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Educating Students About Standardisation Relating to Universal Design

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Abstract. Standardisation education is rarely taught to students in the design disciplines in academic settings, and consequently there is not much evidence about best practices. This paper examines this situation, and elaborates on some of the possible reasons for this situation. Further, it gives an example of how students may be instructed and encouraged to further their interests in standards and the standardization-making process as a means for increasing Universal Design in practice.

Keywords. Universal Design, standardisation education

1. Introduction

Generally speaking, when design students, and even fellow academic faculty, are confronted with the subject of standards of the type developed by standards organisations such as the International Standards Organization (ISO) or the European Standardization Organsations (ES0s)[2], there is a tendency to react with negativity born of difficulties, both real and imagined. Many people complain they are 'inaccessible' in every sense of the word.

To begin with, most standards are not freely available, but need to be purchased. Income from standards purchase contributes as much as 36% of the income of ISO and thus it is important for their business model [7]. While some universities routinely purchase standards for their faculty and students, this is not always widely known or appreciated [13]. They are considered inaccessible by many because they use an arcane naming and text structuring system. Adding to the confusion is the fact that different standards bodies produce different types of documents, each with their own rules about nomenclature and structures. Furthermore, not all documents produced by standards bodies are actually standards, they can be guides, technical reports, and specifications. Finally, the documents are rarely available in accessible formats for people with print disabilities.

All these reasons might be enough to understand why faculty and students alike shy away from standards, but there are two other reasons why designers in particular do not bother with standards. Firstly, many believe that they always contain detailed

[1] Corresponding author: Department of Product and Systems Design Engineering, University of the Aegean, Konstantinopoleus Street, Ermoupolis, Syros, 84100 Greece, email: jennyd@aegean.gr
[2] Comprising three distinct groups: the Committee for Standardization (CEN) the European Committee for Electrotechnical Standardization (CENELEC) and European Telecommunications Standards Institute (ETSI)

technical specifications that are not relevant to designers, but to implementers (such as engineers or software developers). Secondly, and more damaging for standardisation efforts and their relationship with designers is a widely-held belief that standards are prescriptive, that they constrain design. Phrases such as 'thief of creativity' [5] and 'stifling innovation' [11] are commonplace.

In connection with Universal Design, this 'stifling' has also been experienced as following 'the letter rather than the spirit' of accessibility. The limitations of a code-based approach [6] have been noted both by architects working in Barrier-Free Design and by designers and developers involved in Web accessibility. As long ago as 1989, Lusher and Mace noted that codes and standards "have been developed by an approach of modifying the norm through the use of a few specially designed features and products to accommodate the 'few' who vary from the norm" [9]. More worryingly, researchers looking at users and creators of web content showed that overzealous attention to conformance to Web Content Accessibility Guidelines (WCAG) was detrimental and called for a more holistic approach [8].

Given these barriers to access and these experiences of Universal Design standards, this paper seeks to explain what role standardisation education could have for students studying Universal Design as part of their courses in higher education.

2. Standardisation Education, Background and Current Initiatives

Although it could be expected that academic disciplines such as engineering, whose graduates require knowledge about standards in the practical application of their discipline, would include standardisation education in the academic curriculum, this is not so. A survey conducted in the United States about the availability of standardisation education in the curriculum of engineers [2] noted that such education is generally acquired 'on the job' or provided by standards organisations and public or private sector groups. At that time it was noted that there were more than 2,500 universities and colleges, yet only three university schools of engineering offer a standards education course at the graduate level [10].

One explanation for this might be historically standardized education and training was the remit of the standards bodies, and to a great extent, it is still them who undertake to do this activity. Other private and professional bodies also undertake such training, it may be within a corporation, such as seminars to management about the ISO 9000 family, or it may be within professional bodies, such as associations of engineers to their members.

However, many standardisation organisations are aware of the problems of their output not reaching its audience and for the need for new and renewed avenues of education and training. For example:

- ISO carried out a series of workshops in 2013 and 2014 on the subject of good practices for collaboration between National Standards Bodies and universities; it has collated a repository of papers on the subject of teaching standardisation[3]; it has launched a communications department to better their outreach effort in general.

[3] http://www.iso.org/iso/home/standards/standards-in-education/education_initiatives-higher-edu.htm

- The European standards bodies CEN/CENELEC established in a special working group in 2008: the Joint Working Group on Education about standardization (JWG-EaS). Since then, amongst other things, they have produced a Masterplan[4] and also recently teaching materials in the form of a free textbook for education about European standardisation. [4]
- The German Institute for Standardization (Deutsches Institut für Normung - DIN) published in 2009 their strategy and noted the large disconnect between higher level education and standardisation and called for an increased integration of standardisation in higher education. They have established activities under the title 'Standards and Academia' and concentrate on helping establish or reinforcing courses in German universities, as shown on their website[5].
- Finally, also of interest here is the study, commissioned British Standards Institute (BSI), to benchmark education about standardisation in the United Kingdom [13]. Some of the results of this survey showed that students in higher education appreciated the importance of standards to industry and personally to improving their employability. They identified with the need for understanding standards, but needed more help with the structure and content and to learn to apply them in a practical context. Academic faculty reported problems with knowing whether standards are available in the educational institution and how students can access them. They also wanted to know which standards were most suitable for a particular subject and curriculum.

In the case of standards about Accessibility and Universal Design, this last finding resonates with the acknowledged problem that there is a fragmented approach to to accessibility in standards development work: different groups of standardisers work on different aspects, not all areas are covered, and sometimes there are different standards to cover particular application areas. In addition all standards are subject to a revision process, which means that the standard will change.

This acknowledgement has resulted in some interesting and useful information pieces from both ISO and CEN/CENELEC such as continuous effort to inform people, and in particular the Universal Design community, about standards concerned with Accessibility issues with 'news' pages written in a friendly, approachable style[6]. Another example is the helpful infographic produced by ISO called 'Bringing Down the Barriers' (see Figure 1), where the square white boxes list the ISO standards relevant to the facts displayed.

[4] http://www.cencenelec.eu/standards/Education/JointWorkingGroup/Pages/default.aspx
[5] http://www.din.de/en/innovation-and-research/standards-and-academia/academic-seminars-on-strategic-standardization
[6] http://www.iso.org/iso/accessibility

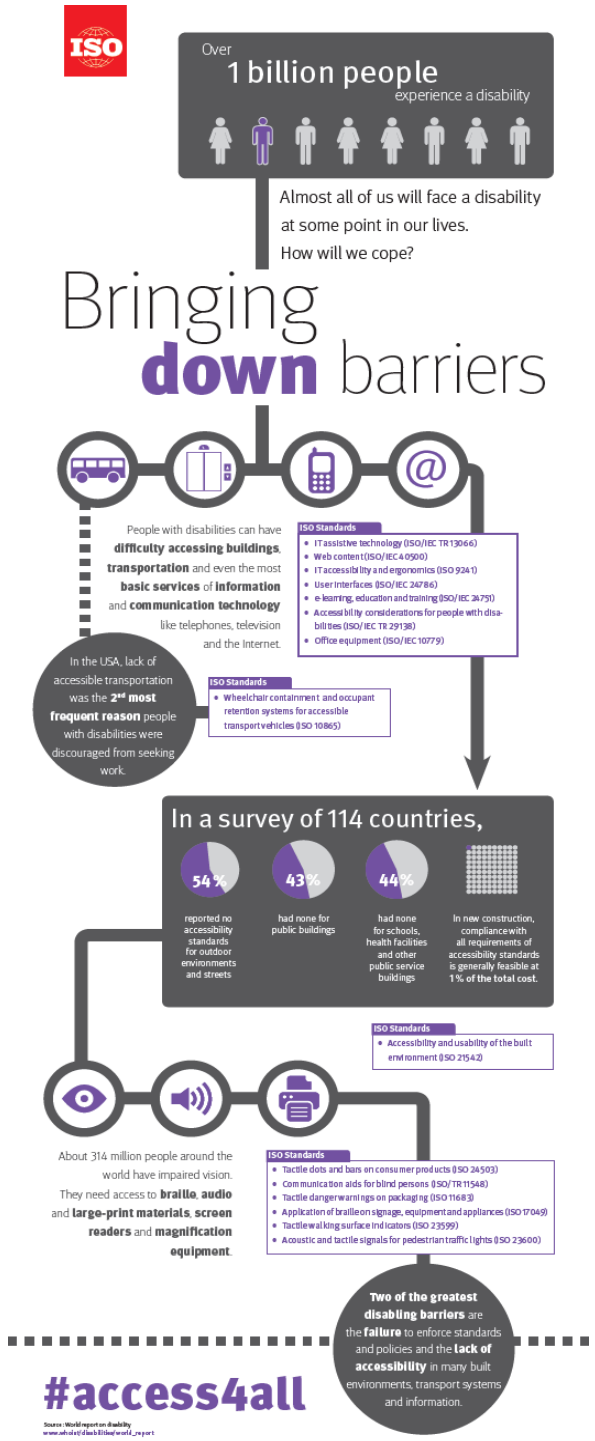

Figure 1. ISO-Infographic 'Bringing down barriers'

3. The Importance of Standards and Standardisation Efforts in Universal Design

So far, we have discussed the problems from the point of view of faculty and students, and the conscious efforts of standardisation organisations to promote teaching about standards and its integration into higher education. However, why should standardisation education be important in an already overcrowded curriculum? The responses put forward here will concern specifically standards relating to accessibility and Universal Design, although many of these arguments are similar if not identical to any standards education initiative.

Standards are important for various reasons. It is usual to refer to their enhancement of safety, quality and interoperability features. Sometimes, especially in Universal Design, these features are essential for people with disabilities or people who are older and in the context of globalization, where products and services increasingly cross borders. However, in this text, the focus is on the benefits to be reaped from the knowledge content of standards, their development and conformance processes; and their use to use to support legislation.

The content of standards, particularly standards that have to do with accessibility and Universal Design, are often an excellent source of helpful and even inspiring material for all designers. This content can give good guidance, and can even promote innovation. As an example, there is the standards work on audible signals used in a variety of electronic goods and services, e.g. the beeps from a domestic cooker; the feedback sounds (or 'earcons') on a computer interface running a banking application; or the warning buzzes on a bus or train. This standard[7] explains to those who are developing the audible signals for interfaces what the problems can be for some people who are hearing impaired, or have age-related hearing problems, and give guidance on the ranges that are the best to use, so that sounds can be distinguished from background noise.

Regarding their development and conformance processes: standards developers are volunteers and standards are open to all to participate in their development. Standards are continually revised, which means that things which are problematic can be revisited. For instance, a notable piece of work from ANEC[8], a European-wide organisation representing consumers in standards is their work overturning the 'exclusion clause' in standards for domestic electrical appliances. This states that the standard, "…does not, in general, take into account the use of appliances by young children or infirm persons without supervision." The work of ANEC has resulted in the revision of over 60 standards dealing with item such as toasters, microwave ovens, hobs and ovens, hairdryers, water heaters, lawnmowers and trimmers, and grills and similar portable cooking appliances. The aim is to make those appliances safer for all, including people who are older or younger, and people with disabilities [1].

With regard to standards supporting legislation, in Europe, there is a strong relationship between directives and standards. Standards are voluntary, consensus-based and as such do not impose any regulations. Some provide the test specifications and test methods for things such as interoperability, safety, and quality. While the application of standards is normally voluntary, some laws and regulations may refer to standards and even make compliance with them compulsory. However, it should be

[7] ISO 24501:2010, Ergonomics – Accessible design – Sound pressure levels of auditory signals for consumer products,

[8] ANEC: http://anec.eu/anec.asp

noted that manufacturers of products and providers of services may choose any technical solution that provides compliance with the essential requirements set by a directive. This is a very important 'clause' or condition for it guarantees the ground for technical development, and it is very important for manufacturers of innovative products, or providers of innovative services, for which standards do not yet exist, want to certify their products/services according to the legal European framework[9].

With particular reference to Universal Design and the European context, the proposed new directive, more commonly known as the European Accessibility Act, explicitly mentions the use of standards to achieve conformance[10].

4. Example of Teaching about Standards to Design Students of Design for All

This section presents a working example of teaching about standards with a thirteen-week semester course on Design for All. As part of the thematic unit, 'Recommendations about how to Design for All', students are introduced to a number of aids, such as the Principles of Universal Design[11] and their application; Guidelines for specific areas, such as guidelines for Public Access Terminals and for Home Displays, from the Centre for Excellence in Universal Design (CEUD)[12]. In addition, students also learn about best practice cases, and are encouraged to look for cases and bring them to the class and defend them. Students were also routinely introduced to standards. In spite of trying various techniques and approaches, it remained the part of the thematic unit that consistently, students did not engage with.

In an attempt to try to remedy this, for the past two years, during this unit, students were only introduced to ISO Guide 71[13] (or CEN Guide 6). This is a guidance document, jointly developed by these two bodies, whose latest revision was finished in 2014, and it is freely available on the CEN and CENELEC sites[14].

At first glance, this might not seem a very useful place to start to introduce students to standards. This guide is aimed at people working in standards (standards developers) and is to help them to address accessibility requirements and recommendations in standards that focus, whether directly or indirectly, on systems (i.e. products, services and built environments) used by people.

However, Guide 71 contains many things that are very helpful to students trying to cope with a wealth of information about Universal Design, such as its history,

[9] CENELEC Frequently ask questions https://www.cenelec.eu/faq/faq_entry.htm

[10] "One of the ways to assess conformity with those requirements is by applying voluntary harmonised standards that are adopted in accordance with Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European Standardisation" Section 1.2 Technical Background, Explanatory Memorandum, Proposal for a Directive of the European Parliament and of the Council on the approximation of the laws, regulations and administrative provisions of the Member States as regards the accessibility requirements for products and services. COM(2015) 615 final 2015/0278 (COD)

[11] Principles of Universal Design Version 2.0 4/1/97. © Copyright 1997 NC State University, The Center for Universal Design, an initiative of the College of Design. Compiled by advocates of Universal Design, listed in alphabetical order: Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, & Gregg Vanderheiden https://www.ncsu.edu/project/design-projects/sites/cud/content/principles/principles.html

[12] CEUD http://universaldesign.ie/

[13] ISO/IEC Guide 71:2014 Guide for addressing accessibility in standards https://www.google.gr/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=ISO+Guide+71

[14] CEN-CENELEC GUIDE 6: Guide for addressing accessibility in standards. Edition 2, 2014-12 http://www.cencenelec.eu/standards/Guides/Pages/default.aspx

awareness of functional, cognitive and sensory limitations to activities, and trying to translate this into requirements for products and services. It offers a summary of current terminology relating to accessibility; issues to consider in support of accessibility; a set of accessibility goals (used to identify user accessibility needs); descriptions of (and design considerations for) human abilities and characteristics; and strategies for addressing user accessibility needs and design considerations.

However, standards are only available in English, increasing the difficulty for students who are not native English speakers. Some sections are not of interest to them, meaning that some guidance from the lecturer is needed to introduce it to the students and as well to help them use the document constructively. During the past two years, Design for All students have been instructed in the use of the guide and encouraged to make use of it. This has taken the form of simple quizzes about the content, to a more active use of the content for their project work. Students were asked, after their projects were graded, to answer a small survey and comment on the contribution of the Guide to their class and project work. On the whole, the responses were positive, with even a small number of students motivated to visit the library of Greek National Standards in Athens[15] to consult standards and other documentation for their final year thesis.

5. Discussion and Conclusions

This information piece has been an attempt to deal with misconceptions, real and perceived, about standards, and to suggest that some education about standardisation would be beneficial in Universal Design courses for design students in higher education, especially in Europe and North America. This is in contrast to countries such as Japan, Korea and China (JKC) where courses on standardisation education are routinely found in their universities [3]. This can be seen as a reflection of the fact that there is already much interest in using standards and their compliance to increase market share of products, and of ensuring quality and making acceptable global trading. Related to Universal Design, in the ISO Technical Committee 173 on Assistive Products for persons with Disabilities[16] there is strong representation from the JKC countries presenting standards for innovative products to promote health and well-being for people with disabilities. Increasingly, this demographic is becoming wider, representing older people and in reality, everyone, as many items are usable and needed by all.

This suggestion about standardisation education does not come without caveats: standards remain problematic because of the difficulties to access to the useful content that is in them. However, a promising sign is that ISO and DIN have begun work on making better search engines to search through the content resources they host, and there are calls for the BSI to also undertake this work, as well as to make standards documents hyperlinked texts, to use more colour, and make them more attractive and easy to understand.

Other initiatives are to have more people involved in the standards development process. Faculty have called for some recognition from the academic community for standards work, both within and without the lecture room. Organisations such as

[15] ELOT http://elot.gr/631_ELL_HTML.aspx
[16] ISO/TC173 http://www.iso.org/iso/iso_technical_committee%3Fcommid%3D53782

ANEC help to bring the consumer voice to standards, and it is timely to remember that whether academics or students, everyone is a consumer. Everyone can benefit from standards, whether they are learning about them and using them, or developing and revising them. Some understanding about all of these activities can be taught within standardisation education during a University course. The more the representation, over the whole range of standardisation-related activities, the better the resulting standards. However, it is not just the standard that embodies the results of the process, it is also the process itself that is valuable to Universal Design, as noted at a world standards event in 2010:

"There are particular benefits and opportunities in using the standards process to gather representatives from a diversity of interests who may not usually meet together to discuss and resolve accessibility issues. The issue requires input from government, regulators, policy makers, industry, accessibility equipment providers, civil society NGOs, accessibility organizations, academia and researchers." [12].

Having so many stakeholders involved in discussing Universal Design issues, is a very positive outcome. Perhaps Universal Design academics owe it to their students to make them aware of opportunities that standardisation offers, not just in the content of the documents, but in their development and occasions for multi-stakeholder dialogue on Universal Design?

A Note on Spelling: this text uses British Spelling with an 's' for 'standardisation' and 'organisation' instead of US spelling with a 'z' organization and standardization.

However, in the interests of standardisation, the European Standardisation bodies, CEN/CENELEC have adopted US spellings as the standardised spelling in their official titles, and are now known as Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC).

In spite of this move by standardisers, British spellings are still the standard for official European documents, as is evident in the text on the Directive for the 'European Accessibility Act'.

The author apologises for any irritation on the part of the reader with these apparent inconsistencies.

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