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Procedia Computer Science 27 (2014) 271 – 280

**Procedia**  
Computer Science

5th International Conference on Software Development and Technologies for Enhancing  
Accessibility and Fighting Info-exclusion, DSAI 2013

## Mandate M 376: new software accessibility requirements

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### Abstract

Software needs to be accessible for persons with disabilities and there are several guidelines to assist developers in building more accessible software. Regulation activities are beginning to make the accessibility of software a mandatory requirement in some countries. One such activity is the European Mandate M 376, which will result in a European standard (EN 301 549) defining functional accessibility requirements for information and communication technology products and services. This paper provides an overview of Mandate M 376 and EN 301 549, and describes the requirements for software accessibility defined in EN 301 549, according to a feature-based approach.

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Selection and peer-review under responsibility of the Scientific Programme Committee of the 5th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion (DSAI 2013).

*Keywords:* software accessibility; standards; accessibility requirements; European policy; ICT

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### 1. Introduction

There is a clear need for software that is accessible for persons with disabilities and this need has led to the development of guidelines for developers to assist them in building better software. Early relevant examples of these guidelines are the Nordic guidelines for computer accessibility<sup>1</sup>, first published in 1993 and updated in 1998, the software design guidelines from the Trace Center<sup>2</sup>, published in 1994 and updated in 1995, the Spanish

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experimental standard on software accessibility UNE EX 139802<sup>3</sup>, published in 1998, and the standards for section 508 of the 1998 amendment of the US Rehabilitation Act<sup>4</sup>.

These guidelines were originally national efforts, which merged into international combined guidelines published by standards organizations. In the software accessibility domain, the International Standards Organization (ISO) published in 2003 a technical specification, ISO TS 16071<sup>5</sup> that was afterwards expanded and completed to become an international standard, ISO 9241-171<sup>6</sup>, published in 2008. In a harmonization effort, ISO 9241-171 was made technically equivalent to the US standard, ANSI HFES 200.2<sup>7</sup> which was being developed in parallel. Up to now, ISO 9241-171 is the international reference guidance for software accessibility, although it has not gained much support from regulation nor from industry. Some examples of research work referring to ISO 9241-171 are works by Amado-Salvatierra et al.<sup>8</sup>, Chuang et al.<sup>9</sup>, Petrie et al.<sup>10</sup> and González et al.<sup>11</sup>

Accessibility has also been a focus of work in the area of the World Wide Web. The Web accessibility initiative (WAI) of the World Wide Web Consortium (W3C) has been working since 1997 on accessibility guidelines for web content, authoring tools (web editors) and user agents (web browsers). The most relevant guidelines are the Web Content Accessibility Guidelines (WCAG), first published as version 1.0 in 1999<sup>12</sup> and then updated as version 2.0 in 2008<sup>13</sup>. WCAG is internationally recognized as the reference for web accessibility, and is being referenced in the regulations of several countries that mandate accessibility of public websites.

One big difference between accessibility requirements for web content and other software has been the level of reference made from regulation. WCAG is mandatory in many countries for public websites and, in some cases, even for private owned sites. In contrast, software accessibility requirements have much less impact in regulation. One outstanding exception is the standards of section 508<sup>4</sup>, which include some basic accessibility requirements for software (1194.21 Software applications and operating systems).

Section 508 mandates federal agencies in the US to develop, procure, maintain, or use accessible information and communication technologies (ICT). In Europe there is an ongoing effort in the same direction, specifically addressing public procurement. The European Commission issued in 2005 a Mandate, M 376<sup>14</sup>, to the three European Standard Organizations (CEN, CENELEC and ETSI) to work on the development of functional accessibility requirements to be used in public procurement of ICT products and services. The work on Mandate M 376 has been divided into two phases, where phase 1 was focused on collecting information about accessibility requirements and conformance assessment systems, and phase 2 is focused on the development of a European standard with the functional accessibility requirements, accompanied by guidance material and an online toolkit supporting the work of public procurers. Phase 2 is in its final stages and will result in the publication of EN 301 549, a European standard jointly published by three European standard organizations.

At the same time in the US the standards for section 508 are in a refresh process that will result in the definition of an updated set of accessibility requirements to be applied by US federal agencies. Drafts of the new standards have been published in 2010<sup>15</sup> and 2011<sup>16</sup>. Given this coincidence in time scales, and given the perceived benefits of a common set of accessibility requirements for a global ICT market, the European effort on Mandate M 376 is carefully harmonizing the requirements drafted for EN 301 549 with the anticipated final standards of section 508.

The results of these two harmonized efforts in defining accessibility requirements for ICT have strong implications in the set of requirements that software products have to meet. The most relevant change is that both the refresh of Section 508 and the current draft of EN 301 549 use WCAG 2.0 not only for web content, but also for non-web documents and software.

The goal of this paper is to describe the software accessibility requirements that result from the European Standard EN 301 549 (in its current form), so that software developers are aware of them before they become mandatory in Europe. Section 2 will provide a short description of the results of the two phases of Mandate M 376. Section 3 will then provide an overview of the structure and contents of the draft EN 301 549. Section 4 will describe the resulting software accessibility requirements. Finally, section 5 will draw some conclusions.

## **2. Mandate M 376**

The European Mandate M 376<sup>14</sup> was issued with the primary goal of creating a set of functional accessibility requirements that could be applied in the public procurement of any type of ICT product or service. This Mandate

was issued in 2005 but technical work only started in 2007, with its first phase, focused on field research performed by two expert teams: one under the supervision of ETSI and a second one under the joint supervision of CEN and CENELEC.

The results of that phase were two reports published in 2009. The first report, ETSI TR 102 612<sup>17</sup>, collected information about existing ICT accessibility standards and other source for ICT accessibility requirements. The second report, published by CEN and CENELEC<sup>18</sup>, collected information about different types of conformity assessment systems and schemes and their application in the context of public procurement of ICT in Europe.

These two reports were analysed by the European Commission and the three European Standards Organizations to refine the detailed goals of phase 2 of the Mandate. The technical work on phase 2 started in 2011, having as a goal the following six deliverables<sup>19</sup>:

1. A European Standard, EN 301 549 “Accessibility requirements for public procurement of ICT products and services in Europe”, specifying the functional accessibility requirements applicable to ICT products and services.
2. A Technical Report, TR 101 550 “Documents relevant to EN 301549”, explaining the decision taken in the development process of the EN, and listing the standards and specifications used for the requirements and tests.
3. A Technical Report, TR 101 551 “Guidelines on the use of accessibility award criteria for publicly procured ICT products and services in Europe”, providing guidelines for contract award criteria in public procurement of accessible ICT.
4. A Technical Report, “Guidance for the application of conformity assessment to accessibility requirements for public procurement of ICT products and services in Europe”, dealing with conformity assessment in the context of public procurement of accessible ICT.
5. An Online Procurement Toolkit for accessible ICT products and services that will provide support for public procurers.
6. Additional guidance and support material for the procurement of accessible ICT products and services, which will be provided as part of the online procurement toolkit.

The expected date for final approval of the deliverables, publication of the European Standard, and release of the online toolkit is February 2014<sup>19</sup>. In the next section the latest draft of EN 301 549 will be presented.

### 3. The standard: Draft EN 301 549

The latest version of EN 301 549<sup>20</sup> was the draft published in February 2013 for the public enquiry period in the three European Standards Organizations. That public enquiry period has ended in late July. Comments on the draft have been received and will be processed to develop the final version of the EN during the last quarter of 2013. As this is an ongoing process, the version of EN 301 549 described here is the one published as a draft in February.

The structure of EN 301 549 is based on a feature-based approach, based on the results of phase 1 of the Mandate. At that time it was agreed that it was not feasible to structure the accessibility requirements according to the type of products to which they apply, due to the increasing convergence between device types. For instance, current smartphones are able to perform most of the functions that a personal computer can perform and so most accessibility requirements would apply. And some digital cameras are incorporating mobile operating systems and thus share features found in smartphones.

The resulting table of contents of the EN is:

- *Introductory clauses*: intellectual property rights, foreword and introduction.
- *Clause 1: Scope*. It explains that the EN contains functional accessibility requirements for ICT products and services and also contains test procedures for each requirement. The Scope also describes situations where the requirements of the EN are not applicable.

- *Clause 2: References.* This section contains normative and informative references to other standards and documents.
- *Clause 3: Definitions and abbreviations.* Here relevant terms are defined to clarify their meaning in the requirements of the EN. Some especially relevant terms are “content”, “document”, “platform software” and “user agent”, as they are used to clarify the applicability of requirements.
- *Clause 4: Functional performance.* This clause describes the needs of persons with disabilities in accessing the full functionality and documentation of an ICT product or service with or without the use of assistive technology. The functional performance statements are intended to enable people to locate, identify, and operate ICT functions; and to access the information provided when a physical, cognitive or sensory ability is not available or cannot be used. The conformance with the user needs of this clause can be demonstrated by meeting the detailed requirements in clauses 5 to 13.
- *Clause 5: Generic requirements.* This clause defines requirements that apply to any combination of hardware and software in an ICT product or service. A relevant part of this clause is the definition of requirements for systems with closed functionality, that is, systems that have functionality where the user is prevented from attaching, installing or using assistive technology. Other requirements in this clause deal with activation of accessibility features, biometrics, preservation of accessibility information, locking or toggle controls, key repeat and simultaneous user actions.
- *Clause 6: ICT with two way voice communication.* This clause contains requirements that apply to any ICT product or service that provides two-way voice communication. There are requirements for wide-band speech, real-time text functionality, caller identification, alternatives to voice-based services, video communication (for ICT providing two-way voice communication that includes real time video functionality) and alternatives to video-based services.
- *Clause 7: ICT with video capabilities.* This clause contains requirements that apply to ICT products and services that display video content. The requirements deal with processing of captions (subtitles for deaf and hard-of-hearing persons) and audio description (narration describing relevant visual content of the video for blind persons).
- *Clause 8: Hardware.* This clause contains requirements that apply to the hardware components of ICT products or services. It contains requirements for connections, colour, speech output (volume and magnetic coupling), physical access (for installed ICT), operable parts (keys, buttons...) and tactile indication of speech mode.
- *Clause 9: Web content.* This clause requires web content to conform to Level A and Level AA success criteria of WCAG 2.0. This means that EN 301 549 fully supports WCAG 2.0 and does not define new requirements for web content. The clause actually references ISO/IEC 40500<sup>21</sup> which is functionally identical to WCAG 2.0.
- *Clause 10: Documents.* This clause uses WCAG 2.0 as the basis for defining accessibility requirements for non-web documents. It does so by making some term substitutions to the WCAG 2.0 level A and AA success criteria so that they can be applied to non-web documents. In addition, this clause provides some applicability notes to better understand how to apply WCAG 2.0 to non-web documents. The content of this clause is intended to harmonize with a report produced by an international group of experts, the W3C’s WCAG2ICT Task Force<sup>22</sup>.
- *Clause 11: Non-web software.* This clause contains accessibility requirements for software. First, it defines a set of software success criteria that are based on the WCAG 2.0 level A and AA success criteria, with some term substitutions and applicability notes. Again, this set of software success criteria is intended to harmonize with the results of the WCAG2ICT Task Force. In addition, clause 11 contains additional requirements related to interoperability with assistive technology, documented accessibility usage, user preferences and authoring tools.
- *Clause 12: Documentation and support services.* This clause defines accessibility requirements for the product documentation and for the support services associated with a given ICT product or service.
- *Clause 13: Relay and emergency services.* This clause defines accessibility requirements that are specific for ICT-based relay and emergency services.
- *Annexes.* The draft EN contains three annexes. Annex A contains the full text of WCAG 2.0 as an electronic attachment. Annex B explains the relationships between the requirements in clauses 5 to 13 and the functional performance statements of clause 4. And Annex C defines the procedures necessary to determine compliance

with the individual requirements defined in clauses 5 to 13. There is one compliance determination procedure for each individual requirement, describing the type of compliance (testing, inspection...), pre-conditions, procedure and expected result of the evaluation.

This structure is, as has been explained above, a feature-based structure. This implies that most sections of the EN apply to most types of ICT products and services. For instance, a modern smartphone, which is a combination of hardware (the device) and software (the operating system and included applications) would probably need to conform to the following clauses:

- *Clause 5. Generic requirements.* Most of the requirements in this clause apply, except for the ones on closed functionality, as today most smartphones enable assistive technologies.
- *Clause 6. Two-way voice communication.* The smartphone provides real time two-way voice communication so it needs to conform to this clause.
- *Clause 7. Video capabilities.* If the smartphone is provided with a video player application, then that application has to conform to this clause.
- *Clause 8. Hardware.* All the requirements of this clause apply, except for the requirements on the physical access to installed products.
- *Clause 11. Software.* The software of the smartphone should conform to all the requirements in this clause, except for the ones on authoring tools.
- *Clause 12. Documentation and support services.* The documentation of the phone and the customer support services offered by the supplier of the phone have to conform to this clause.

The next section will describe which requirements of EN 301 549 apply to software, given the feature-based structure of the EN.

#### **4. Accessibility requirements for software in EN 301 549**

The decision of which requirements from EN 301 549 apply to software products or to the software aspects of ICT products and services has to be based on the features of individual products. Some requirements apply to any type of software, whereas others only apply to software products that provide some specific features, such as two-way voice communication or being an authoring tool. Fig. 1 shows the features that software programs can provide.

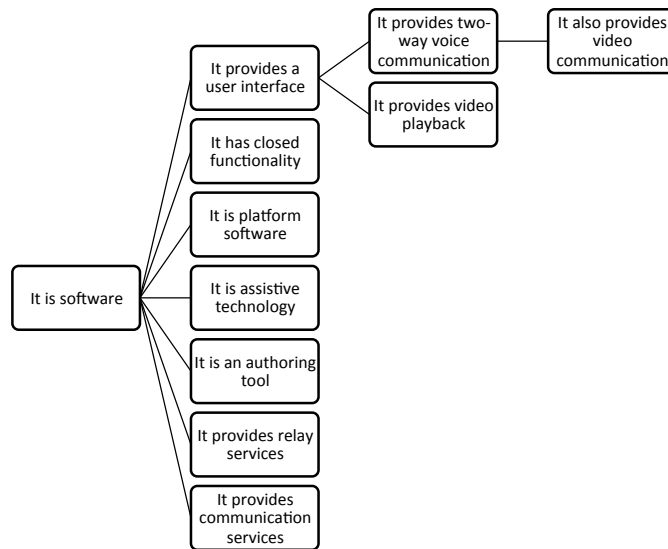


Fig. 1. Features provided by software programs.

The description below of accessibility requirements that apply to software is based on the features shown in Fig. 1. This description will also compare the differences between the requirements of EN 301 549 and the requirements found in other international standards, such as ISO 9241-171.

#### 4.1. Requirements that apply to any software program

The requirements that apply to any software program are the ones in clauses 5.2 to 5.6 as long as the software program has accessibility features (5.2), deals with biometrics (5.3), converts information (5.4), has locking or toggle controls (5.5) or manages keyboard input with key repeat (5.6). Clause 5.7 deals with simultaneous actions and thus applies to any software program. In addition, the requirements of clause 12 apply to the documentation and support services of the software program.

Comparing this set of requirements to the requirements of ISO 9241-171, it happens that most of these are new requirements that were not considered in ISO 9241-171, except for the requirements on key repeat (5.6) that are covered in clauses 9.3.6 and 9.3.7 of ISO 9241-171, and the requirements for documentation and support (12) that are covered in clause 11 of ISO 9241-171.

#### 4.2. Requirements that apply to software programs that provide a user interface

If the software program provides a user interface then the following requirements apply: the software success criteria based on WCAG 2.0 (11.2), the use of platform accessibility services that enable interoperation with assistive technology (11.3.2.3 and then 11.3.2.5 to 11.3.2.17), the user control and no disruption of accessibility features (11.4) and the use of platform-level user preferences for presentation (11.5). There are some exceptions for software programs with closed functionality, as described in the next section.

There is a high degree of equivalence between this set of requirements and ISO 9241-171, with some exceptions. First, there are some new requirements as ISO 9241-171 does not consider some of the WCAG-based success criteria such as meaningful sequence, sensory characteristics, images of text, link purpose, multiple ways, headings and labels, language, error suggestions and parsing. Second, there are some requirements in ISO 9241-171 that are not covered: always-on-top windows, highly visible cursors and thresholds for key acceptance. These

gaps in the EN may be addressed in the final version depending on the comments received during the public enquiry process.

In addition, it has to be noted that the set of requirements related to interoperability with assistive technologies (clause 11.3) has been harmonized with another international standard, ISO/IEC 13066-1<sup>23</sup>.

#### *4.3. Requirements that apply to software programs with closed functionality*

If the software program has closed functionality, then the set of requirements in clause 5.1 apply. Most of the other requirements of the EN continue to apply except for requirements related to programmatic access to the user interface (6.3.2.2, some of the WCAG-based success criteria as described in table 4 of the EN and clause 11.3).

The situation defined by the EN about software with closed functionality is more precise than what ISO 9241-171 specifies. The ISO standard contained some requirements specific for closed systems but with less comprehensiveness.

#### *4.4. Requirements that apply to software programs providing two-way voice communication*

If the software program provides two-way voice communication then it has to transmit and receive wide-band speech (6.2), to provide real-time text functionality with concurrence of voice and text, display of real-time text, interoperability and responsiveness (6.3), to provide caller ID (6.4) and to provide alternatives to voice-based services (6.5).

In addition, if the software also provides real time video communication functionality, then it has to provide good resolution, frame rate and synchronization for enabling communication via sign language and lip-reading (6.6) and it has to provide alternatives to video-based services (6.7).

The requirements in clause 6 of the EN have no equivalence in ISO 9241-171, which did not consider two-way voice or video communication.

#### *4.5. Requirements that apply to software programs providing video playback*

If the software program has video capabilities it has to be able to display captions (7.1.1), preserve synchronization of captions (7.1.2), preserve caption data (7.1.3), play audio descriptions (7.2.1), preserve synchronization of audio descriptions (7.2.2) and preserve audio description data (7.2.3). In addition, the software has to provide user controls for activating captions and audio description that are at the same level of interaction as the primary media controls (7.3).

It has to be noted that these are requirements on software with video capabilities when playing video content that has captions and audio description. The EN also contains requirements on video content to have captions and audio descriptions, as part of the web content, document and software success criteria (clauses 9, 10.2 and 11.2).

These set of requirements did not exist in ISO 9241-171, which has no requirements dealing with specific capabilities of media players.

#### *4.6. Requirements that apply to platform software*

If the software program is platform software (i.e. it is an operating system), then it has to provide accessibility services that enable software that provides a user interface running on the platform software to interoperate with assistive technology (11.3.2.1 and 11.3.2.2). The set of accessibility services has to, as a minimum, support the requirements of clauses 11.3.2.5 to 11.3.2.17.

ISO 9241-171 had some requirements dealing with interoperability with assistive technologies, but with less detail than what is described in the EN, which in this section is harmonized with another international standard, ISO/IEC 13066-1<sup>23</sup>.

#### 4.7. Requirements that apply to software that is assistive technology

If the software program is an assistive technology (such as a screen reader, screen magnifier or keyboard emulator) then it has to use the platform accessibility services (11.3.2.4).

This is a new requirement that has no equivalence in ISO 9241-171, but there is one equivalent requirement (9.2) in ISO/IEC 13066-1.

#### 4.8. Requirements that apply to software that is an authoring tool

If the software program is an authoring tool, then it has to enable and guide the production of accessible content (11.6.2), preserve accessibility information when transforming content (11.6.3), provide repair suggestions for accessibility errors (11.6.4) and offer accessible templates (11.6.5).

This set of requirements has no equivalence in ISO 9241-171, which has no specific coverage for authoring tools. The requirements on authoring tools have been harmonized with the refresh of Section 508<sup>16</sup> but with wording that is based on the current draft of W3C's Authoring Tool Accessibility Guidelines<sup>24</sup>.

#### 4.9. Requirements that apply to software that provides relay services

If the software program provides relay services, then it has to conform to the requirements of ES 202 975<sup>25</sup> for the different types of relay services offered (text, sign, lip-reading, captioned and speech), as described in clause 13.1 of EN 301 549.

In ISO 9241-171 there are no requirements dealing with relay services, so clause 13.1 of the EN defines a new set of requirements that only apply if the software program is providing relay services. However, these requirements are not new, as they are linked with the requirements of the ETSI standard ES 202 975 on relay services, published in 2009.

#### 4.10. Requirements that apply to software that provides communications services

If the software program provides communications services (such as an IP-based telephone exchange system, or PBX), then it must not prevent access to relay services (13.2) and emergency systems (13.3) for outgoing and incoming calls.

These two requirements are new to the EN and have no equivalence in other international standards, including ISO 9241-171.

### 5. Conclusions

The current draft of EN 301 509 presents a comprehensive set of accessibility requirements that apply to any type of ICT product or service. In the case of software, the feature-based structure of the EN implies that most of the requirements also apply to software, as has been described in section 4 and is summarized in table 1. Only the requirements of clause 8 of the EN (hardware) are clearly outside the scope for software programs.

Table 1. Requirements in EN 301 549 that may apply to software, depending on its features

Feature	Requirements
Any software program	5.2 to 5.7, 12
It provides a user interface	11.2, 11.3.2.3, 11.3.2.5 to 11.3.2.17, 11.4, 11.5
It has closed functionality	5.1, and exceptions in 6.3.2.2, 11.2 and 11.3
It provides two-way voice communication	6.2, 6.3, 6.4, 6.5
It provides two-way voice and video communication	6.5, 6.7
It provides video playback	7.1, 7.2, 7.3



It is platform software	11.3.2.1, 11.3.2.2, 11.3.2.5 to 11.3.2.17
It is assistive technology	11.3.2.4
It is an authoring tool	11.6
It provides relay services	13.1
It provides communications services <sup>1</sup>	13.2, 13.3

The features enumerated in table 1 are non-exclusive, which means that one individual software product may provide several of them at the same time and thus will have to conform to all the applicable requirements.

As section 4 has shown, there is a high degree of overlapping between the requirements contained in EN 301 549 and the requirements that exist in previous international standards, such as ISO 9241-171, ISO/IEC 13066-1 and ES 202 975. However, there are some new requirements that have been identified and are summarized in table 2. And there are also a few gaps in the EN, in particular requirements that exist in ISO 9241-171 about always-on-top windows, highly visible cursors and thresholds for key acceptance. But these gaps may be addressed as the EN is still under review.

The main conclusion is that organizations that are already using existing standards for software accessibility such as ISO 9241-171, ISO/IEC 13066-1 and ES 202 975 should be able to adapt to EN 301 549 once it is published, as there are few new requirements. The main set of new requirements that affect most software products (as long as they provide a user interface) is the set of WCAG-based software criteria.

Table 2. New requirements in EN 301 549 that do not appear in other international standards

Subject area	Clause numbers in the EN
Accessibility features	5.2
Biometrics	5.3
Information conversion	5.4
Locking or toggle controls	5.5
Meaningful sequence, sensory characteristics, images of text, link purpose, multiple ways, headings and labels, language, error suggestions and parsing	11.2 (WCAG-based success criteria)
Two-way voice and video communication	6
Communications services	13.2, 13.3

A key issue related to successful application of the requirements in EN 301 549 is the development process. Accessibility has to be integrated into the standard development process of an organization in order to deliver good accessibility in their product. One good example of process-related guidance is the British Standard BS 8878<sup>26</sup>, which is a process-oriented standard that provides a framework for web accessibility when designing or commissioning web products that have to conform to WCAG 2.0. A similar approach could be applied to EN 301 549, by generalizing BS 8878 to enable its application to any ICT.

## Acknowledgements

The authors wish to acknowledge all the experts who have been members of STF 416: [http://portal.etsi.org/STFs/STF\\_HomePages/STF416/STF416.asp](http://portal.etsi.org/STFs/STF_HomePages/STF416/STF416.asp).

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