic standards

5.1 ISO 9241-11:2018

Title	Ergonomics of human-system interaction — Part 11: Usability: Definitions and concepts
Abstract	This standard provides a framework for understanding the concept of usability and applying it to situations where people use interactive systems, other types of systems (including built environments), products (including industrial and consumer products) and services (including technical and personal services). The standard explains usability and its key components: effectiveness, efficiency and satisfaction with definitions and examples. It also explains the context of use and its key components: users, goals, tasks, resources and environments with definitions and examples.
Sample 1	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.
Sample 2	6.2 Effectiveness Effectiveness is the accuracy and completeness with which users achieve specified goals. Accuracy is the extent to which an actual outcome matches an intended outcome. The basis for accuracy will depend on the specificity of the intended outcome(s). In some cases, accuracy is based on whether or not the outcome is correct. EXAMPLE 1 The user successfully recorded the intended TV programme on a personal video recorder (PVR) Causes of lack of accuracy can include … use errors or difficulties. EXAMPLE 2 A person selects a valid ticket from a train ticket machine but buys a higher-class ticket than intended, not realizing the double fare (price).
Contents	29 pages. Includes: — Table of contents (2 pages) — Rationale and benefits of usability (1 page) — Usability in a context of use (2 pages) — Outcomes of use (definitions of effectiveness, efficiency and satisfaction) (4 pages) — Context of use (4 pages) — Applying the concept of usability (2 pages) — Annex A. Relationship of usability to other concepts (5 pages) — Annex B. Usability measurement (3 pages) — Bibliography (2 pages)
Relations	The definitions in this standard are used throughout the ISO 9241 series and many other ISO standards.
Keywords	Definitions of basic usability concepts: usability, effectiveness, efficiency, satisfaction, context of use, user, goal, task, resource, environment.

5.2 ISO 9241-13:1998

Title	Ergonomic requirements for office work with visual display terminals (VDTs) — Part 13: User guidance

Abstract	This standard deals with user guidance aspects of software user interfaces. User guidance is additional information beyond the regular user-computer dialogue that is provided to the user on request or is automatically provided by the system. The main purpose of user guidance is to aid the user's interaction with the system by: — promoting efficient system use; — avoiding unnecessary mental workload; — providing support to users to manage error situations; — providing support for users at various skill levels. The user guidance recommendations are presented in the following clauses: — Common guidance recommendations (15 recommendations, 2 pages) — Prompts (9 recommendations, 1 page) — Feedback (9 recommendations, 1 page) — Status information (6 recommendations, 1 page) — Error management (23 recommendations, 3 pages) — Error management (35 recommendations, 4 pages)
Sample	The clause Error management consists of the following subclauses: — Description — Error prevention — Error correction by the system — Error management by the user — Error messages Three of the 10 recommendations provided for error messages are: If brief error messages are displayed, users should be able to request more detailed online information or should be referred to additional off-line information. If an error has occurred in a sequence of operations invoked by a single user action, information should be made available about which system operations have already been completed and which have not been completed. Error messages should convey what is wrong, what corrective actions can be taken and: a) the cause of the error; EXAMPLE An error has been detected in a logical unit of inputs, the cursor is positioned in the data field or command word at the point of the first identified error to indicate the location of the error. or b) the system should provide an indication of the class of error as precisely as possible [e.g. error reading file (file name)].
Contents	32 pages. Includes: — Table of contents (1 page) — User guidance recommendations; six clauses with 97 recommendations (13 pages) — Annex A. Sample procedure for assessing applicability and adherence (13 pages) — Annex B. Bibliography (3 pages)
Relations	Further recommendations regarding aspects of user guidance can be found in ISO 9241-110.
Keywords	User guidance, prompts, feedback, status information, error management, help, online help.

5.3 ISO 9241-14:1997

Title	Ergonomic requirements for office work with visual display terminals (VDTs) — Part 14: Menu dialogues
Abstract	This standard deals with the ergonomic design of menu dialogues. In menu dialogues, the dialogue system presents one or more groups of options to the user, the user chooses one or more options and the computer executes the desired process denoted by the option(s). Recommendations are presented in the following clauses: — Menu structure (13 recommendations, 3 pages) — Menu navigation (10 recommendations, 2 pages) — Option selection and execution (28 recommendations, 7 pages) — Menu presentation (37 recommendations, 8 pages)
Sample	The clause “Menu structure” is divided into the subclauses: — Structuring into levels and menus — Grouping options within a menu — Sequencing of options within groups Specific example from subclause 5.3, “Sequencing of options within groups”: Options should be sequenced within an option group to facilitate option search and task performance. NOTE Except for consistency, it may be necessary to compare the relative appropriateness of the sequencing approaches (i.e. perform “tradeoffs”) for the users and tasks for which the menu system is intended. 5.3.1 Consistency Options should be placed consistently in the same relative order within the option group. EXAMPLE Options in a menu panel are ordered “file, edit, insert, print” and these options appear in the same order when that group is presented again (or another panel containing the same group of options is presented). NOTE If users have the capability to reorder menu options, it is important that any new option order selected by a user is preserved until the user makes another change or reverts to the default order.
Contents	57 pages. Includes: — Table of contents (2 pages) — Recommendations; four clauses with 88 recommendations (20 pages) — Annex A. Sample procedure for assessing applicability and adherence (19 pages) — Annex B. Examples of applying ISO 9241-14 (2 pages) — Annex C. Bibliography (10 pages, including cross-references to recommendations)
Relations	Further recommendations regarding aspects of user guidance can be found in ISO 9241-110.
Keywords	Menu, menu options, navigation

5.4 ISO 9241-110:2020

Title	Ergonomics of human-system interaction — Part 110: Interaction principles

Abstract	This standard deals with the ergonomic design of interactive systems. It describes seven interaction principles which help prevent usability problems, such as insufficient and poor information on the user interface and inefficient error recovery. The interaction principles are generally independent of any specific interaction technique. The principles are applicable in the analysis, design and evaluation of interactive systems. The seven interaction principles are: — Suitability for the user's task (6 recommendations, 2 pages) — Self-descriptiveness (8 recommendations, 2 pages) — Conformity with user expectations (11 recommendations, 3 pages) — Learnability (6 recommendations, 2 pages) — Controllability (10 recommendations, 3 pages) — Use error robustness (12 recommendations, 4 pages) — User engagement (12 recommendations, 4 pages) For each of the seven interaction principles, the standard provides recommendations. The standard also provides two specific examples for each recommendation.
Sample	Interaction principle: Self-descriptiveness Explanation of interaction principle: The interactive system presents appropriate information, where needed by the user, to make its capabilities and use immediately obvious to the user without unnecessary user-system interactions. The standard provides eight recommendations for this interaction principle. One of them is: The interactive system should provide information that guides the user and minimizes the need for consulting online help, user manuals or other external information. EXAMPLE 1 An office phone with answering machine and call-forwarding facility offers clearly labelled buttons to initiate actions such as "recording a message" or "setting a forwarding number". EXAMPLE 2 In a railway station, electronic information displays present the time until the departure of trains, rather than the time of departure so that the user does not need to find the current time and calculate how long is available to get to the train.
Contents	43 pages. Includes: — Table of contents (2 pages) — Interaction principles and recommendations; with 65 recommendations (19 pages) — Annex A Checklist to aid in applying the recommendations in ISO 9241-110 (8 pages) — Bibliography (2 pages)
Relations	This standard can be used together with ISO 9241-112, which focuses on presentation of information that is part of an interactive system. The principles in ISO 9241-110 also work with the principles presented in ISO 9241-171, which focuses on designing accessible solutions.
Keywords	Heuristic, interaction principle

5.5 ISO 9241-112:2017

Title	Ergonomics of human-system interaction — Part 112: Principles for the presentation of information

Abstract	This standard deals with common usability issues that arise in the presentation of information, when designing user interfaces. It describes six principles which address ways in which information presented in the design of user interfaces supports effectiveness and efficiency and can lead to increased user satisfaction. The six principles are: — detectability (18 recommendations, 3 pages) — freedom from distraction (2 recommendations, 1 page) — discriminability (17 recommendations, 3 pages) — interpretability (28 recommendations, 3 pages) — conciseness (11 recommendations, 1 page) — consistency (internal and external) (14 recommendations, 2 pages)
Sample	Principle: Detectability Explanation of principle: Presented information is detectable if the information is presented so that it will be recognized as present. Detectability involves guidance related to prominence, timely presentation of information, design the controls to be detectable, and continuity. Guidance related to using prominence (which is an aspect of detectability): Recommendation: The focus of attention should be set on important information. EXAMPLE 1 Important information is presented at the top centre of a page of visual information EXAMPLE 2 Important information is presented first in an audio announcement slowly and in easily understandable/acceptable languages of the users. EXAMPLE 3 Important tactile/haptic information is presented using a higher intensity than less important information.
Contents	20 pages. Includes: — Table of contents (1 page) — Introduction to principles (1 page) — Principles and recommendations. Six principles, which are described on 12 pages. The principles are elaborated by 90 recommendations, which are illustrated by 53 examples — Bibliography (1 page).
Relations	This standard is intended to be used together with ISO 9241-110, which focuses on general ergonomic design of interactive systems. More detailed guidance for some of the six general principles in this standard are provided in ISO 9241-125.
Keywords	Presentation of information, visual presentation, heuristic, interaction principle

5.6 ISO 9241-125:2017

Title	Ergonomics of human-system interaction — Part 125: Guidance on visual presentation of information

Abstract	This standard provides guidance for the visual presentation of information controlled by software, irrespective of the device. It gives provisions for the organization of information taking account of human perception and memory capabilities. The main clauses are: — Visual structuring of information (27 recommendations, 7 pages) — Using user interface elements to organize information (53 recommendations, 9 pages) — Graphical objects (18 recommendations, 3 pages) — Coding techniques (58 recommendations, 10 pages) — Use of colour (22 recommendations, 6 pages)
Sample	The clause "Using user interfaces to structure information" is divided into the four clauses Lists, Tables, Entry fields, Windows. The clause Lists is divided into the eight subclauses List structure, Item separation, Alphabetic information, Numeric information, Fixed font size, Item numbering, Indication of relative position of displayed information, Indication of list continuation. Specific example from subclause 6.1.3 Alphabetic information: The format of lists of alphabetic information should depend on language conventions, e.g. vertical lists of alphabetic information are left-justified for languages which read from left to right. NOTE Indentation can be used to indicate subordination in hierarchical lists (Figure 8 provides an example). Cities: Basel London New York Paris Figure 8 — Illustration of left-justified and indented alphabetic information
Contents	42 pages. Includes: — Table of contents (4 pages) — Five clauses with 178 recommendations (34 pages) — Bibliography (1 page).
Relations	This standard provides more detailed guidance for some of the six general principles in ISO 9241-112. ISO 9241-125 discusses presentation of visual information, while ISO/TS 9241-126 discusses presentation of auditory information.
Keywords	Visual presentation, heuristic, interaction principle

5.7 ISO/TS 9241-126:2019

Title	Ergonomics of human-system interaction — Part 126: Guidance on the presentation of auditory information

Abstract	This standard provides guidance for the auditory presentation of information controlled by software, irrespective of the device. It includes specific properties such as the syntactic or semantic aspects of information, e.g. coding techniques, and gives provisions for the organization of information taking account of human perception and memory capabilities. The main clauses are: — Appropriate usage guidance (9 recommendations, 1 page) — Auditory presentation (22 recommendations, 3 pages) — Auditory dimensions (52 recommendations, 6 pages) — Speech (29 recommendations, 4 pages) — Earcons (8 recommendations, 1 page) — Coding (24 recommendations, 2 pages) — Warnings (15 recommendations, 2 pages) Earcons are non-verbal audio messages used in the user-computer interface to provide information to the user about some computer object, operation, or interaction.
Sample 1	Clause 5, Appropriate usage recommendations: Recommendation 5.3 Inability to maintain visual attention If the task prevents the user from maintaining focus on a visual display, then information should be presented aurally. EXAMPLE If users are required to move continually, they may not be able to look often enough at a stationary display, and if the task requires the users to use both hands, portable displays may not be practical either.
Sample 2	Clause 7.1, Auditory dimensions – Pitch: Recommendation 7.1.7 Harmonicity for pitch identification Inharmonic tones should not be used for any task requiring pitch identification. EXAMPLE Users are unlikely to be able to identify the pitch of a click or a percussive drum sample. Truly inharmonic sounds do not have a discernable pitch.
Sample 3	Clause 8.2, Speech – General speech presentation recommendations: Recommendation 8.2.4 Pre-processing To improve speech intelligibility in high-noise environments, speech should be pre-processed with 3 dB/octave boost or peak clipping so that consonant sounds are more detectable. NOTE Consonant sounds are more easily masked than vowel sounds because they have lower power, shorter durations, and higher frequencies.
Contents	33 pages. Includes — Table of contents (4 pages) — Seven clauses with 159 recommendations (19 pages) — Bibliography (3 pages).
Relations	This standard is intended to be used together with ISO 9241-110 and ISO 9241-112, which focus on general ergonomic design of interactive systems. ISO/TS 9241-126 discusses auditory design while ISO 9241-125 discusses visual design.
Keywords	Auditory information, speech, earcons

5.8 ISO 9241-129:2010

Title	Ergonomics of human-system interaction — Part 129: Guidance on software individualization

Abstract	This standard provides guidance on the application of software individualization in order to achieve as high a level of usability as possible. Thus, it addresses individualization as the modification of interaction and presentation of information to suit individual capabilities and needs of users. Individualization enables support of a wide range of users, tasks, and contexts of use. It is particularly useful in increasing accessibility, which is discussed in ISO 9241-171. The main clauses are: — General guidance on individualization (16 recommendations, 3 pages) — Stages of individualization (7 recommendations, 1 page) — Configuration, settings and default (36 recommendations, 5 pages) — Supporting individual users (19 recommendations, 4 pages) — Individualizing interface components (17 recommendations, 4 pages) — Individualizing interaction activities (9 recommendations, 2 pages) — Individualizing content (8 recommendations, 1 page) This standard does not require the use of individualization but does provide guidance on how to implement individualization in a manner that improves its usability.
Sample 1	Clause 6.2. General guidance on individualization – Controllability: Recommendation 3 Control of use of individualization features Where the use of an individualization feature might result in usability problems, the system should notify the user of the potential problem(s) and allow the user to accept or reject the individualization, or to select between various possibilities that could result from the individualization. EXAMPLE Where an individualization feature could change both the foreground and background colour to the same value, the user is warned that the result will be unreadable and is asked whether or not to allow this change.
Sample 2	Clause 8.2. Configuration, settings and defaults – Usability of configuration and reconfiguration: Recommendation 3 Minimizing the need of configuration The need to perform configuration should be kept to a minimum. NOTE It is preferable that software can be used without requiring initial configuration.
Contents	58 pages. Includes — Table of contents (4 pages) — Seven clauses with 112 recommendations (19 pages) — Annex A. Overview of the ISO 9241 series (1 page) — Annex B. Factors to consider when designing individualizations (7 pages) — Annex C. Checklist for ISO 9241-129) (13 pages) — Bibliography (3 pages)
Relations	This standard elaborates the interaction principle “Suitability for individualization” in ISO 9241-110. This standard is particularly useful in increasing accessibility, which is discussed in ISO 9241-171.
Keywords	Individualization of software

5.9 ISO 9241-143:2012

Title	Ergonomics of human-system interaction — Part 143: Forms

Abstract	This standard provides guidance for the design and evaluation of forms – in which the user fills in, selects entries for, or modifies labelled fields on, a "form" or dialogue box presented by the system. Often, the system then creates or updates the data associated with the form. Form-based entries typically are in the form of typed input (abbreviations or full names) or selections from available option lists. The main clauses are: — Forms (13 recommendations, 2 pages) — Information presentation (35 recommendations, 7 pages) — Interaction (77 recommendations, 14 pages) — Validation (2 recommendations, 1/2 page) — Choice of form elements (16 recommendations, 9 pages) — Form element design (67 recommendations, 12 pages)
Sample	Clause 4.2. Forms – General requirements and recommendations: Recommendation 1 Form titles Forms shall be titled unless a title would be redundant (e.g. provided by surrounding user interface). Any title shall clearly indicate the purpose of the form and differentiate it from other forms. NOTE 1 In visually displayed forms, titles are usually placed at the top of the form (or page in the case of a web-based application). NOTE 2 In window-based interfaces, the title of the form can be the window title, if the form is the only content of the window. NOTE 3 Forms are typically embedded in larger user interfaces, such as applications.
Contents	95 pages. Includes: — Table of contents (1 page) — Six clauses with 210 recommendations (46 pages) — Annex A. Overview of the ISO 9241 series (1 page) — Annex B. Checklist for applying this part of the ISO 9241 series (40 pages) — Bibliography (1 page)
Relations	This standard is intended to be used together with ISO 9241-110, which focuses on general ergonomic design of interactive systems and ISO 9241-161, which addresses generally the use of visual user interface elements.
Keywords	Forms

5.10 ISO 9241-154:2013

Title	Ergonomics of human-system interaction — Part 154: Interactive voice response (IVR) applications

Abstract	This standard contains provisions specific to interactive voice response (IVR) systems, which can involve a combination of voice technologies, but are distinguished by the use of the telephone as the information transfer mechanism. These provisions assume no visual displays of information to the user beyond the labels on the telephone's keypad, with the notable exception of text telephones (TTYs), which have a visual feedback display. This standard covers both IVR systems that employ touchtone input and those using automated speech recognition (ASR) as the input mechanism. It is equally applicable to cases in which the caller or the IVR system itself (e.g. in some telemarketing applications) initiates the call. The main clauses are: — Information input (4 recommendations, 1 page) — Speech input (11 recommendations, 2 pages) — Touchtone input (7 recommendations, 1 page) — Information output (42 recommendations, 7 pages) — Navigation (6 recommendations, 1 page) — Help (5 recommendations, 1 pages) — Access to human representatives (21 recommendations, 3 pages) — Feedback (20 recommendations, 4 pages) — Errors (17 recommendations, 3 pages)
Sample 1	Clause 8. Touchtone input: Recommendation 2 Indicating touchtone capability If callers are explicitly asked to indicate they have a touchtone telephone by pressing a key, the prompt shall specify "1" as the appropriate key press, but any touchtone shall be recognized as a correct response to the request. NOTE There may be equally valid ways of identifying touchtone capability other than requiring the caller to press a key. This requirement does not assume that this particular procedure represents the only or best way to determine whether or not a caller has a touchtone phone.
Sample 2	Clause 12. Access to human representatives: Recommendation 6 Assistance from human representatives If available, callers should be transferred automatically to a human representative at any point at which a pre-determined threshold is exceeded in terms of speech-recognition errors or other measures of caller frustration. EXAMPLE When the caller exceeds a predetermined number of errors at any one point in the IVR or cumulatively during the course of the call, they are transferred to an agent to complete their request
Contents	35 pages. Includes: — Table of contents (2 pages) — Nine clauses with 133 recommendations (22 pages) — Annex A. Overview of the ISO 9241 series (1 page) — Annex B. The role of speech recognition errors in IVR design (3 pages) — Bibliography (2 pages)
Relations	This standard is intended to be used together with ISO/IEC 13714. ISO 9241-154 is an application-specific standard. It doesn't directly relate to any other standards in the ISO 9241 series.
Keywords	Interactive voice response, IVR

5.11 ISO 9241-161:2016

Title	Ergonomics of human-system interaction — Part 161: Guidance on visual user-interface elements
Abstract	This standard describes visual user interface elements, such as labels and push buttons, and provides requirements and recommendations on when and how to use them. This standard is concerned with software components of interactive systems to make human-system interaction usable as far as the basic interaction aspects are concerned. The standard provides a comprehensive list of generic visual user-interface elements, regardless of a specific interaction technique, input method, visualization, and platform or implementation technology. It recognizes that additional elements can evolve. It also addresses derivates, compositions (assemblies) and states of user-interface elements. It gives requirements and recommendations on selection, usage and dependencies of user-interface elements and their application. It is applicable regardless of a fixed, portable or mobile interactive system.
Sample	8.32 Push button / command button 8.32.1 Description A push button is a user-interface element used for executing an immediate command or action. NOTE 1 A push button typically contains a label, which can be textual and/or graphical. NOTE 2 Sometimes a push button is referred to as command button. 8.32.2 Components A push button consists of the following components: a) Label, describing the command or action b) Canvas, to present the Label 8.32.3 States A push button can have the following states: — active / deactivated; — focused / unfocused; and — pressed / not pressed. 8.32.4 When to use a push button A push button is an applicable design solution to initiate a system function 8.32.5 How to use a push button Every push button shall have a label. A push button label should be short and concise. If additional Information is needed in the system function that is to be initiated, the design of the push button should reflect that. Push Buttons shall be activated by a single activation event, e.g. Mouse click, touch; not by double click.
Contents	63 pages. Includes: — Table of contents (6 pages) — Fifty-one subclauses, which are structured as shown in the sample. Each subclause describes a user interface element, for example Accordion, Carousel, Check box, Date picker, Dialogue box and Pop-up menu (54 pages) — Annex A. Assignment of common functions to visual user-interface elements (1 page)
Relations	This standard is intended to be used together with ISO 9241-110, ISO 9241-112 and ISO 9241-125, which contain related principles and recommendations for ergonomic design of interactive systems.

Keywords	User interface element

5.12 ISO 9241-171:2008

Title	Ergonomics of human-system interaction — Part 171: Guidance on software accessibility
Abstract	This standard provides guidance on the design of the software of interactive systems to achieve as high a level of accessibility as possible. Designing human-system interactions to increase accessibility promotes increased effectiveness, efficiency, and satisfaction for people who have a wide variety of capabilities and preferences. This standard is based on the current understanding of the characteristics of individuals who have particular physical, sensory and/or cognitive impairments. — General recommendations (50 recommendations, 16 pages) — Inputs (41 recommendations, 11 pages) — Outputs (45 recommendations, 10 pages) — Online documentation, Help and support services (7 recommendations, 2 page)
Sample (abbreviated)	Clause 8.4. General recommendations – General control and operation recommendations: Recommendation 4 Provide “Undo” and/or “Confirm” functionality Software should provide a mechanism that enables users to undo at least the most recent user action and/or cancel the action during a confirmation step. NOTE 1 Although this is a general ergonomic principle, “Undo” mechanisms are particularly important for users who have disabilities that significantly increase the likelihood of an unintentional action. These users can require significant time and effort to recover from such unintentional actions. NOTE 4 It is preferable if undo operations themselves can be undone. NOTE 6 It is preferable that the default configuration provides a confirmation step for any actions that the user cannot undo with a single Undo command. Software may allow the user to disable the confirmation for specific actions. EXAMPLE 1 A user with Parkinson’s disease may inadvertently input a sequence of keystrokes, which activate several dialogues that need to be undone. The use of several steps of the undo function may permit the user to go back to the original state. EXAMPLE 2 A user is about to format a hard disk. As this is an operation that cannot be undone, the software shows a confirmation dialog before the formatting begins.
Contents	90 pages. Includes: — Table of contents (2 pages) — Four clauses with 143 recommendations (39 pages) — Annex A. Overview of the ISO 9241 series (4 pages) — Annex B. Requirements clauses (2 pages) — Annex C. Sample procedure for assessing applicability and conformance (14 pages) — Annex D. Issues regarding activity limitations (6 pages) — Annex E. StickyKeys, SlowKeys, BounceKeys, FilterKeys, MouseKeys, ... (8 pages) — Annex F. Accessibility and usability (2 pages) — Bibliography (4 pages)
Relations	This standard is intended to be used together with ISO 9241-110, which focuses on general ergonomic design of interactive systems.
Keywords	Accessibility

5.13 ISO 9241-210:2019

Title	Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems
Abstract	This standard provides requirements and recommendations for human-centred design principles and activities throughout the life cycle of interactive systems. It is intended to be used by those managing both technical and creative design processes. It is concerned with ways in which both hardware and software components of interactive systems can enhance human–system interaction. It does not provide detailed coverage of the methods and techniques required for human-centred design, nor does it address health or safety aspects in detail. Although it addresses the planning and management of human-centred design, it does not address all aspects of project management. The requirements and recommendations in this standard can benefit all parties involved in human-centred design and development. It includes a checklist that can be used to support claims of conformance with this standard.
Sample (abbreviated)	7.3.3 Deriving user requirements The specification of user requirements shall include: a) the intended context of use; b) requirements derived from user needs and the context of use; c) requirements arising from relevant ergonomics and user interface knowledge, standards and guidelines (e.g. accessibility requirements are found in ISO 9241-20 and ISO 9241-171); d) usability requirements and objectives, including measurable usability performance and satisfaction criteria in specific contexts of use; e) requirements derived from organizational requirements that directly affect the user. User requirements provide the basis for the design and evaluation of interactive systems to meet the user needs. User requirements are developed in conjunction with, and form part of, the overall requirements specification of an interactive system.
Contents	33 pages. Includes: 1 Scope 2 Normative references 3 Terms and definitions 4 Rationale for adopting human-centred design 5 Principles of human-centred design 6 Planning human-centred design 7 Human-centred design activities 8 Sustainability and human-centred design 9 Conformance Annex B Sample procedure for assessing applicability and conformance

Relations	This standard is for those responsible for managing hardware and software design and re-design processes to identify and plan effective and timely human-centred design activities. It is intended to be used to manage all applications of the ISO 9241-1XX family of documents. The human-centred approach to design described in this standard complements existing systems design approaches. It can be incorporated in approaches as diverse as object-oriented, waterfall and rapid application development. Guidance on adoption of this standard is described in ISO 9241-220.
Keywords	Human-centred design, context of use, user requirements, usability, user experience, evaluation

5.14 ISO 9241-220:2019

Title	Ergonomics of human-system interaction — Part 220: Processes for enabling, executing and assessing human-centred design within organizations
Abstract	This standard describes the processes and specifies the outcomes by which human-centred design (HCD) is carried out within organizations. The processes are described from the viewpoint of those responsible for the analysis, design and evaluation of the human use of interactive systems. The descriptions include the purpose, benefits, outcomes, typical activities and work products for each process, and are for use in the specification, implementation, assessment and improvement of the activities used for HCD and operation in any type of system life cycle. The processes are associated with the domains of ergonomics/human factors, human–computer interaction, usability and user experience. This standard is intended for use by organizations that want to address and improve their treatment of HCD of either their internal systems or the products and services they provide, and the procurement of systems and parts of systems. The process descriptions provide the basis for an assessment of an enterprise's capability to carry out human-centred processes.

Sample (abbreviated)	Clause 9.4.3.2 Identify the intended user population and differentiate groups of users. Process purpose To identify the intended user population and differentiate the groups of users taking account of the diversity of the population, and describe the relevant characteristics of the identified user groups. Process benefits The intended user population is known and provides a basis for describing the context of use. Process outcomes: a) User groups to be considered are identified. b) Users with accessibility needs have been included to the greatest extent possible. c) The relevant characteristics (including the diversity of these characteristics) of each user group and their goals are described. d) User groups not to be considered are identified. Process activities (typical): 1) Identify users based on the intended target audience for the interactive system. 2) Identify the goals that the users have and the characteristics of the potential users based on information about existing users, information from databases, and standards. 3) Differentiate user groups on the basis of shared goals, roles with respect to the interactive system under consideration and any relevant demographic characteristics. 4) Describe the attributes of each user group relevant for the interactive system to be designed or evaluated, including any needs for accessibility. 5) Include potential users with accessibility needs to the greatest extent possible, including all potential users covered by any legislation. 6) Identify any types of users who are not included in the intended context of use, and the reasons why they are not included.
Contents	104 pages. Includes: — Table of contents (2 pages) — HCD processes (4 pages) — HCD process descriptions (42 pages) — Annex A Work products for HCD processes (14 pages) — Annex B Tailoring of processes and work products (3 pages) — Annex F Risk management and human-centred design (3 pages)
Relations	This standard provides guidance on the adoption of ISO 9241-210.
Keywords	Human-centred design, process model, process assessment, Human-centred quality

6 Standards under development

At the time of publication, the following standards are under development. This document will be updated regularly to incorporate the executive summaries once these standards have been published. Please note that all titles of the listed standards are working titles that are also subject to change.

ISO 9241-20, *Ergonomics of human-system interaction — Part 20: An ergonomic approach to accessibility within the ISO 9241 series*

ISO 9241-20 provides an introduction to the importance of accessibility to human-systems interaction and discusses the relationship of principles within the ISO 9241 series and accessibility. It describes activities in ISO 9241-210 that focus on accessibility and supplies references to standards relevant to the accessibility of interactive systems.