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RoboBraille as a UDL tool: Evaluation of the service converting printed materials into speech and Braille in Poland

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Abstract

RoboBraille is a free-of-charge online service used to convert black-printed texts into an audio or Braille format. After its creation in Denmark, it has since been implemented in many other countries. The aim of the research conducted in Poland was to clarify the performance of the service in a Polish context (a web-based questionnaire was created). The main group of examined users consisted of students and teachers of pedagogy. Results: RoboBraille proved to be a tool of high usability. The availability of the service free of charge was an important reason to test it. The service was used both by people with visual and reading impairment and by those without dysfunctions. Over 93% of the recipients wish to use it again, although only 9.5% were visually impaired. The utility of RoboBraille for different groups makes it not stigmatizing. In the cases of visual and reading impairments, RoboBraille is a necessity in converting text to alternate formats, while for people without disabilities, RoboBraille can serve as an assistive learning tool or be of entertainment purposes. Attracting the attention of teachers and students to RoboBraille may promote the use of the service among a larger user group of dyslexic, blind, low-vision and old-age people.

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Keywords: RoboBraille, reading impaired, visually impaired, UDL.

1. Introduction

Universal Design for Learning (UDL) guides teachers and educators to increase students' access to learning by reducing physical, cognitive, intellectual and organizational barriers in learning such as different backgrounds,

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learning styles, abilities and disabilities (Rose & Meyer 2002). Persons with a reading disability are part of a group in need of support both in education and their everyday lives.

In the developed world, over 82 million people experience difficulties in reading printed materials: blindness, partial sightedness, learning disabilities such as dyslexia (Chan et.al., 2009). Taking into account all cognitive, sensory, physical and learning disabilities, individuals with print-related disabilities compose 52% of students in the postsecondary disability population (National Center for Educational Statistics, 2003). They are often forced to rely on others when accessing written information, which leads to a loss of independence and productivity or they appear to be slow readers, which in turn leads to frustration and discouragement. Reading constitutes a fundamental component of education, independent professional and personal life (Chan et. al., 2009). The use of assistive technologies provides these people with an access to information on an equal basis to others, while at the same time allows the full participation at school, work and in daily life (Edwards & Lewis, 1998).

However, research indicates a limited usage of assistive technologies by visually impaired people that constitute the majority in the population of reading-disabled persons. Nationwide calculations made by Kelly (2009) showed that 59% to 71% of students with visual impairments able to benefit from assistive technology did not have the opportunity to use it. What is the cause? The analysis of literature allows us to point to three fundamental reasons: financial, social and the lack of knowledge and skills of the teachers.

The Polish research on the use of new technology by visually impaired persons shows that the main barriers to use hardware and software are high prices, lack of support and technical complexity (Walter 2007).

There is also a problem of competence and knowledge of teachers working with people with special needs in the field of reading printed texts. American research shows that teachers did not feel confident when teaching the use of new technologies and they assessed a low skills level in this area. In the process of self- training and retraining they often do not have hands-on experience with many assistive devices to read print (Lee, Vega, 2005; Parker et al., 1990).

A survey of 165 teachers in Texas (Zhou et. al., 2011) showed that 57.5% of them did not feel confident to teach the usage of technologies to support their students. They had a significant deficit of knowledge in 55 of 74 (74.32%) competencies, such as: the knowledge of the Braille alphabet-related equipment and the ability to use it, the usage of screen-reading programs, the usage of Braille text conversion software, the usage of Braille displays and accompanying software, fundraising knowledge for the purchase of technological equipment. Similarly, the majority of teachers of students with visual impairments in Florida admitted they were not familiar with most of the various types of access technologies mentioned in the survey and had difficulty acquiring the training needed in this field (Edwards & Lewis, 1998). The lack of competence in teaching students with visual impairments using assistive technologies was reported by 51% of the teachers who participated in the study of Abner & Lahm (2002). Another survey by Kapperman, Sticken, & Heinze (2002) revealed that 72% of the teachers they interviewed were unable to answer the questions on assistive technologies because they lacked enough knowledge in this field. Brazilian research (Alves et al., 2009) showed that almost all (94.8%) teachers working at schools attended by visually impaired students did not use information technology in didactic work. The most common reason was the lack of competence in this area (70.4%). The lack of competence in computer use among students was indicated less often (20.4%).

The universality of using adaptive technologies by the disabled can also be influenced by social factors. Social contacts assume bilateral relationships between blind and sighted people. Visually impaired persons are not only recipients of services facilitating learning/reading of printed texts, but also need to prepare materials to be read by sighted teachers, colleagues, relatives. In addition, fully-abled people without adequate knowledge and skills who work or support persons with disabilities must have a simple tool they can use.

Creators of technologies supporting the development of self-reliance in the lives of the disabled stand before a choice in the designing process: a narrow design which may fail marketwise or a broad design that may fail usability-wise. Due to the narrow circle of users strongly specialized assistive devices may not ensure their creators economic success. On the other hand, widening the set of features risks not meeting various needs and capabilities of users (Chan et al., 2009). Creating a simple, universal tool allows to create the transparent social space in which the same rules define the functioning of all participants. Promoting support tools which are easy to use also by non-professionals is particularly important in the public area - in offices, customer service points and other such places. It would be desired if next to the specific equipment tailored to the capabilities and needs of its users, regarding

perception and finance as well as functionality, a universal solution would apply for easy reciprocal communication between persons with and without reading disabilities.

2. RoboBraille – an easy-to-access, universal tool supporting sightless reading of the print

RoboBraille is a good tool for creating transparent social space which supportd access to and exchange of printed information. It is available for free for non-profit purposes, which allows to overcome the financial obstacle to access adaptive aids. Access to RoboBraille is free and easy. It does not require specialized knowledge, equipment or training – all one needs is a computer, access to the Internet and the ability to use it (send and receive e-mails with attachments). It provides discreet use, as motivated by an intention to incorporate it into the environment of sighted people. It brings benefits of usage for people with and without difficulties in reading print (Kilian & Śmiechowska-Petrovskij, 2011).

RoboBraille is an e-mail-based service which can convert digital text documents into either Braille or audio files. The user sends an e-mail with an attached text document to the specific RoboBraille e-mail account according to the needs. Shortly, they should receive the document back from RoboBraille in the specified format – e.g. an audio file. RoboBraille allows to prepare teaching materials in Braille or in audio format. It facilitates users to read books, scientific or informative texts or simply as a form of entertainment, if available in an electronic text file form. RoboBraille automatically converts documents into a variety of alternate formats. The tool currently offers service in four categories:

1. Braille transcription services: translation to and from Braille (contracted, uncontracted).
2. Audio conversion services: All document types listed in the previous section may be converted into mp3 files. What is more, RoboBraille is capable of converting well-structured Word documents into Daisy Talking Books complete with audio.
3. Accessibility services: Otherwise inaccessible documents such as image files, image-only pdf, as well as all pdf file types may be converted to more accessible formats.
4. E-Book conversion services: Most document types listed above may be converted into the popular ePub and Mobi (Kindle) e-book formats.

The service was originally developed for the blind and for the partially-sighted but it also assists other people facing reading difficulties such as dyslexics, mentally or physically disabled. In current, dynamically agin societies there is also an increase in demand for services aimed at meeting the specific needs of the visually impaired older people. Their secondary reading disorders manifest in difficulties in acquiring Braille and in the use of specialized equipment and software, which may prevent them from reading printed texts.

Another group of recipients consists of people having no difficulties in reading printed texts, i.e. parents, guardians and teachers of those embarked with such deficiency, who do not possess the necessary specialized knowledge and equipment to transform the printed text into an audio or Braille format. RoboBraille accommodates the preparation of teaching materials in Braille by teachers and educators who rarely use alternative formats, because they do not read Braille.

Another important target group that can benefit from the described service is a variety of public and private institutions and information centres, offering special needs customers the exchange of printed materials, but having no special equipment or sufficient knowledge to accommodate it.

The service can also be beneficial to people with no reading skills at all, which demostrates its possibilities in mitigating the effects of illiteracy. There is a planned implementation of RoboBraille in countries with a high coefficient of illiteracy, e.g. in Africa, made available via mobile phones and the Internet.

The fifth, broad group of users is constituted by non-disabled people who do not show any difficulties in reading and are of no connection with people bearing such difficulties, who use the possibility to transform the printed content into a sound form for entertainment or scientific purposes, e.g. commuters, students who prefer learning by hearing. The service is easy to use both for people having sufficient knowledge and competence in using highly specialised and customised assistive technology and for people without such knowledge and competence. They use the e-mail service for work, learning or pastime activities. The fact that the service may be used by different user

groups makes it universal and non-stigmatizing, which is why it can be classified as a UDL tool (Kilian & Śmiechowska-Petrovskij, 2015).

RoboBraille has been developed in cooperation with Sensus ApS and Synscenter Refsnæs in Region Zealand, Denmark. The service is constantly undergoing further development with the support from various external resources. It has been operational since 2004 and since 2009 in Poland. The RoboBraille service has recently expanded its services to include the Polish language, and the need for user opinions in Poland has called for a survey.

3. The study

The evaluation of the Polish RoboBraille version was conducted in 2010 by The RoboBraille Consortium and The Cardinal Stefan Wyszyński University in Warsaw, Poland among the Polish users of the RoboBraille service. The aim of the survey was to assess the performance of the service in the Polish context.

The RoboBraille Team in Denmark developed the questions for the test in collaboration with Polish partners. Users from Poland were invited via email to participate in the questionnaire. Polish partners, organisations, universities and other friends of RoboBraille in Poland were encouraged to send out an invitation to their network with a link to the localized web-based questionnaire. The participants were required to have used the service at least once. If they had never tried it before, they were sent a link, encouraged to use the service and evaluate it afterwards.

The survey included questions regarding:

- Users' background information (age, sex, employment status)
- Service use (scale and scope of use, expectations about future use)
- Service usability (feedback, accuracy, stability, overall satisfaction)
- RoboBraille's impact on everyday life

The survey was created with closed multiple-answer questions, with a single option to comment. It was designed to address blind users as well as sighted individuals, and therefore a few questions regarding daily use were not relevant for students in general. When a question, due to the nature of the participants, was deemed not relevant to the study it was omitted or mentioned in the context.

4. Results

In total, 64 Polish users of RoboBraille participated in the web-based survey. In the Polish study, 73% were students, primarily students of pedagogy, and 12.7% were teachers. The remaining participants were as follows: specialists of typhlopedagogics, academic teachers and other professions. Visually impaired participants constituted 9.5 % of the respondents. This response rate does not allow to generalize about the results in regard to all users of RoboBraille. However it allows us to present an explorative study where the results provide us with a solid indication of who the users are and how they evaluate the service.

Replies to the initial background questions have shown that the average user in the survey is between 20 and 29 years old and represents 81% of the participants, the the majority of whom are women representing 85.7%. These figures reflect a general population of the students at the university.

4.1. Use

The majority of respondents (85.2%) have used the service 1-3 times, 9.8% have used it 4 times or more. Almost all of the participants tried the text-to-audio conversion (91.8 %). 13.6% have made a conversion into Braille, 23.8% have converted a file into other formats, 2.3% tried creating a DAISY book.

93.4% of Polish users want to use the service again. The reason for the continued interest in the service is perceiving it as a good tool for studies and in future work situations. The purpose for the future use of the service is close to being evenly shared between the different functionalities of the service: 82.1% refer to converting a text to an audio file in mp3 format, 21,4% refer to creating a book in the DAISY format (the structure of an audio book), 30,4% refer to converting graphic files, pdf, rtf or MS Word documents into other types of files (conversion) and

35,7% refer to converting documents to Braille. This indicates that the different functionalities of the service are all seen as important tools for the participants either in future work situations or in their current situation.

4.2. Usability

Respondents have also evaluated the usability of the service. In regard to the speed of transferring documents 75.9% of the surveyed have pointed that the service is fast or very fast. In the opinion of 77.6% of the examined, the quality of the transferred document was good or very good. In the evaluation of 82.8% of respondents, the service is stable or very stable. When asked about their satisfaction with the service 89.3% participants answered that they were either pleased or very pleased. No-one was disappointed with the service.

4.3. Everyday life

The survey conducted in Poland showed that 94.7% of the participants agreed that an important reason to try the RoboBraille service was that it is free of charge. Moreover, 34.5% of respondents stated that RoboBraille made it easier for them to participate in studies and/or leisure activities. 16.7% said that RoboBraille is an important assistive technology in their daily life. 11% agreed that they would find themselves in a worse situation, if the RoboBraille service had not been invented. 5.5% claim RoboBraille makes it easier for them to read public information, bank statements. The majority of participants (86.3%) agreed that they see the potential for this service as a supplement to the existing assistive technology solutions. The participants answered that they would use the tool in the future in work/study-related circumstances, stating a variety of potential uses.

5. Conclusions

The Polish RoboBraille study offers key findings. First of all, the participants were very positive in their replies in all cases. The usability of the Polish text-to-speech engine meets the anticipated quality of the Polish users. The service appears to be well suited for the Polish users with its new Polish speech synthesis and conversion engine.

Secondly, a large part of users wanted to use the service in spite of not bearing any disabilities. The fact that people (mostly students) found RoboBraille useful as an assistive learning tool is important as it suggests that the use of the service extends beyond being an assistive technology. Another interesting finding is the variety of the types of users. When the service is used both by people with and without disabilities, RoboBraille is merely a smart and convenient service. For the visually and reading impaired individuals RoboBraille is a necessity to convert text to alternate formats, for people without disabilities RoboBraille can serve as an assistive learning tool or for entertainment purposes.

If students, mainly of pedagogy, would generally like to use the service, it could make the process of reaching their future wards with reading disabilities. The participants answered that they would use the service in the future in work/study-related circumstances. The functionalities they suggested that they would use were very widespread. Such use would be of real value for the RoboBraille service, since this would benefit many end-users if incorporated into work routines for employees with print reading difficulties. Making teachers and students interested in the RoboBraille service may promote the use of the service in supporting people with reading disorders by reaching a larger user group of dyslexic, blind, low vision and older people.

The RoboBraille service overcomes some of the traditional barriers of assistive technology, which is often costly and complex and users need advanced computer skills or special training to be able to use it. As a web-based service with an intuitive interface, RoboBraille can be operated by everybody and provides efficient integration within the sphere of families, colleagues, friends, educators and employees, due to its no-stigmatizing character.

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