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Ergonomics of human–system interaction —

Part 210: Human-centred design for interactive systems

Ergonomie de l'interaction homme–système —

*Partie 210: Conception centrée sur l'opérateur humain pour les
systèmes interactifs*



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ISO 9241-210:2010(E)**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 9241-210 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

This first edition of ISO 9241-210 cancels and replaces ISO 13407:1999, of which it constitutes a technical revision. The changes include the following:

- clarifying the role of iteration in the whole design process (not just evaluation);
- emphasizing that human-centred methods can be used throughout the system life cycle;
- explaining design activities;
- clarifying the principles of human-centred design.

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 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 technology (ICT) equipment and services*
- *Part 100: Introduction to standards related to software ergonomics [Technical Report]*
- *Part 110: Dialogue principles*
- *Part 151: Guidance on World Wide Web user interfaces*
- *Part 171: Guidance on software accessibility*
- *Part 210: Human-centred design for interactive systems*
- *Part 300: Introduction to electronic visual display requirements*
- *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 308: Surface-conduction electron-emitter displays (SED) [Technical Report]*
- *Part 309: Organic light-emitting diode (OLED) displays [Technical Report]*
- *Part 400: Principles and requirements for physical input devices*
- *Part 410: Design criteria for physical input devices*
- *Part 420: Selection procedures for physical input devices*
- *Part 910: Framework for tactile and haptic interaction*
- *Part 920: Guidance on tactile and haptic interactions*

The following parts are under preparation:

- *Part 129: Guidance on software individualization*
- *Part 143: Forms-based dialogues*
- *Part 310: Visibility, aesthetics and ergonomics of pixel defects [Technical Report]*

Design guidance for interactive voice response (IVR) applications and evaluation methods for the design of physical input devices are to form the subjects of future parts 154 and 411.

Introduction

Human-centred design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques. This approach enhances effectiveness and efficiency, improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance.

There is a substantial body of human factors/ergonomics and usability knowledge about how human-centred design can be organized and used effectively. This part of ISO 9241 aims to make this information available to help those responsible for managing hardware and software design and re-design processes to identify and plan effective and timely human-centred design activities.

The human-centred approach to design described in this part of ISO 9241 complements existing systems design approaches. It can be incorporated in approaches as diverse as object-oriented, waterfall and rapid application development.

The principles of human-centred design and the related activities have not changed substantially since ISO 13407 was produced and have been validated by ten years of application. This part of ISO 9241 reflects this by making requirements as well as recommendations.

Ergonomics of human–system interaction —

Part 210: Human-centred design for interactive systems

1 Scope

This part of ISO 9241 provides requirements and recommendations for human-centred design principles and activities throughout the life cycle of computer-based interactive systems. It is intended to be used by those managing design processes, and is concerned with ways in which both hardware and software components of interactive systems can enhance human–system interaction.

NOTE 1 Computer-based interactive systems vary in scale and complexity. Examples include off-the-shelf (shrink-wrap) software products, custom office systems, process control systems, automated banking systems, Web sites and applications, and consumer products such as vending machines, mobile phones and digital television. Throughout this part of ISO 9241, such systems are generally referred to as products, systems or services although, for simplicity, sometimes only one term is used.

This part of ISO 9241 provides an overview of human-centred design activities. 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 information in this part of ISO 9241 is intended for use by those responsible for planning and managing projects that design and develop interactive systems. It therefore addresses technical human factors and ergonomics issues only to the extent necessary to allow such individuals to understand their relevance and importance in the design process as a whole. It also provides a framework for human factors and usability professionals involved in human-centred design. Detailed human factors/ergonomics, usability and accessibility issues are dealt with more fully in a number of standards including other parts of ISO 9241 (see Annex A) and ISO 6385, which sets out the broad principles of ergonomics.

The requirements and recommendations in this part of ISO 9241 can benefit all parties involved in human-centred design and development. Annex B provides a checklist that can be used to support claims of conformance with this part of ISO 9241.

NOTE 2 Annex A and the Bibliography contain information about relevant related standards.

2 Terms and definitions

For this document, the following terms and definitions apply.

2.1

accessibility

⟨interactive systems⟩ usability of a product, service, environment or facility by people with the widest range of capabilities

[ISO 9241-171]

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2.2
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]

2.3
effectiveness
 accuracy and completeness with which users achieve specified goals

[ISO 9241-11:1998]

2.4
efficiency
 resources expended in relation to the accuracy and completeness with which users achieve goals

[ISO 9241-11:1998]

2.5
ergonomics
study of human factors
 scientific discipline concerned with the understanding of interactions among human and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance

[ISO 6385:2004]

2.6
goal
 intended outcome

[ISO 9241-11:1998]

2.7
human-centred design
 approach to systems design and development that aims to make interactive systems more usable by focusing on the use of the system and applying human factors/ergonomics and usability knowledge and techniques

NOTE 1 The term “human-centred design” is used rather than “user-centred design” in order to emphasize that this part of ISO 9241 also addresses impacts on a number of stakeholders, not just those typically considered as users. However, in practice, these terms are often used synonymously.

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

2.8
interactive system
 combination of hardware, software and/or services that receives input from, and communicates output to, users

NOTE This includes, where appropriate, packaging, branding, user documentation, on-line help, support and training.

2.9
prototype
 ⟨interactive system⟩ representation of all or part of an interactive system, that, although limited in some way, can be used for analysis, design and evaluation

NOTE A prototype may be as simple as a sketch or static mock-up or as complicated as a fully functioning interactive system with more or less complete functionality.

2.10**satisfaction**

freedom from discomfort and positive attitudes towards the use of the product

[ISO 9241-11:1998]

2.11**stakeholder**

individual or organization having a right, share, claim or interest in a system or in its possession of characteristics that meet their needs and expectations

[ISO/IEC 15288:2008]

2.12**task**

activities required to achieve a goal

[ISO 9241-11:1998]

2.13**usability**

extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

NOTE Adapted from ISO 9241-11:1998.

2.14**user**

person who interacts with the product

[ISO 9241-11:1998]

2.15**user experience**

person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service

NOTE 1 User experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use.

NOTE 2 User experience is a consequence of brand image, presentation, functionality, system performance, interactive behaviour and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use.

NOTE 3 Usability, when interpreted from the perspective of the users' personal goals, can include the kind of perceptual and emotional aspects typically associated with user experience. Usability criteria can be used to assess aspects of user experience.

2.16**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

[ISO 9241-110:2006]

ISO 9241-210:2010(E)**2.17****validation**

confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

[ISO 9000:2005]

NOTE Validation is the set of activities ensuring and gaining confidence that a system is able to accomplish its intended use, goals and objectives (i.e. meet stakeholder requirements) in the intended operational environment.

2.18**verification**

confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

[ISO 9000:2005]

NOTE Verification is a set of activities that compares a system or system element against the required characteristics. This can include, but is not limited to, specified requirements, design description and the system itself.

3 Rationale for adopting human-centred design

Using a human-centred approach to design and development has substantial economic and social benefits for users, employers and suppliers. Highly usable systems and products tend to be more successful both technically and commercially. In some areas, such as consumer products, purchasers will pay a premium for well-designed products and systems. Support and help-desk costs are reduced when users can understand and use products without additional assistance. In most countries, employers and suppliers have legal obligations to protect users from risks to their health, and safety and human-centred methods can reduce these risks (e.g. musculoskeletal risks). Systems designed using human-centred methods improve quality, for example, by:

- a) increasing the productivity of users and the operational efficiency of organizations;
- b) being easier to understand and use, thus reducing training and support costs;
- c) increasing usability for people with a wider range of capabilities and thus increasing accessibility;
- d) improving user experience;
- e) reducing discomfort and stress;
- f) providing a competitive advantage, for example by improving brand image;
- g) contributing towards sustainability objectives.

The complete benefits of human-centred design can be determined by taking into account the total life cycle costs of the product, system or service, including conception, design, implementation, support, use, maintenance and, finally, disposal. Taking a human-centred design approach contributes to other aspects of system design, for example, by improving the identification and definition of functional requirements. Taking a human-centred design approach also increases the likelihood of completing the project successfully, on time, and within budget. Using appropriate human-centred methods can reduce the risk of the product failing to meet stakeholder requirements or being rejected by its users.

Examples of outputs from human-centred design activities are illustrated in Table 1.

Table 1 — Examples of outputs from human-centred design activities

| Activities | Outputs from human-centred design |
|---|--|
| Understand and specify the context of use | Context of use description |
| Specify the user requirements | Context of use specification User needs description User requirements specification |
| Produce design solutions to meet these requirements | User interaction specification User interface specification Implemented user interface |
| Evaluate the designs against requirements | Evaluation results Conformance test results Long-term monitoring results |
| NOTE More detailed information on each output is to be found in ISO/IEC/TR 25060. | |

4 Principles of human-centred design

4.1 General

This part of ISO 9241 provides a framework for human-centred design. It does not assume any particular design process, nor does it describe all the different activities necessary to ensure effective systems design. It is complementary to existing design methodologies and provides a human-centred perspective that can be integrated into different design and development processes in a way that is appropriate to the particular context. All the human-centred design activities identified in Clause 6 are applicable (to a greater or lesser extent) at any stage in the development of a system.

Whatever the design process and allocation of responsibilities and roles adopted, a human-centred approach should follow the principles listed below (and described in 4.2 to 4.7):

- a) the design is based upon an explicit understanding of users, tasks and environments (see 4.2);
- b) users are involved throughout design and development (see 4.3);
- c) the design is driven and refined by user-centred evaluation (see 4.4);
- d) the process is iterative (see 4.5);
- e) the design addresses the whole user experience (see 4.6);
- f) the design team includes multidisciplinary skills and perspectives (see 4.7).

4.2 The design is based upon an explicit understanding of users, tasks and environments

Products, systems and services should be designed to take account of the people who will use them as well as other stakeholder groups, including those who might be affected (directly or indirectly) by their use. Therefore, all relevant user and stakeholder groups should be identified. Constructing systems based on an inappropriate or incomplete understanding of user needs is one of the major sources of systems failure.