A self-service approach to promote self-sufficiency, independence and inclusion amongst disabled students

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Abstract. This paper presents how SensusAccess has been adapted and is being used in higher education to create inclusive educational environments. Reflecting on challenges of providing alternate versions of educational material to students with disabilities, it also discusses how the service can benefit mainstream learners.

Keywords. Inclusive education, alternate media, Braille, audio books, large-print, e-books, visual impairment, dyslexia, self-service

1. Introduction

Many people with disabilities are unable to use printed material and therefore require alternate versions of the material in order to be able to complete an education, sustain a job or take part in society. Consequently, timely production of material in suitable alternate formats is a crucial aspect of providing an inclusive educational environment and fundamental to forming educational environments based on universal design principles as advocated by the UN Convention on the Rights of Persons with Disabilities [1]. Without access to the same material at the same time as their fellow mainstream students, students with disabilities are disadvantaged [2-3].

Alternate versions of educational material cover a wide range of different media types such as Braille, audio books, e-books and large-print. Many blind students require material in Braille. Partially sighted students often need large-print material, preferably adapted in accordance with individual diagnoses and personal preferences. Visually impaired students also use audio books. People with dyslexia, learning disorders, poor reading skills or poor language skills need audio books and printed material that has been adapted to individual preferences. People with physical disabilities may need digital editions that can be navigated on e-readers using switch controls. And the list goes on.

Converting material into alternate formats is time-consuming, cumbersome and requires substantial skills and technical proficiency. Often faculty needs to make lists of readings and other course material as well as actual handouts and exercises available for conversion weeks or even months in advance, if the material is to be available in suitable formats for students with disabilities, resulting in reduced flexibility. Likewise, it may be necessary for students with disabilities to involve fellow students or staff members to convert handouts, assignments and supplementary readings, resulting in both delay and

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invasion of privacy. Because of the time and efforts needed for traditional alternate media conversion, catering for the needs of students with disabilities is often being seen as an overly expensive burden by academic institutions. In summary, most traditional alternate media conversion methods are manual, slow, inflexible, expensive and rely on help from others.

2. Approach

A solution to the timely availability of educational material in suitable alternate formats could be a user-centric solution that enables those with disabilities to convert their own documents. The tools and technologies used by alternate media professionals to convert material are well known, and most of these supports automation.

The above scenario formed the foundation for the creation of the RoboBraille service in 2004. Incepted and developed by Sensus and backed by a national resource center, RoboBraille combines well-known document conversion technologies with automated workflows and an intuitive user interface. Originally developed to support the needs for an inclusive environment for the 450 visually impaired children in the Danish primary school system, it soon became apparent that the approach had the potential to solve a universal problem of inclusive education. By reaching out to partners across Europe, it was possible to add support for a wealth of languages beyond Danish, thereby making the service relevant to an international community. Likewise, other reading platforms and document formats were added to expand the user base to people with print impairments in general [4].

The service was first introduced as an official accommodation in higher education in a collaborative project between Sensus and Stanford University in 2011. Rebranded SensusAccess, the project added a customizable web interface, reporting capabilities and a range of important conversion options to the original service. The project also created the foundation for a sustainable business model and for a resource-sharing scheme [5]. SensusAccess was designed to support inclusion and universal access and is therefore not available for individual, personal licensing. This approach serves several purposes:

Inclusive: By making the service available to everyone rather than just to people with disabilities, the aim is to avoid the stigma that may otherwise be associated with assistive technologies. Mainstream users of the service include foreign students with poor language skills, foreign language learners, flexible learners interested in mixing modalities, faculty with a need to convert legacy PDF documents and others [6].

Long-term: Students with disabilities are likely to have the same special needs when they graduate and go into further education or get a job. The inclusive approach enables institutions to offer the SensusAccess service as a long-term strategy that extends to both students and alumni.

Open: Academic institutions can avoid the hassle of tracking users and granting access rights, and are not being penalized financially as more users convert documents with SensusAccess.

3. Results

Today, numerous academic institutions and systems across North America and Europe subscribe to SensusAccess and make the service available as an official accommodation

to students with disabilities. New features are added regularly in response to real-world issues reported by institutions and individual users. Provided as a web-based service, there is no need to install software and SensusAccess is available across platforms irrespective of operating system, browser and hardware.

SensusAccess is an entirely automated self-service solution intended for everybody with a need to convert material into alternate formats. The service supports a substantial number of languages and some target formats even has multilingual support [7]. With SensusAccess, users can convert popular document types into several target formats: (1) MP3 audio files; (2) structured audio books in both DAISY and EPUB3 with media overlay; (3) reflowable e-books (digital large-print); and (4) digital Braille books. In addition, SensusAccess can convert otherwise inaccessible or tricky formats into more accessible formats.

Academic institutions state that they subscribe to the SensusAccess service for a variety of reasons: (i) To promote and support independence and self-sufficiency; (ii) to ensure availability of material in suitable alternate formats; (iii) to preserve privacy amongst students with disabilities; (iv) to provide situation-dependent formats; (v) to facilitate reuse and avoid costly, specialized equipment; and (vi) to provide accessibility support in online education.

Although SensusAccess is mainly used as a user-driven document conversion service, academic institutions are increasingly exploring how the service can be exploited to improve the accessibility in other solutions. As such, SensusAccess is being integrated with email-enabled photocopiers/scanners, as well as with learning management systems, digital library systems, learning portals and similar digital services.

4. Discussion

The automated nature of the SensusAccess service constitutes a natural limitation as to what can be converted. These limitations are mainly caused by lack of mature technologies to adequately process, identify and describe structural and content elements in digital files. Examples of such limitations include the inability to accurately headings and heading levels and math equations, and the inability to automatically describe the meaning or function of illustrations in their particular contexts. The consequence of these limitations is that SensusAccess is primarily useful for converting two types of documents: (1) documents that mainly contain text and (2) documents that comply with the accessibility requirements [8]. In case of the latter, documents may even include sophisticated contents such as math equations, charts and illustrations. SensusAccess is less suited for converting inaccessible documents such as image-only math and biology text books and other similar STEM-type material.

SensusAccess has two main capabilities: (1) it can convert inaccessible or tricky documents into more accessible formats or formats that are easier to use; and (2) it can convert already accessible documents into sophisticated alternate formats such as DAISY Talking Books and e-books. As discussed above, SensusAccess is not the end solution to all alternate media conversion needs nor will it ensure accessibility compliance. At present, some documents – especially STEM-type material – will require human editing and value adding in order to ensure that the material can be made comprehensible to and rendered in formats suitable for those with disabilities. Likewise, compliance with accessibility requirements cannot (currently) be automated and does require authors to be proficient with their technology.

5. Conclusions

Moving ahead, SensusAccess is expected to continue to support and promote self-sufficiency, independence and inclusion amongst print-impaired students. Improved capabilities and new conversion options will be added to the service in order to cover a larger proportion of documents. However, improved authoring practices towards improved accessibility are also needed to ensure timely access to alternate versions of educational material.

The boundary between conversions that can be automated and conversions that need human intervention is not stationary. As existing technologies mature and new technologies emerge, major advances are expected over the coming years. To this effect, several technologies are being researched for adaptation in SensusAccess. These include accurate math recognition, recognition of document structure with conversion into proper mark-up, automated provision of image descriptions and video captions, language-to-language translation, speech recognition and text-to-sign language translation. A significant challenge is the lack of skills amongst those producing digital material. As such, knowledge workers are often expected to know how to use word processors, presentation software, PDF converters and similar in a correct and accessible way without proper instruction, few are aware of the principles of digital accessibility and even fewer attempts to comply with these. The result is that the vast majority of all published material is inaccessible to readers with print disabilities. An unpublished survey (2014) by the Danish Ministry of Education revealed that almost all education material produced by the educational institutions failed basic accessibility criteria and that approx. 80 per cent of the errors were introduced by the authors themselves. To address this issue, instruction in the proper use of authoring technology should be mandatory for faculty and staff creating or publishing educational material.

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