SIE 2012

5th International Symposium of Industrial Engineering

IE

supported by:
Steinbeis
Advanced
Risk
Technologies

SOME PROBLEMS OF IMPLEMENTATION OF STANDARDS IN THE FIELD OF HUMAN - COMPUTER INTERACTION

Aleksandar Zunjic

Faculty of Mechanical Engineering, Kraljice Marije 16, Belgrade, Serbia, azunjic@mas.bg.ac.rs

Abstract. *The main purpose of publishing of standards relating to the system human - computer consists in the fact that their application provides ergonomic design of individual system components, but their application also may have to provide safe, efficient and comfortable user experience. Although international standards, such as for example ISO 9241, by their nature and content permit their worldwide application, they are usually implemented in practice and applied within a limited number of countries. This paper discusses some problems related to designing and adoption of standards in the field of human - computer interaction, as well as the difficulties associated with the practical application of these standards.*

ABOUT THE EMERGENCE OF STANDARDS IN THE FIELD OF HUMAN - COMPUTER INTERACTION

The main purpose of publishing of standards relating to the system human - computer consists in the fact that their application provides ergonomic design of individual system components, but their application also may have to provide safe, efficient and comfortable user experience. The application of some of the standards in this area facilitates the choice between different existing variants and solutions, related to the observed component or phenomenon in a system human - computer.

International standards in the field of human - computer interaction are mostly developed under the auspices of the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC), (Serco usability services). From the name of the standards can be concluded which of these organizations has participated in its designing. Design of standards represents a complex and time-consuming process, mainly due to achieving the consensus among groups of people involved in their design, as well as the need to achieve stability in relation to

appearance and use of the new technology (Travis). Certainly, the structure of the content and scope of standards largely determine the time dimension which is related to their creation and beginning of application in the practice.

In the formation of ergonomic standards under the auspices of the International Organization for Standardization, national bodies for standardization of member states of the ISO group participate. The work of the ISO organization is performing within the technical committees and subcommittees that have a meeting as needed each year, and whose members are delegates from member states of this international organization. In practice, technical jobs perform so-called Working groups of experts, who are assumed to act independently of external influences. Adoption of standards represents a process that often takes several years, until a consensus is reached (usually within the Working groups of experts). When a standard enters the further procedure, a formal voting (usually within the parent sub-committee) is performed. Thus, when the proposed standard passes all the planned stages of development, its ultimate status gets a name the international standard.

In the following chapter will be discussed about the standard that is most frequently used and cited in the field of human - computer interaction, which was developed by the ISO. This standard has the ISO 9241 label, and its initial name is "Ergonomic requirements for office work with visual display terminals".

ISO 9241 STANDARD

In late seventies of the last century, in the public grew concern about ergonomic aspects of work on video display terminals. At that time, the main concern was related to whether the prolonged use of video display terminals may cause a worsening of vision of users. This research subject matter, as well as some others that have emerged in the meantime,

have led that the existing Committee for Information Technology made the decision which related to the statement that the mentioned area is suitable topics for consideration within the established special committee ISO/TC 159. Working material was submitted to the ISO/TC159/SC4 subcommittee. Inaugural meeting was then held in Manchester in 1983. This meeting was very well attended by delegates from many countries, whereby several important decisions were made. At that time, in practice, the office work got a strong momentum, so it was decided that the standard should be focused on VDT work in offices. It was also decided that the standard should be conceptualized from several parts, which would cover a wide field of ergonomic requirements related to VDT work. Six initial working groups was formed (Stewart).

So, the basic idea was to make the standard that should consist of several parts, which could be partly related to hardware and partly to software. Accordingly, the first six parts of the standard refer to the hardware, while the parts of 10 to 17 relate to the software. In addition, the parts of the standard related to the hardware were added, such as reflection (7), color screens (8) and devices for data input that are different from a keyboard (9), (Stewart). In this way, the structure of the standard in essence reflects the history of its formation, which lasted slightly more than 17 years (Stewart).

ISO 9241 is intended for the general population of users, from engineers, professionals in the field of usability, designers of software tools, end users, as well as companies that produce hardware and software. Some parts of the standard require certain technical and ergonomic knowledge, while other parts of the standard are understandable for every user of the computer technology. Many countries have adapted this ISO standard and they apply it as a national standard (Travis). In Table 1 are listed ISO/TC 159/SC4 members.

As noted above, ISO 9241 standard consists of 17 parts. The names of the parts of this standard are:

ISO 9241-1: General Introduction
ISO 9241-2: Guidance on task requirements
ISO 9241-3: Visual display requirements
ISO 9241-4: Keyboard requirements
ISO 9241-5: Workstation layout and postural requirements
ISO 9241-6: Environmental requirements
ISO 9241-7: Display requirements with reflections
ISO 9241-8: Requirements for displayed colours
ISO 9241-9: Requirements for non-keyboard input devices
ISO 9241:10: Dialogue principles
ISO 9241-11: Guidance on usability
ISO 9241-12: Presentation of information
ISO 9241-13: User guidance
ISO 9241-14: Menu dialogues
ISO 9241-15: Command language dialogues

ISO 9241-16: Direct manipulation dialogues
ISO 9241-17: Form-filling dialogues.

From 2006, the standard changed its name to the "Ergonomics of Human System Interaction". As part of this change, ISO has renumbered some parts of the standard, so now the new ergonomic standard covers somewhat more topics (for example, example tactile and haptic interaction). The new standard is structured according to the series, as follows:

100 series: Software ergonomics
200 series: Human system interaction processes
300 series: Displays and display related hardware
400 series: Physical input devices - ergonomics principles
500 series: Workplace ergonomics
600 series: Environment ergonomics
700 series: Application domains - Control rooms
900 series: Tactile and haptic interactions.

OTHER STANDARDS IN THE FIELD OF HUMAN - COMPUTER INTERACTION THAT HAVE AN INTERNATIONAL CHARACTER

In practice, it is very difficult to achieve a uniform standard that would be universally accepted. It is common that for one area, there are a number of standards. Another reason behind this phenomenon (especially when it comes to the interface design) represents the fact that computer technology constitutes the basis for a greater number of industries, so that the standards have profound influence on a market success (Stewart).

However, to the duplication of standards comes not only at the international plane, but a similar phenomenon can be noticed at the national level. Thus in the UK, the Committee for SC4 BSI (British Standards Institution) has published an initial version of the first six parts of ISO 9241 standards, as British Standard BS 7179: 1990 (Stewart). The main reason for this is contained in the provision of recommendations for the workers at video display terminals, in order help them to choose the equipment that would suit their needs.

Country			
Austria	Tanzania	Hungary	Czech Republic
China	Belgium	Canada	France
Germany	Denmark	Finland	Japan
Korea	Ireland	Italy	Poland
Slovakia	Netherlands	Norway	Thailand
United Kingdom	Spain	Sweden	Romania
Australia	United States	Mexico	

Table 1. Member states ISO/TC159/SC4.

A similar phenomenon was noticed in the United States. HFES (Human Factors and Ergonomics Society) has initially brought HFES 100 standard, which refers to the ergonomics related to the use of video display terminals. Later, the same institution by developing HFES 100 has brought a new national standard HFES 200. This standard contains most of the ISO 9241 standards that are related to the software (Stewart).

In the following part of the text will be listed names of international standards in the field of human - computer interaction (according to Serco usability services), which can be applied in practice in addition to the standard ISO 9241:

ISO/IEC 11581: Information technology — User system interfaces and symbols — Icon symbols and functions
ISO/IEC 10741-1: Cursor control for text editing
ISO 14915: Software ergonomics for multimedia user interfaces
ISO 13406: Ergonomic requirements for work with visual displays based on flat panels
ISO/IEC 14754: Pen-based interfaces — common gestures for text editing with pen-based systems
ISO/IEC 15910: Software user documentation process
ISO 13407: Human-centred design processes for interactive systems.

Besides the mentioned standards, it should be noted that there are other standards that could be applicable for VDT workplaces. One of the such standards is, for example, BIFMA G1. Business and Institutional Furniture Manufacturer's Association (BIFMA) released this standard.

DIFFICULTIES IN THE APPLICATION OF STANDARDS IN THE FIELD OF HUMAN - COMPUTER INTERACTION

In practice, it is often the case that the ergonomic standards in the field of human - computer do not apply to the extent necessary, or they do not apply at all. Many people believe that these standards are difficult for understanding and usage (Stewart). Schaffer and Sorflaten state the reasons why standards do not function in practice:
- too many standards to be remembered
- ambiguity: recommendations versus standards
- they create the biases
- too general for certain specific tasks
- problems with versions
- there is no creativity
- demanding for the application
- tedious to track of amendments
- the application is expensive
- too specific to certain platforms.
Analyzing the causes for which the standards in the field of human - computer interaction are not widely used, Travis emphasizes the following reasons:

• Standards are expensive.
•The use of the name "office jobs" in the name of the ISO 9241 suggests that the standard is intended for work in offices. However, the standard can be applied to other business conditions and to different tasks.
• Standards are big and often too large.

CONCLUSION

Successful implementation of standards means that designers working in the field of human - computer interaction and other people who want to use ergonomic standards in practice understand first of all the aim and benefits from the implementation of any recommendation from the standards. Also, it is necessary that they are familiar with the conditions under which certain recommendations should be implemented, with the essence of the proposed solutions and procedures that should be implemented to ensure the application of certain recommendation from the standard.

If the application of standards is not legally required, there is no obligation for their usage in practice. This is one of the reasons (besides the already mentioned) due to which standards in the field of human - computer interaction are not applied sufficiently. It is usually the case that the application of certain standards is dictated by the market, especially when it comes to computer technology manufacturers. In order to achieve a certain quality of products from the assortment, producers are forced to apply, to some extent, ergonomic standards, when designing and implementing the manufacturing program. The application of ergonomics standards in the manufacture of computer technology also has a strong marketing effect, because then, as one of the reasons for buying products on the market emphasizes that the product meets the ergonomic criteria and standards.

Passing legislation by which a standard from the ergonomics domain would be applied in practice may also be justified, especially if the application of this standard ensures that it will preserve the health of VDT operators, and the work makes more efficient. In this way can be avoided litigations that became a phenomenon in some developed countries, initiated as a result of adverse effects associated with the use of non ergonomically designed software or hardware. By application of ergonomic design of the interface in the system human - computer can be achieved significant reduction of the absence from work due to health problems, arising as a result of performing of working tasks at a workplace with the video display terminal, which is not designed according to the ergonomic principles. Applying the standards in this area mentioned problems can be substantially eliminated.

Although international standards (such as for example ISO 9241) by their nature and content permit their worldwide application, they are usually

implemented in practice and applied within a limited number of countries. By comparing IEA member countries (International Ergonomics Association) and member states that participated in the creation of ergonomic standards ISO 9241 (given in Table 1), it is evident that 26 IEA members have not taken a part in the design of this standard. Among them are some of the world's most populous countries like India and Russia. Serbia also has not been participating in the writing of aforementioned standard, as well as other ergonomic standards in this field, although it is the IEA member. This may represent one of the reasons why the ISO 9241 standard in our country does not have significant practical application.

When exist, the national standards in the field of human - computer interaction are usually in agreement with some of the international standards in this field. The reason for this is that the world is increasingly seen as the global market. A man is in this sense treated as a whole that has universal characteristics, taking into account national and regional specificities of each country. However, Serbia does not have a national standard in the field of human - computer interaction. The adoption of such a standard in addition to gathering experts in the mentioned areas requires a comprehensive action, which refers to spreading of consciousness about the necessity of applying the standard, introducing with the benefits related to the practical application of standards, and increasing the level of general knowledge in the ergonomics among the general population of users of computer technology. Ergonomics standards in the field of human - computer interaction were created based on the results from numerous studies in this field. However, certain standard in this field should not be treated as unchanging category, or a category that will automatically provide the most optimal working conditions. The standards provide elevating of conditions of using the computer technology to a higher level, which in the given period of time can be treated as conditionally optimal. The standards should also include new researches and knowledge relating to the ergonomic use and design of working places with video display terminals, and to comply with the advancement of computer technology and with the emergence of new products based on the application of ergonomic knowledge. Such an approach can contribute to continuous improvement of conditions and results of the work of users and operators in workplaces with a video display terminal.

LITERATURE

[1] Serco usability services, 2001, User centred design standards, Serco Ltd., London.
[2] Stewart T., 2000, Ergonomics user interface standards: are they more trouble than they are worth?, Ergonomics, Vol. 43, No. 7, Taylor & Francis, London.
[3] Travis D., 2004, Bluffers' guide to ISO 9241, Userfocus Ltd., London.