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**Ergonomic requirements for office work  
with visual display terminals (VDTs) —**

**Part 10:**  
Dialogue principles

*Exigences ergonomiques pour travail de bureau avec terminaux à écrans  
de visualisation (TEV) —*

*Partie 10: 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.

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.

International Standard ISO 9241-10 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

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

- Part 1: *General*
- Part 2: *Guidance on task requirements*
- Part 3: *Visual display requirements*
- Part 4: *Keyboard requirements*
- Part 5: *Workplace requirements*
- Part 6: *Environmental requirements*
- Part 7: *Display requirements with reflections*
- Part 8: *Requirements for displayed colours*
- Part 9: *Requirements for non-keyboard input devices*
- Part 10: *Dialogue principles*
- 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*

Annex A of this part of ISO 9241 is for information only.

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## Introduction

This part of ISO 9241 deals with ergonomic design of software for visual display terminals (VDTs) and describes general ergonomic principles which are independent of any specific dialogue technique, but should be applied in accordance with ISO 9241.

When specifying, developing or evaluating dialogue systems, these principles can be applied, but as general guidelines only. The manner in which each dialogue principle can be applied 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 will be found in Parts 14 to 17 of ISO 9241.

The ultimate beneficiary of the standard will be the end user at the VDT. It is the needs of this user that provide the ergonomic requirements used by the International Standards developers. Although it is unlikely that the end user will read the standard or even know of its existence, its application should provide user interfaces that are more usable, consistent and that enable greater productivity.

This part of ISO 9241 contains one informative annex that lists the sources used during its development.

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# Ergonomic requirements for office work with visual display terminals (VDTs) —

## Part 10: Dialogue principles

### 1 Scope

This part of ISO 9241 provides ergonomic principles formulated in general terms, i.e. they are presented without reference to situations of use, application, environment or technology. These principles are intended to be used in specifications, design and evaluation of dialogues for visual display terminals (VDTs).

### 2 Definitions

For the purposes of this part of ISO 9241, the following definitions apply.

**2.1 dialogue:** Interaction between a user and a system to achieve a particular goal.

**2.2 user:** Individual interacting with the system.

### 3 Dialogue principles

#### 3.1 General

The following seven principles have been identified to be important for the design and evaluation of a VDT dialogue:

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

- suitability for individualization;
- suitability for learning.

The dialogue principles are presented in 3.2 to 3.8, together with a short description and typical applications followed by examples. The examples illustrate possible implementations. Applications and examples are chosen for clarification and are not exhaustive.

### 3.1.1 User characteristics

The dialogue principles should be applied taking into consideration user characteristics such as:

- attention span;
- limits of short-term memory;
- learning behaviour;
- level of work and system experience;
- the user's internalized view of the underlying structure and purpose of the system with which the user will interact.

### 3.1.2 Task characteristics

The performance of a task at hand is enabled by the system's dialogue features. The effectiveness and efficiency of the performance can be improved if the requirements of task performance have been satisfied.

### 3.1.3 Relationship between the principles

The dialogue principles are not independent, and it may be necessary to trade off the benefits of one principle against others. The applicability and the relative importance 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.

It may be necessary to establish priorities on a case-by-case basis when applying the principles.

### 3.2 Suitability for the task

A dialogue is suitable for a task when it supports the user in the effective and efficient completion of the task.

| <b>Application:</b>  | <b>Examples include:</b>  |
|--|---|
| The dialogue should present the user only with information related to the completion of the task.  | Formatting information such as colour, and information such as current day, date, etc. are presented only if they facilitate completion of the task.  |
| Help information should be task-dependent.   | When the user requests help, the dialogue system presents information relevant to the current task (e.g. list of editing commands if in editing state). When a particular dialogue box is displayed and the user requests help, the interface software presents information relevant to that dialogue box.  |
| Any actions that can appropriately be allocated to the interface software for automatic execution should be carried out by the software without user involvement.  | The cursor is automatically positioned at the first entry field relevant for the task.<br>System startup procedures are automatically processed.  |
| When designing the dialogue, consideration should be given to the complexity of the task with respect to the user's skills and abilities.  | In a public access system, where there is a set of alternative inputs, a menu is used to present the possible choices.  |
| The format of input and output should be appropriate to the given task and user requirements.  | Input screens are structured so that all of the data to be obtained from a single source are together, and these items are ordered and formatted in the same way as in the data source, regardless of whether or not the underlying system will use the data in that order or format.<br>The precision of input is equal to the precision required by the task. |
| The dialogue should support the user when performing recurrent tasks.  | The dialogue system allows sequences of activities to be saved and allows the user to reuse them (e.g. usage of macros).  |
| If default input capabilities exist for a given task (e.g. standard default values), it should not be necessary for the user to input such values. It should also be possible to replace default values by other values or other appropriate default values. | If the current date is required by the task, it need not be typed in, but can be modified by the user.  |
| During performance of a task in which data are changed, the original data should remain accessible if the task requires this.  | By pressing the [Esc] key, the contents of an entry field revert to the state before the field was edited.  |
| The dialogue should avoid forcing unnecessary task steps.  | The user is able to save a document and exit in a single step.  |

### 3.3 Self-descriptiveness

A dialogue is self-descriptive when each dialogue step is immediately comprehensible through feedback from the system or is explained to the user on request.

| Application:   | Examples include:   |
|--|---|
| <p>After any user action, the dialogue should provide feedback where appropriate. If severe consequences may result from the user action, the system should provide explanation and request confirmation before carrying out the action.</p> | <p>Echoing of keying activity together with modification status of data are necessary to help the user in understanding what happens in the application and what the user can control. If the dialogue can be reversed, the application indicates this by giving explicit information on what can be reversed.</p> <p>If a deletion cannot be reversed, the dialogue system asks for confirmation.</p>                                  |
| <p>Feedback or explanations should be presented in a consistent terminology which is derived from the task environment rather than from dialogue system technology.</p>  | <p>The technical terms used in the dialogue are those actually used in the specific field of application. In addition, the user can have a term explained by inputting the relevant keyword. Thus, following input of the term "change of scale", the user is provided with an explanation of the task involved, reference also being made to the relevant program and to supplementary information to be found in the user manual.</p> |
| <p>Feedback or explanations should assist the user in gaining a general understanding of the dialogue system as a possible supplement to user training.</p>  | <p>During the saving of a file, a message "Data being saved to file... please wait" is displayed.</p>   |
| <p>Feedback or explanations should be based on the level of knowledge which the typical user may be expected to have.</p>  | <p>A clerical user receives a definition in terms of the data entry task, while a technical user receives information in terms of the technical context of the system.</p>  |
| <p>Feedback or explanations varying in type and length, based on user needs and characteristics, should be available to the user.</p>  | <p>By pressing the "Help" key once, the user obtains a brief explanation; by pressing twice, a detailed explanation of the command concerned is received.</p> <p>The user can choose between an explanation given in general terms and one in the form of an example.</p>   |
| <p>To enhance their value for the user, feedback or explanations should strictly relate to the situation for which they are needed.</p>  | <p>The dialogue system offers help which is sensitive to the context of the current activity.</p>   |
| <p>The quality of feedback or explanations should minimize the need to consult user manuals and other external information, thus avoiding frequent media switches.</p>   |   |
| <p>If defaults exist for a given task, they should be made available to the user.</p>  | <p>Display of current date is provided in a form-filling dialogue.</p> <p>The interface software presents a list of valid alternatives that can be entered into a field.</p>  |

| <b>Application:</b>   | <b>Examples include:</b>   |
|---|--|
| <p>The user should be informed about changes in the dialogue system status that are relevant to the task.</p>   | <p>Insight regarding the current dialogue status is achieved by showing the user performance situations such as:</p> <ul style="list-style-type: none"> <li>— when input is expected;</li> <li>— command currently being processed;</li> <li>— overview of future steps in interaction, including possible user response alternatives;</li> <li>— history of interaction.</li> </ul> |
| <p>When input is requested, the dialogue system should give information to the user about the expected input.</p>   | <p>The dialogue system requests input by presenting a field name together with information on data type (e.g. date, numbers, flag) and the input format (e.g. yy.mm.dd).</p>   |
| <p>Messages should be formulated and presented in a comprehensible, objective and constructive style and in a consistent structure. Messages should not contain any value judgements, such as "This input is nonsense".</p> | <p>Message reads: "For date of birth, please use the following format: YY/MM/DD".</p>  |

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### 3.4 Controllability

A dialogue is controllable when the user is able to initiate and control the direction and pace of the interaction until the point at which the goal has been met.

| <b>Application:</b>  | <b>Examples include:</b>   |
|--|--|
| The speed of interaction should not be dictated by the operation of the system. It should always be under the control of the user according to the user's needs and characteristics. | No input field is erased, replaced or otherwise made unavailable to the user until the user signals completion of data entry, such as by pressing the ENTER key.   |
| The dialogues should give the user control over how to continue with the dialogue.   | The dialogue system positions the cursor to the next input field, but offers the user the possibility to select a different field instead.   |
| If the dialogue has been interrupted, the user should have the ability to determine the point of restart when the dialogue is resumed, if the task permits.                          | It is possible for the user to decide after an interruption (e.g. on the basis of interim results) whether the dialogue should be continued from the point of interruption, whether some interaction activities should be reversed, or whether the whole dialogue should be cancelled with the possibility of defining certain conditions for restarting the dialogue. |
| If interactions are reversible and the task permits, it should be possible to undo at least the last dialogue step.  | The dialogue system offers the possibility to access deleted objects.  |
| Different user needs and characteristics require different levels and methods of interaction.  | Menus for new users and accelerators for experienced users.<br>Different levels of detail in help, which correspond to different levels of expertise.  |
| The way that input/output data are represented (format and type) should be under the control of the user.  | The system offers the possibility to switch between textual and iconic presentation of a list of files.  |
| If control of the amount of data displayed is of use for a particular task, the user should be able to exercise such control.  | A form to be filled in is distributed over several pages of the display. The task permits the user to choose between the display pages to suit the work situation.<br>The user receiving an output that is not required is able to stop the output.  |
| Where alternative input/output devices exist, the user should have the option of which one to use.   | The user has the choice between mouse and keyboard input.<br>The dialogue system offers the possibility to select between several printers.  |

### 3.5 Conformity with user expectations

A dialogue conforms with user expectations when it is consistent and corresponds to the user characteristics, such as task knowledge, education and experience, and to commonly accepted conventions.

| Application:   | Examples include:  |
|--|--|
| Dialogue behaviour and appearance within a dialogue system should be consistent.   | System status messages always appear on the same line.<br><br>The same key is always used to terminate the dialogue.   |
| State-change actions should be implemented consistently.   | The F1-key is always used to get help.   |
| The application should use the vocabulary which is familiar to the user in the performance of the task.  | The technical terms used in the dialogue are those actually used in the context of the user task.  |
| Dialogues used for similar tasks should be similar, so that the user can develop common task-solving procedures.                                   | To activate an application in a system using a number of different applications, the user is always required to double-click on the corresponding icon to open it.<br><br>Users move all moveable windows by dragging a pre-specified area near the top of the window.<br><br>In a command dialogue, a standard structure for all commands, including common syntax rules, is maintained and wherever possible uses a consistent set of names. |
| Immediate feedback on user input should be given where appropriate to user expectations. It should be based on the level of knowledge of the user. | The dialogue system moves the cursor immediately following the movement action of the associated input device.   |
| The cursor should be where the input is wanted.  | The dialogue system moves the cursor automatically to the position where the user expects to make the next input.  |
| If a response time is likely to deviate considerably from the expected response time, the user should be informed of this.                         | The user receives the message: "Please wait: your data is being processed", or a graphical wait indication is provided, e.g. hourglass.<br><br>Prior to starting a dialogue, the user is able to gain an overall picture of the current status of the dialogue system. The user is informed of dialogue system downtime, availability and other relevant characteristics.  |

### 3.6 Error tolerance

A dialogue is error-tolerant if, despite evident errors in input, the intended result may be achieved with either no or minimal corrective action by the user.

| Application:   | Examples include:   |
|--|---|
| The application should assist the user in detecting and avoiding errors in input.  | If a sequence of actions is required, the interface software is designed such that the next step in any sequence can be determined from the information displayed; e.g. in form-fill dialogues, labels are clearly visible in the next field to be filled in. |
| The dialogue system should prevent any user input from causing undefined dialogue system states or dialogue system failures.   | The interface software checks for numerical input if only numbers are allowed.  |
| Errors should be explained to help the user to correct them.   | The dialogue system presents an error message containing information on error occurrence, type of error and possible methods of correction to the extent the dialogue system is able to define.   |
| Depending on the task, it may be desirable to apply special effort in presentation techniques to improve the recognition of error situations and their subsequent recovery.                        | The dialogue system discovers an error which clearly relates to a particular data field. This field is marked and the cursor positioned automatically at the start of the field.  |
| In cases where the dialogue system is able to correct errors automatically, it should advise the user of the execution of the corrections and provide the opportunity to override the corrections. | Acceptable inputs are displayed.  |
| In cases where the dialogue system is able to correct errors automatically, it should advise the user of the execution of the corrections and provide the opportunity to override the corrections. | In a spell-check facility, an error message is offered for a word that is misspelled. Alternatives for corrections are provided on request.   |
| User needs and characteristics may require that error situations are deferred, leaving the decision to the user as to when to handle it.   | When a letter is being written on a word-processing dialogue system equipped with a spelling-aid function, corrections will not be suggested until the user requests them.  |
| It is desirable to provide additional explanations during error correction on request.   | A dialogue box, giving information about an error, contains a button offering the user more information.  |
| Validation/verification of data should take place before attempting to process the input.  | A list of items to be deleted is displayed in advance. Actual deletion takes place on confirmation.   |
| Additional controls should be provided for commands with serious consequences.   |   |
| Error correction should be possible without switching dialogue-system states, where the task permits.  | When making an entry into a form, the user can type over incorrect characters without going to an editing mode.   |

### 3.7 Suitability for individualization

A dialogue is capable of individualization when the interface software can be modified to suit the task needs, individual preferences and skills of the user.

NOTE 1 Although in many cases providing users with customization capabilities is very desirable, it is not an acceptable substitute for ergonomically designed dialogues. In addition, customization capability should only be provided within certain limits, such that modifications cannot cause users any potential discomfort (e.g. unacceptable noise levels with user-configured auditory feedback).

| Application:  | Examples include:  |
|---|--|
| Mechanisms should be provided to allow the dialogue system to be adapted to the user's language and culture, individual knowledge and experience of task domain, perceptual, sensory-motor and cognitive abilities.                 | Increased font size for partially-sighted users, correct use of colour for users with colour perception defects, different assignment of keys for different cultures.<br><br>The mouse can be adapted for left- or right-hand usage. |
| The dialogue system should allow the user to choose from alternative forms of representation according to individual preference and to the complexity of the information to be processed.   | The user can change the presentation and/or format of output according to personal preference.   |
| The amount of explanation (e.g. details in error messages, help information) should be modifiable according to the individual level of knowledge of the user.   | The user can change the level of detail for output depending on the situation (e.g. more detail while learning, medium detail for error feedback, minimum detail for status output).   |
| The user should be allowed to incorporate his/her own vocabulary to establish individual naming for objects and actions if it suits the contexts and tasks. It should also be possible for the user to add individualized commands. | The user can record typing sequences and even program function keys in order to simplify the execution of a sequence of repeated commands.   |
| The user should be able to set up operational time parameters to match his/her individual need.   | The dialogue system allows the user to control the speed of the scrolling information output.  |
| Users should be able to choose between different dialogue techniques for different tasks.   | The dialogue system allows the user to start a dialogue function by either entering a command or selecting a menu option.  |

### 3.8 Suitability for learning

A dialogue is suitable for learning when it supports and guides the user in learning to use the system.

| Application:   | Examples include:  |
|--|--|
| <p>Rules and underlying concepts which are useful for learning should be made available to the user, thus allowing the user to build up his/her own grouping strategies and rules for memorizing activities.</p> | <p>The user is able to obtain information on the model on which the application is based.</p> <p>Accelerator key combinations use, where possible, the first letter of the menu commands to which they correspond, and this is clearly shown on the menu.</p>  |
| <p>Relevant learning strategies (e.g. comprehension-oriented, learning by doing, learning by example) should be provided.</p>  | <p>The user can always switch back and forth between overview help information and learning-by-example feedback (e.g. the user can ask for an overview of the overall structure of a database system. Thereafter the user can then ask for an explanation of a certain function and can execute this function in a "what-if" manner).</p> <p>Learning by doing is supported by encouraging the user to experiment, walk through examples during various situations, applying "what-if" alternatives (e.g. allowing error correction without the danger of causing potentially catastrophic results).</p> <p>Interactive online tutorials support the learning-by-doing method.</p> |
| <p>Relearning facilities should be supported.</p>  | <p>Attention is given to the frequency of command usage. Frequently-used commands offer the user shortcuts and defaults. Seldom-used commands are more self-explanatory in their design and accompanied by more guiding information.</p>   |
| <p>A number of different means to help the user to become familiar with the dialogue elements should be provided.</p>  | <p>Standard locations are used for same type of message.</p> <p>Similar layout of screen elements are used for similar task objectives.</p>  |