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## Accessibility through standardization

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### 1. INTRODUCTION

Accessibility and universal access have been gaining increasing attention recently due to the increasing recognition of the need to promote equal opportunities for all users of interactive systems. Growing dependence on information technology based products and services, both at work and at home, and for leisure and travel, means that ever increasing numbers of the population are users of the technology. Thus if the technology raises barriers for some users they will face potential exclusion from activities which have become routine within society. This has also been recognized by the International Organization for Standardization (ISO). The member bodies of ISO Technical Committee 159, SC4 (Ergonomics of Human-System Interaction) have adopted a work item on software accessibility that has resulted in the development of a Technical Specification, ISO TS 16071 Ergonomics of human-system interaction – guidance on software accessibility [1]. ISO standards are adopted according to the following three guiding principles; consensus, industry-wide and voluntary. ISO standards do therefore not represent the general truth, or state of the art, within the field, but rather a general agreement between the international member bodies participating in ISO on the topic in question.

### 2. DEFINING ACCESSIBILITY

The purpose of ISO TS 16071 is to provide guidance to developers on designing human-computer interfaces that can be used with as high a level of accessibility as possible. Designing human-computer interactions to increase accessibility promotes increased effectiveness, efficiency, and satisfaction for people who have a wide variety of capabilities and preferences. Accessibility is therefore, according to ISOs definition of it, strongly related to the concept of usability as defined in ISO 9241 Part 11 – Guidance on usability [2]. However, it places the focus upon the specification of criteria which include the great potential diversity of user characteristics and needs. ISO TS 16071 defines **accessibility** as:

*The usability of a product, service, environment or facility by people with the widest range of capabilities.*

Usability is defined as “the extent to which a product can be used by specified users, to achieve specified goals, with effectiveness, efficiency and satisfaction, in

a specified context of use” [2]. Through its relation to the definition of usability accessibility becomes a measurable entity, and subsequently developers could acquire the goal of increasing the level of accessibility of the products they develop rather than assessing if a product is accessible or not. ISO TS 16071 do not present methods or procedures for actually specifying metrics to identify specific levels of accessibility, just as ISO 9241 part 11 does not provide usability metrics. But, by promoting such a definition we hope to encourage research and development of methods for measurable accessibility.

ISO TS 16071 provides specific guidelines to take account of software attributes to increase accessibility by ensuring that both platforms and applications offer support for users with the widest possible range of capabilities. It does not specifically address the design of assistive technologies but strives to make sure that hooks should be provided for using assistive technologies whenever appropriate. In addition to the guidelines supplied by ISO TS 16071 the most important methodological approaches to increase the accessibility of a given human-computer interface are:

- The use of human centered design principles (ISO 13407 - Human centered design process for interactive systems) [3]
- Task-oriented design of user interfaces.
- Customization
- Individualized user instruction and training.

### **3. ADDRESSED CAPABILITIES**

The ISO TS 16071 is based mainly on the prevalent knowledge of individuals with sensory and/or motor impairments in a work context. However, accessibility is an attribute that affects a large variety of capabilities and preferences of human beings in a range of different settings. These different capabilities may be the result of age, disease, and/or disabilities. Therefore, ISO TS 16071 addresses accessibility for a widely defined group of users including:

- people with physical, sensory and cognitive impairments by birth or acquired during life
- elderly people who can benefit from new IT products and services but experience reduced physical, sensory and cognitive abilities
- people with temporary disabilities such as a person with a broken arm or someone who forgot their glasses
- people who are experiencing difficulties in certain situations, such as a person who works in a noisy environment or has both hands occupied by other work

Unfortunately a standard of this sort cannot address the quality of an impairment, for example, regarding its medical and/or legal implications. The purpose can never be to standardize impairments by describing them, defining limitations and borderlines and to identify where “regular” capabilities end and where the impaired capabilities begin. The same goes for the temporal aspects of a disability.

Therefore, in order to address the problem of incorporating the widest range of capabilities, it occurs sufficient and even most effective to work with

paradigms. As long as a community agrees on characteristics of an impairment or disability, we can use this concept for our work. Therefore, this concept becomes a paradigm for our standard. A standard has to engulf established paradigms to address the widest range of capabilities. A consequence of this concept is that accessibility becomes the major strategy regarding all topics dealing with the use of a system, i.e. usability.

To become usable to a developer the accessibility guidelines should also be connected to and incorporated in a design process to provide designers with a decision strategy explaining what to address when. Initially it should be sufficient to link accessibility to the human-centered design processes (such as ISO 13407), But, given the increased addressing of the area, specialized cases of user centered design for increased accessibility must be developed. Issues arise that are needed to address the circumstances of accessibility during processes (assessment, design process, project management, etc.). The work on subsequent international standards developed based on this technical specification dealing with accessibility of human-system interaction will have to cover this area as well.

#### **4. RATIONALE AND BENEFITS**

In order to determine the level of accessibility that has been achieved, it is necessary to measure the performance and satisfaction of users working with a product or interacting with an environment. Measurement of accessibility is particularly important in view of the complexity of the interactions with the user, the goals, the task characteristics and the other elements of the context of use. A product, system, environment or facility can have significantly different levels of accessibility when used in different contexts.

Planning for accessibility as an integral part of the design and development process involves the systematic identification of requirements for accessibility including accessibility measurements and verification criteria within the context of use. These provide design targets that can be the basis for verification of the resulting outcomes of each iteration in the human-centered development process.

The approach adopted in ISO Technical Specification 16071 has benefits, which include [4]:

- The framework can be used to identify the aspects of accessibility and the components of the context of use to be taken into account when specifying, designing or evaluating the accessibility of a product.
- The performance (effectiveness and efficiency) and satisfaction of the users can be used to measure the extent to which a product, system, environment or facility is accessible in a specific context.
- Measures of the performance and satisfaction of the users can provide a basis for the comparison of the relative accessibility of products with different technical characteristics, which are used in the same context.
- The accessibility planned for a product can be defined, documented and verified (e.g. as part of a quality plan).

## 5. DISCUSSION

The concepts of Universal Access and Design for all have gained increasing attention lately, due to the release of several publications in the area and the launching of this very conference on Universal Access in Human Computer Interaction. Universal access refers to the conscious and systematic effort to proactively apply principles, methods and tools of universal design, in order to develop Information Society Technologies which are accessible and usable by all citizens, including the very young and the elderly and people with different types of disabilities, thus avoiding the need for a posteriori adaptations or specialized design [5]. International standards play an important role in providing agreed sets of formal criteria that apply across different countries and which support the development of products and systems that will meet common needs wherever they are developed and wherever they are used. The development of a standard for software accessibility poses new challenges of which we do not have much experience, and the relevant body of knowledge continues to grow. It was therefore decided to develop the document as a Technical Specification, which is a normative precursor to the development of a full standard. Experience in the application of the TS and the increasing knowledge base will then be used to refine and extend the full standard.

As an international standard it has the broadest possible audience that can work to make the guidelines provided in this specification serve the purpose of universal access for all types of users, either through procurement, legislation, or quality certification, or, by influencing the way in which systems, services and products are designed to make them accessible to the widest possible audience.

For example addressing the needs of the growing number of elderly people (25 % of the population in Europe will be aged 60 or above in the year 2020 [6]), is an important goal that has not so far been subject to international standardization. Therefore the goal, when working to turn this technical specification into a standard must be to incorporate all existing knowledge on accessibility guidelines that has so far not been incorporated into ISO standards into this document, to benefit the widest possible range of users. This requires some modifications to the procedures that organizations, such as ISO, adopt, e.g. by referencing unpublished documents, such as web sites. The WAI guidelines for accessibility are a particularly important example of this issue [7].

One area that needs further elaboration to fit into such a procedure is the processes with which we develop accessible products. It is not obvious that the human centered design principles described in [3] could easily be applied to solve accessibility problems, even though the concept of accessibility is related to usability. Therefore the standards work need to review and analyze not only criteria for design of accessible user interfaces, but the processes with which accessible products should be developed.

Work on international standards for accessibility is important, not only to provide tools for the developers of systems, but for the discussion and marketing of the issues that in itself probably has the highest effect in increasing the collective awareness of universal access of human-computer interfaces.

By defining the character of Accessibility as a view of usability, it becomes an essential understanding of all aspects of access and usage of systems, environments, information etc. The recommendations included in the TS are aimed at system design issues that are supportive for every kind of user (impaired/disabled, aged, young, unimpaired). Universal access is an ideal quality of every system, environment etc. The TS provides an elaborate tool to communicate the model of universal access into system design. By addressing users with the widest range of capabilities the paradigm of Accessibility will be relevant for every design process.

## 6. ACKNOWLEDGEMENTS

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