
**Ergonomics of human-system
interaction —**

**Part 110:
Dialogue principles**

*Ergonomie de l'interaction homme-système —
Partie 110: Principes de dialogue*
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 9241-110 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

This first edition of ISO 9241-110 cancels and replaces ISO 9241-10:1996, which has been technically revised as follows:

- the explanation of suitability for the task (4.3) has been made more comprehensible;
- for each dialogue principle given in 4.3 to 4.9, general recommendations have been made;
- examples for each of these general recommendations have been given;
- a framework for the use of the dialogue principles has been added to Clause 5;
- an explanation of the relationship with ISO 9241-11 and ISO 9241-12 has been given in Clause 6;
- Annex A, presenting an overview of the ISO 9241 has been added.

ISO 9241 consists of the following parts, under the general title *Ergonomic requirements for office work with visual display terminals (VDTs)*:

- *Part 1: General introduction*
- *Part 2: Guidance on task requirements*
- *Part 3: Visual display requirements*
- *Part 4: Keyboard requirements*
- *Part 5: Workstation layout and postural requirements*
- *Part 6: Guidance on the work environment*
- *Part 7: Requirements for display with reflections*
- *Part 8: Requirements for displayed colours*

- Part 9: Requirements for non-keyboard input devices
- Part 11: Guidance on usability
- Part 12: Presentation of information
- Part 13: User guidance
- Part 14: Menu dialogues
- Part 15: Command dialogues
- Part 16: Direct manipulation dialogues
- Part 17: Form filling dialogues

ISO 9241 also consists of the following parts, under the general title *Ergonomics of human-system interaction*:

- Part 20: Accessibility guidelines for information communication equipment and services
- Part 110: Dialogue principles
- Part 400: Principles for physical input devices — Introduction and requirements

The following parts, under the general title *Ergonomics of human-system interaction*, are under preparation:

- Part 151: Guidance on World Wide Web software user interfaces
- Part 171: Guidance on software accessibility
- Part 300: Introduction to requirements and measurement techniques for electronic visual displays
- Part 302: Terminology for electronic visual displays
- Part 303: Requirements for electronic visual displays
- Part 304: User performance test methods for electronic visual displays
- Part 305: Optical laboratory test methods for electronic visual displays
- Part 306: Field assessment methods for electronic visual displays
- Part 307: Analysis and compliance test methods for electronic visual displays
- Part 410: Design criteria for products for physical input devices
- Part 420: Selection procedures for physical input devices
- Part 421: Workplace assessment methods for physical input devices

Introduction

This part of ISO 9241 deals with the ergonomic design of interactive systems and describes dialogue principles which are generally independent of any specific dialogue technique and which are applicable in the analysis, design and evaluation of interactive systems.

These dialogue principles concern the development of user interfaces and help prevent users of those products 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,
- unexpected response of the interactive system,
- navigational limitations during use, and
- inefficient error recovery.

In this part of ISO 9241, a dialogue is the "interaction between a user and an interactive system as a sequence of user actions (inputs) and system responses (outputs) in order to achieve a goal", where user actions include not only entry of data but also navigational and other (control) actions of the user.

The priority with which each dialogue principle is weighted will depend on the characteristics of the intended user of the system, the tasks, the environment and the specific dialogue technique used. Guidance on identifying relevant aspects of the users' tasks and environment of use is given in ISO 9241-11. Specific guidance on the use of techniques such as menus, command languages, direct manipulation and form-based entry can be found in ISO 9241-14 to ISO 9241-17.

The ultimate beneficiary of ISO 9241 will be the user of an interactive system. It is the needs of this user that provide the ergonomic requirements used by the International Standards developers. Although it is unlikely that the user will read ISO 9241 or even know of its existence, its application will lead to user interfaces that are more usable, consistent and that enable greater productivity.

This part of ISO 9241 comprises the following:

- a) the dialogue principles;
- b) recommendations corresponding to the dialogue principles;
- c) a framework for requirements concerning analysis, design and evaluation that gives guidance on
 - the specification of dialogue requirements, based on the dialogue principles, for the design of interactive systems that adhere to ISO 9241-110, and this part of ISO 9241,
 - the specification of appropriate design solutions based on the recommendations for the application of dialogue techniques according to ISO 9241-14 to ISO 9241-17;
 - the evaluation of interactive systems against the dialogue requirements.

Ergonomics of human-system interaction —

Part 110: Dialogue principles

1 Scope

This part of ISO 9241 sets forth ergonomic design principles formulated in general terms (i.e. presented without reference to situations of use, application, environment or technology) and provides a framework for applying those principles to the analysis, design and evaluation of interactive systems.

While this part of ISO 9241 is applicable to all types of interactive systems, it does not cover the specifics of every context of use (e.g. safety critical systems, collaborative work).

It is intended for the following types of users:

- designers of user interface development tools and style guides to be used by user interface designers;
- user interface designers, who will apply the guidance during the development process;
- developers, who will apply the guidance during design and implementation of system functionality;
- buyers, who will reference this part of ISO 9241 during product procurement;
- evaluators, who are responsible for ensuring that products meet its recommendations.

This part of ISO 9241 focuses on dialogue principles related to the ergonomic design of the dialogue between user and interactive system, and does not consider any other aspect of design such as marketing, aesthetics or corporate design.

The list of recommendations for each of the dialogue principles is not exhaustive.

2 Normative references

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

ISO 9241-11:1998, *Ergonomics — Ergonomic requirements for office work with visual display terminals (VDTs) — Part 11: Guidance on usability*

ISO 9241-12, *Ergonomics — Ergonomic requirements for office work with visual display terminals (VDTs) — Part 12: Presentation of information*

ISO 9241-13, *Ergonomics — Ergonomic requirements for office work with visual display terminals (VDTs) — Part 13: User guidance*

ISO 9241-14, *Ergonomics — Ergonomic requirements for office work with visual display terminals (VDTs) — Part 14: Menu dialogues*

ISO 9241-15, *Ergonomics — Ergonomic requirements for office work with visual display terminals (VDTs) — Part 15: Command dialogues*

ISO 9241-16, *Ergonomics — Ergonomic requirements for office work with visual display terminals (VDTs) — Part 16: Direct manipulation dialogues*

ISO 9241-17, *Ergonomics — Ergonomic requirements for office work with visual display terminals (VDTs) — Part 17: Form filling dialogues*

3 Terms and definitions

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

3.1 context of use

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

[ISO 9241-11:1998, 3.5]

3.2 dialogue

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

NOTE 1 User actions include not only entry of data but also navigational actions of the user.

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

3.3 dialogue principles

set of general goals for the design of dialogues

NOTE Dialogue principles are not bound to any specific technology or technique.

3.4 dialogue requirement

characteristic of a dialogue which satisfies user needs within the identified context(s) of use

3.5 goal

intended outcome

[ISO 9241-11:1998, 3.8]

3.6 interactive system

combination of hardware and software components that receive input from, and communicate output to, a human user in order to support his or her performance of a task

[ISO 13407:1999, 2.1]

NOTE 1 The term “system” is often used rather than “interactive system”.

NOTE 2 The term “interactive system” is not to be confused with the term “work system” as used in ISO 9241-11.

3.7**task**

activities required to achieve a goal

[ISO 9241-11:1998, 3.9]

NOTE The term “task” is used here, as in ISO 9241-11, in its widest sense, rather than in reference to the specifics of use of the dialogue system.

3.8**user**

person who interacts with the interactive system

NOTE Adapted from ISO 9241-11:1998, 3.7.

3.9**user interface**

all components of an interactive system (software or hardware) that provide information and controls for the user to accomplish specific tasks with the interactive system

4 Dialogue principles and recommendations**4.1 Overview**

This clause presents the dialogue principles and gives recommendations illustrating the individual dialogue principles.

Seven principles have been identified as being important for the design and evaluation of interactive systems, which serve as a set of general goals for the design and evaluation of dialogues:

- suitability for the task;
- self-descriptiveness;
- conformity with user expectations;
- suitability for learning;
- controllability;
- error tolerance;
- suitability for individualization.

NOTE The order in which the principles are presented here does not imply any priority.

For each of the principles, this part of ISO 9241 provides a non-exhaustive list of illustrative recommendations at various levels of detail. Dialogues designed in accordance with these recommendations will help prevent users experiencing typical usability problems.

The set of dialogue principles presented in this part of ISO 9241 represents a particular way of identifying key impacts on usability for the design of interactive systems. This part of ISO 9241 does not preclude that there might be different ways of identifying those key aspects, thus leading to different sets of principles. The dialogue principles and the related recommendations within this part of ISO 9241-110 are not intended to be interpreted as a set of prescriptive guidelines that allow the direct specification of a design solution by themselves.

The recommendations given in 4.3 to 4.9 are each accompanied by an example placed in a specific context of use.

The recommendations given in this part of ISO 9241 will help in the identification and specification of dialogue requirements relevant to specific contexts of use. This part of ISO 9241 is not intended to be a detailed dialogue-requirements specification or design specification for interactive systems.

The recommendations are applied within the specific context of use which serves as the primary source of information that determines whether a recommendation applies or not. Not every recommendation within this part of ISO 9241 is applicable in every context of use. If the context of use does not imply user needs that correspond to one or more recommendations of this part of ISO 9241, then those recommendations do not apply within this particular context of use. The application of a single recommendation does not necessarily mean that the application of a principle has been fully satisfied.

A framework for the development of dialogue requirements that serve as the foundation for design of specific design solutions is presented in Clause 5.

4.2 Relationships between dialogue principles

The dialogue principles are not strictly independent and can semantically overlap. It may be necessary to achieve a “trade-off” between principles in order to optimize usability. The applicability and the priority given to each principle will vary with the specific field of application, user groups and the dialogue technique chosen. This implies taking into account the following aspects:

- goals of the organization;
 - needs of the intended (end) user group;
 - tasks to be supported;
 - available technologies and resources.
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The relevance and relative importance of each principle is determined by the particular context of use. Each of the principles needs to be considered in analysis, design and evaluation; however, principles might vary in their relative importance depending on the context of use and other design requirements. In practice, within design situations for an interactive system, compromises will be made.

EXAMPLE 1 Design for controllability is not independent from design for error tolerance or ease of learning.

EXAMPLE 2 A conflict between controllability and error tolerance can arise when using an e-mail client. Security functions of the e-mail client are less controllable when using automatic settings. If the user is allowed to control specific security functions (increasing controllability), error tolerance is decreased because it is difficult to prevent the user from making settings that have unintended consequences.

4.3 Suitability for the task

An interactive system is suitable for the task when it supports the user in the completion of the task, i.e. when the functionality and the dialogue are based on the task characteristics (rather than the technology chosen to perform the task).

4.3.1 The dialogue should present the user with information related to the successful completion of the task.

NOTE The needs of the task determine the required quality, quantity and type of information to be presented.

EXAMPLE 1 In a context where the processing of some of the incoming correspondence is time-critical, the dialogue system displays relevant deadlines related to each item.

EXAMPLE 2 In the context of an online shop, the dialogue system offers context-sensitive help that describes the steps needed to complete an order.

4.3.2 The dialogue should avoid presenting the user with information not needed for the successful completion of relevant tasks.

NOTE The presentation of inappropriate information could lead to decreased task performance and unnecessary mental workload.

EXAMPLE In a context where travellers want to book a hotel room for a specific date, the dialogue system displays only hotels with available rooms for this specific date. Information about other hotels in the area that are booked out, or additional information about travelling, such as sightseeing spots, is only displayed on request.

4.3.3 The format of input and output should be appropriate to the task.

EXAMPLE 1 A currency conversion application designed for travellers converting currencies displays converted amounts with a precision that is suitable for the target currency (e.g. two decimal digits for most European currencies).

EXAMPLE 2 A dialogue which is purely intended for a domestic market states this clearly to the user.

4.3.4 If typical input values are required for a task, these values should be available to the user automatically as defaults.

EXAMPLE 1 In a ticket machine at a railway station, where it has been determined that railway travellers typically buy railway tickets from the station they start their journey from, the station of departure is preselected at the start of the dialogue.

EXAMPLE 2 Within a business application, once the user has identified him or herself to the system based on user name and password, the system automatically makes the e-mail address of the user available for processing wherever required in the dialogue.

4.3.5 The steps required by the dialogue should be appropriate to the completion of the task, i.e. necessary steps should be included and unnecessary steps should be avoided.

NOTE 1 Unnecessary steps include actions that can be more appropriately done automatically by the system.

NOTE 2 The dialogue can offer additional support to the user when performing recurrent tasks/steps in order to minimize task steps.

EXAMPLE 1 A mobile phone for business users who often access messages on their answering machine (mail box), provides a dedicated option at the top level for this task in order to avoid unnecessary dialogue steps.

EXAMPLE 2 A software package for business contact management which contains input fields for both postcode (zip code) and city, automatically displays the city based on the input of the postal code and vice versa in order to avoid unnecessary dialogue steps.

EXAMPLE 3 A dialogue which is open for both domestic and international users does not demand data that are only relevant for the domestic market.

4.3.6 When a task involves source documents, the user interface should be compatible with the characteristics of the source document.

NOTE This recommendation is not intended to prohibit improvements of source documents to make them better suited for the task.

EXAMPLE Within an insurance company, a paper document is used as the source for computer input. The form-filling dialogue screen is designed to be consistent with the structure of the paper source document in terms of item ordering, grouping and units for input values.

4.3.7 The channels for inputs and outputs offered by the dialogue system should be appropriate to the task.

EXAMPLE In a computer aided design (CAD) application where the user's hands are used for positioning the pointer, simple actions can be activated by voice commands.

4.4 Self-descriptiveness

A dialogue is self-descriptive to the extent that, at any time, it is obvious to the users which dialogue they are in, where they are within the dialogue, which actions can be taken and how they can be performed.

NOTE This principle relates to the characteristics of presented information in ISO 9241-12.

4.4.1 The information presented to the user at any step of a dialogue should guide the user in completing the dialogue.

NOTE Information includes guidance, feedback, status information, etc.

EXAMPLE A hotel reservation system permits the user to enter the needed data and uses a [Next] button and a [Back] button to be guided through the steps of the dialogue.

4.4.2 During the interaction, the need to consult user manuals and other external information should be minimized.

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 A software package offers a set of menu items, the titles of which explicitly reflect the typical user tasks supported by the software package.

4.4.3 The user should be kept informed about changes in the status of the interactive system, such as

— when input is expected,

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— by provision of an overview of upcoming steps in the dialogue.

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EXAMPLE 1 An office phone with answering machine and call-forwarding facility clearly indicates whether or not the answering machine or “call forwarding” is active.

EXAMPLE 2 An e-commerce application explicitly displays to the user all required steps which need to be completed for purchasing a product. The dialogue always clearly indicates to the user which step he/she is currently in.

4.4.4 When input is requested, the interactive system should provide information to the user about the expected input.

EXAMPLE Within an e-commerce application, an entry field for the expiration date of a credit card displays the expected format as “dd/mm/yyyy”.

4.4.5 Dialogues should be designed so that the interaction with the interactive system is apparent to the user.

EXAMPLE A software package for playing DVDs on a computer provides controls with icons picturing the established buttons for “play”, “stop”, “pause”, “fast forward”, etc.

4.4.6 The interactive system should provide the user with information on required formats and units.

EXAMPLE A stationary purchase system displays the unit of goods (1 000 sheets of paper possibly representing one unit) that can be ordered to clearly indicate the total amount to be ordered.

4.5 Conformity with user expectations

A dialogue conforms with user expectations if it corresponds to predictable contextual needs of the user and to commonly accepted conventions.

NOTE 1 Conforming to existing conventions is only one aspect of conformity with user expectations.

NOTE 2 Consistency generally increases the predictability of the dialogue.