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

Part 15:
Command dialogues

Exigences ergonomiques pour travail de bureau avec terminaux à écrans de visualisation (TEV)
Partie 15 : Dialogues de type langage de commande

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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 9241-15 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee 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 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: Environmental requirements*

— *Part 7: Requirements for display 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*

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—   *Part 14: Menu dialogues*

—   *Part 15: Command dialogues*

—   *Part 16: Direct manipulation dialogues*

—   *Part 17: Form-filling dialogues*

Annexes A and B of this part of ISO 9241 are for information only.

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Introduction

ISO 9241 covers both the hardware and software ergonomic aspects of the use of visual display terminals. The description of the individual parts of ISO 9241, their interrelationships, and a description of the expected users of the parts is described in ISO 9241-1.

ISO 9241-15 is concerned with the ergonomic design of command dialogues. In command dialogues, users input, by recall, either complete or abbreviated command phrases as required by the command language syntax, and the computer performs the actions associated with the commands and their parameters.

ISO 9241-15 serves the following types of user of this part of ISO 9241:

a) The user-interface designer, who will apply ISO 9241-15 during the development process.

b) The buyer, who will reference ISO 9241-15 during the product procurement process.

c) Evaluators, responsible for ensuring that products meet the recommendations in ISO 9241-15.

d) Designers of user-interface development tools to be used by interface designers.

e) End-users who will gain from the potential benefits provided by this part of ISO 9241.

The ultimate beneficiary of this part of ISO 9241 will be the end-user at the VDT. It is the needs of these users that provide the ergonomic recommendations in ISO 9241-15. Although it is unlikely that the end-user will read this part of ISO 9241 or even know of its existence, its application should provide user interfaces that are more usable, consistent and that enable greater productivity.

In order to apply ISO 9241-15 within the overall context of the ergonomic requirements for human-system interaction, it is suggested that users be familiar with the following parts of 9241:

ISO 9241-1   *Ergonomic requirements for office work with visual display terminals (VDTs) - Part 1: General introduction*

ISO 9241-2   *Ergonomic requirements for office work with visual display terminals (VDTs) - Part 2: Guidance on task requirements*

ISO 9241-10   *Ergonomic requirements for office work with visual display terminals (VDTs) - Part 10: Dialogue principles*

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

ISO 9241-15 consists of a number of recommendations, some of which are
conditional, concerning command dialogues. Conditional recommendations
are recommendations which should be met within the specific context for
which they are relevant (e.g. particular kinds of users, tasks, environments,
technology). These recommendations were developed primarily by reviewing
the existing relevant literature and empirical evidence, then generalizing and
formulating this work into recommendations for use by the interface designer
and/or evaluator. Sources for the individual recommendations are listed in
Annex B.

Designers and evaluators using ISO 9241-15 need to know that they are
developing an interface that will meet the recommendations provided therein.
Likewise, the buyer needs a means to determine how a product matches the
recommendations in ISO 9241-15. The elements can be tailored due to the
"if - then" structure in ISO 9241-15. Additionally, it is not the intent of
ISO 9241-15 that every recommendation should be applied, only those that
are relevant.

The application of this part of ISO 9241 is expected to improve the overall
quality of the command language, but ISO 9241-15 (like any other standard)
will not guarantee the quality of the interface. Quality depends on specific
usability criteria as set by the user, buyer or other command-dialogue
consumer which may include specifications based on this part of ISO 9241.

It should be noted that ISO 9241-10 describes dialogue principles that are
relevant for the design of command dialogues. These principles should
provide the designer and evaluator with additional information concerning the
ergonomic rationale for the various recommendations in ISO 9241-15 and,
therefore, assist in making tradeoffs. However, it may be necessary to base
tradeoffs on other considerations as well.

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

Part 15:
Command dialogues

1 Scope

This part of ISO 9241 provides recommendations for command dialogues used to accomplish typical office tasks using visual display terminals (VDTs). Command dialogues are sequences of instructions provided by the user to the system which, when processed, result in associated system actions. Users input (from recall, rather than selecting from a menu) complete or abbreviated command phrases (e.g. mnemonics, letters, function keys, hot keys in the order required by the command language syntax and the computer performs the activities initiated by the command(s) and their associated parameters.

Interface design depends upon the task, the user, the environment, and the available technology. Consequently, ISO 9241-15 cannot be applied without a knowledge of the design and use context of the interface and it is not intended to be used as a prescriptive set of rules to be applied in their entirety. Rather, it assumes that the designer has proper information available concerning task and user requirements and understands the use of available technology (this may require consultation with a qualified ergonomics professional as well as empirical testing with real users).

ISO 9241-15 applies to the use of command dialogues, either in conjunction with other dialogues (e.g. menus, direct manipulation) or as the primary dialogue technique (e.g. in the case of "dumb terminals" or where high speed is required in a particular application). In addition, this part of ISO 9241 provides recommendations for those "key" commands (i.e. function keys and hot keys) which represent commands within a command dialogue. If the command functions are evident from the nature of their representation (e.g. pictorial icons) and invoking these functions does not require memory on the part of the user, this would not be considered a command dialogue according to ISO 9241-15. Commands can be accessed through other dialogue techniques (e.g. menu options, forms, direct manipulation). However, these methods do not require recall on the part of the user and will be excluded from this part of the standard and will be dealt with in other parts. It also should be noted that ISO 9241-15 does not provide guidance for dialogues which use "natural" language.

2 Definitions

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

2.1 argument

Independent variable (including object) used in a command phrase to modify or direct the action of a command.

NOTE   Arguments often include parameters.

2.2 command

Whole word, abbreviation, or string of words representing actions requested of the system.

2.3 command dialogue; command language

Command set(s), phrases, structure and syntax associated with a specific interaction of a user with a computer system by means of commands.

2.4 command dialogue structure

Logical structure of the command dialogue (and associated phrases).

2.5 command queuing (stacking)

Accumulation of a series of command phrases in order to allow their input into the system as a group rather than require that they be entered and executed one at a time.

2.6 command phrase

Phrase including the command (words or their abbreviations) and associated separators and arguments (parameters).

EXAMPLE: [Command word] [separator] [argument1] [separator] [argument2] [terminator]

2.7 command set

All of the commands available to the user to perform a given task in a particular application context.

2.8 command syntax

Sequential and other procedural requirements for inputting the components into command phrases.

2.9 command word (name)

Word (or name) used as a command in the command dialogue and representing actions requested from the system.

2.10 command word abbreviation

Shortened version of a command word which is recognizable by the computer as representing the command.

NOTE Such abbreviations may be single or multiple letters of the command word.

2.11 hot keys

Keys, other than numbered function keys (i.e. F1, F2, etc.), not normally used for data entry such as modifier keys (e.g. Ctrl, Alt), or key combinations (e.g. Ctrl/c) which execute immediately without the need for any additional operations.

2.12 keyword

Word in a command phrase identifying a particular argument class (e.g. type font).

2.13 modifier

Argument that alters or limits the action of a command.

2.14 parameter

Value used in conjunction with a keyword to modify the action of a command or argument.

2.15 separator

String of one or more characters, or a pause (for voice), used to separate or organize elements in the command phrase and between command phrases.

3 Application of ISO 9241-15

3.1 Design of command dialogue

In a command dialogue, the command phrase is entered by the user in the specific syntactic arrangement "understood" by the computer. The computer acknowledges receiving the command, indicates whether it is an acceptable command for the current processing state, indicates whether the associated parameters are appropriate for both the command and the current processing state, and if so, performs the requested activities and/or provides the requested outputs. Command phrases may be entered into the computer in a number of different ways, e.g. by means of a "command line", a dialogue box, or by voice input.

Commands may be:

a) Whole words, or strings of words, separated by blanks (pauses, in the case of voice input) or other delimiters, indicating syntax to the computer.

b) Single or multiple letter abbreviations.

Dialogue design determines the way in which a user is guided by the system to make inputs and influences the amount of control the user has over the dialogue. Command dialogues should be designed to support the user in his/her actual work without being bothered by additional work caused by system peculiarities as well as enabling the user to become well-informed and to keep in control of the flow of work (see also ISO 9241-10). Such design goals have to be considered in designing command structure and syntax, command representations, command input and output specifications, and feedback and help mechanisms.

Application of ISO 9241-15 to design and evaluate a system or product requires that the person applying the standard has an understanding of the intended users, their environment and their tasks. User tasks should be listed and the most frequent and important tasks should be explicitly identified. In applying the recommendations, it also is important to consider general laws about human perception, identification and discrimination of information, and psychomotor skills involved in keying in commands.

3.2 Appropriateness of command dialogue

Command dialogues are especially appropriate for one or more of the following conditions, which have been grouped to reflect user and task issues. The applicability of command dialogues becomes greater as more conditions are met.

a) User characteristics

   1) Users have good typing skills (if users key in the commands).

   2) Users will use the system frequently.

   3) Users will receive training on using the command language.

   4) Users are familiar with computer technology and command languages.

b) Task characteristics

   1) It is not possible to predict the choices of actions that the user may require in the dialogue.

   2) Options and/or data may be entered in an arbitrary order.

   3) Rapid selection or access to specific system functions is required (in an airline reservation system for example).

   4) Extendibility (i.e. creation of new commands, or chains of commands, to suit new situations) is required.

3.3 Applying the recommendations

General ergonomic design objectives are provided in each major subclause of clauses 4 through 7. The individual recommendations aimed at achieving these objectives should be applied within the specific context for which they are relevant (e.g. particular kinds of users, tasks, environments, technology). The format for the individual recommendations is: statement of the recommendation, example (if appropriate), and notes (if appropriate). Examples provided for the various recommendations generally depict an implementation that embodies the recommendation. Some examples also indicate preferred solutions.

Individual recommendations should be evaluated for their applicability and, if judged to be applicable, should be implemented in the relevant command dialogue unless there is evidence that to do so would cause deviation from the design objectives or would result in an overall degradation in usability. When determining applicability, the recommendations generally should be evaluated in the order presented in the relevant clause or subclause. In judging whether applicable recommendations have been met, evaluators should evaluate the product or observe representative users of the product in the context of accomplishing the user's tasks via the command dialogue system. Sample procedures which support the determination of applicability and for judging whether a recommendation has been followed are provided in Annex A.

3.4 Evaluation of products

If a product is claimed to have met the applicable recommendations in ISO 9241-15, the procedure used in establishing requirements for, developing, and/or evaluating the command dialogue shall be specified. The level of specification of the procedure is a matter of negotiation between the involved parties.

Annex A provides a sample procedure that can be used to specify applicability and adherence to this part of ISO 9241. Users of this International Standard can either utilize the procedures provided in Annex A, or develop a comparable set of procedures tailored to their particular development and/or evaluation environment.

4 Structure and syntax

4.1 General

The command language should be designed such that users enter commands in a manner which is natural or familiar to the user without concern for how the computer will process the commands to produce the output (i.e. the command language should reflect the user's needs rather than the computer process and the syntax structure should be consistent with user expectations, task requirements and the input media).

4.2 Internal consistency

The command language should be internally consistent so commands with the same name, function in the same way throughout the application regardless of the context. Commands that do the same thing should have the same name.

NOTE   This does not exclude the use of synonyms where appropriate.

4.3 Command macros

If sequences of command words or command phrases are used frequently, users should be allowed to create and use higher level commands (macros) for these sequences.

NOTE   Macro commands should follow the same recommendations as commands.

4.4 Argument structures

Command phrases should be structured to minimize the complexity of arguments.

a) Long lists - If argument lists are long (more than 8 arguments), then additional command names should be created, functions should be combined under single arguments, or lists should be broken into some logical functional groupings.

Dependencies - Dependencies between arguments of a command should not dramatically change the meaning of the command phrase.

EXAMPLES: A dialogue uses:

Command "Quit - filename" to save data to the file named filename

Command "Cancel" to cancel without saving (instead of the more complex "Quit -c")

4.5   Syntax structure

a)   Appropriateness for modality - The syntax structure of the command phrases should be appropriate for the input modality (e.g. voice, typed input, gestures).

EXAMPLE: Voice input is used exclusively and the syntax is completely consistent with spoken language.

b)   Consistency within modality - Syntax should be consistent within a given modality.

EXAMPLE: For a screen-based command dialogue, the object follows the action (i.e., action - object syntax) throughout the application.

c)   Consistency across modalities - Syntax should be consistent across modalities as much as possible.

EXAMPLE: Voice is used as well as typed input for commands in an application and the syntax is object - action for both modalities.

4.6   Command separation

If the input of multiple commands is allowed, a simple and consistent method to separate commands should be used:

a)   Blanks - If system constraints do not require the use of a specific separator, blanks should be used rather than punctuation marks to separate commands.

b)   Standard symbol - If system constraints require a separator other than blanks to distinguish separate stacked commands, a simple standard symbol should be used consistently.

EXAMPLE: Using the slash (/) in the sequence of command words "SORT/FORMAT/PRINT".

4.7   Language correspondence

Command structure (semantics and syntax) should correspond to the terminology and data organization familiar or natural to the user.

EXAMPLE: The rules for natural language syntax (e.g. English, French) are applied in designing a query language.

4.8   Command arguments

Command arguments should be easy for the user to specify and to relate to the commands that they modify.

NOTE   In some cases, it may be appropriate to represent arguments as names rather than single letters.

4.8.1   Command element linkage

The command dialogue should be structured so that the relationship between the command phrase elements is clear.

EXAMPLE: Print pages=1-15 copies=2.

4.8.2   Argument formats

If appropriate to the task, keyword formats (parameters designated by argument identifiers that precede them) should be used rather than positional formats (parameters designated by their sequential position in the argument string following the command).

EXAMPLE 1 (Keyword format): change shape=round color=red size=4

EXAMPLE 2 (Positional format): change round red 4

4.8.3   Placement of optional argument

If keyword formats are not used, optional arguments should be placed at the end of the arguments list.

4.8.4 Separation of arguments

a) Blank space - If blanks are allowed, a variable number of blanks should be allowed between command elements.

b) Other separators - If system constraints require separators other than blanks to distinguish separate arguments, a simple standard symbol should be used consistently.

EXAMPLE: Using the comma (,) in the command phrase "print fileA,fileB,fileC".

4.9 Quantifiers

The use of imprecise or unnecessary quantifiers should be avoided in a command dialogue.

NOTE In query languages, "few" or "many" are imprecise and users tend not to understand what these terms mean.

5   Command representation

5.1 Command names

5.1.1 General

Command names should be easily related to their function, generally stated as verbs (usually in imperative form), be easily remembered by users, and be consistent with the user's task requirements, experience and language usage.

5.1.2 Distinctiveness

Command names should be distinctive.

a) Distinctive meaning - Command names should be semantically distinct and unambiguous.

EXAMPLE: In English, the words insert and delete are more semantically distinct than add and remove (i.e., add and remove typically have many different interpretations).

b) Specific meaning - Command names whose meanings are specific or constrained should be used rather than those that are more general.

EXAMPLE: Use replace rather than change.

c) Visual/auditory similarity - Command names should be avoided that look or sound similar but have different meanings.

EXAMPLE: In English, store and restore should be avoided because they have different meanings but sound similar.

d) Congruent command pairs - If command operations have inverses or counterparts, congruent pairs of commands for these operations should be provided.

EXAMPLE: read/write, open/close, yes/no.

5.1.3 User orientation

Command names should be chosen that are consistent with the user's experience and correspond to the user's operational language.

NOTE If there are multiple user groups, it may be important to provide different sets of command names for these different groups.

5.1.4 Emotional content

Words selected as command words should be emotionally neutral.

EXAMPLE: In English use "cancel" instead of "abort" and use "delete" rather than "kill".