Inclusive by Design: Enhancing Easy-to-Read Content through User-Centric Approaches

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Abstract
This paper explores the intersection of Natural Language Processing (NLP) and the principles of Inclusive Design in the creation of Easy-to-Read (E2R) content. While NLP offers promising avenues for automatically adapting texts into E2R, current approaches often omit critical involvement from the target users. This lack of inclusion can lead to tools that do not fully align with the specific needs of these groups. Through a detailed examination of Disability Theory and Inclusive Design principles, this paper highlights the necessity of integrating target users into the development of NLP tools for E2R. We argue that such an inclusive approach not only enhances the effectiveness of these tools but also ensures that they are genuinely accessible to the people they are designed to assist. The paper concludes with recommendations for future research and development in this field, emphasizing the importance of user-centred design.

Keywords
Natural Language Processing (NLP), Easy-to-Read (E2R), Inclusive Design, disability

1. Introduction

In the evolving landscape of global communication and information access, the importance of inclusive and accessible content cannot be overstated. This is particularly crucial for individuals with cognitive disabilities and those facing literacy challenges. Improving cognitive accessibility is essential and aligns with the United Nations' (UN) tenth sustainability goal, which focuses on reducing inequality both within and between nations. A fundamental aspect of this goal is ensuring equitable access to information, a resource as vital as any other in our increasingly interconnected world. According to the United Nations Convention on the Rights of Persons with Disabilities (CRPD), access to information, knowledge and culture is a fundamental right, and states should facilitate information in accessible ways [1]. The UN stated that 759 million adults, or 16% of the world's population, do not possess the basic literacy skills [1]. These literacy issues have been made worse by the COVID-19 pandemic's aftermath. The number of children struggling with reading skills has escalated alarmingly, rising from 460 million to 584

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[1]Education for All: Rising to the Challenge https://www.un.org/en/chronicle/article/education-all-rising-challenge (last accessed 05-03-2024)

million [2]. This increase underscores the urgency of addressing literacy as a critical component of educational and social development. Additionally, a 2013 report by the Organisation for Economic Co-operation and Development (OECD) revealed significant fluctuations in adult literacy proficiency at the most basic levels across OECD countries, ranging from 4.9% to 27.7% [2]. The 2015 report by the OECD revealed that even among younger, formally educated populations, 10% of recent graduates in these countries exhibit weak literacy abilities [3]. On the other hand, around 16% of the world's population lives with some form of disability; this estimate is increasing due to population ageing, the rapid spread of chronic diseases, and improvements in disability measurement methodologies [3] [4].

One strategy to bridge this accessibility gap is the implementation of Easy-to-Read (E2R) language formats. The information presented in E2R is intended to be easy to understand, limiting itself to the basic grammar and vocabulary of a given language. E2R is mainly aimed at people with cognitive impairments, although there are other target users who can also benefit from it, namely people with various learning disabilities, neurocognitive disorders, people with intellectual disabilities, people with auditory disabilities, or people with low literacy [4, 5, 6]. Immigrants are also considered a target group in some countries, while in others, they are expected to learn the language without the aid of E2R [6].

The process to create E2R texts is very costly in both time and financial resources, as it involves several steps. This makes it difficult to keep up with time-sensitive materials such as news texts or regulations. Natural Language Processing (NLP) offers a promising solution to these challenges. NLP technologies might be leveraged to create tools and applications that automatically adapt a given text into E2R. While some initial work in this area shows promise, these technologies still face limitations. Most existing work in developing E2R tools using NLP technologies tend to overlook the involvement of target users in the creation process. This paper delves into the concepts of disability and inclusive design, and emphasizes their importance in the development of NLP tools for E2R.

The rest of the paper is structured as follows: section 2 introduces some related work on NLP for E2R, section 3 deals with the concept of disability, ableism and inclusive design, section 4 presents some Inclusive Design proposals, and section 5 discusses the main conclusions.

2. NLP for E2R

Work has been conducted on various E2R language variants, and multiple solutions have been proposed.

The rules of *Leichte Sprache*, the German version of E2R, have been implemented in *Acrolinx*[5]

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[2]100 million more children fail basic reading skills because of COVID-19 https://news.un.org/en/story/2021/03/1088392 (last accessed 05-03-2024)

[3]Disability https://www.who.int/health-topics/disability#tab=tab_1 (last accessed: 05/03/2024)

[4]Obtaining detailed and specific global statistics on cognitive and intellectual disabilities is challenging due to variability in the definition and diagnosis of these conditions, as well as differences in data collection and reporting between different countries and regions. Often, global reports tend to lump together various forms of disability without disaggregating them by specific types such as cognitive or intellectual.

[5]*Acrolinx* https://www.acrolinx.com (last accessed 12-03-2024)

and *LanguageTool*[6] [7, 8]. For *Leichte Sprache* we can also find the *EasyTalk* paraphrase generator [9]. Some efforts have also been made for *Lectura Fácil*, the Spanish E2R version. *Simplext* [10][7] is a rule-based prototype for syntactic simplification in Spanish. The *ClearText* project [11][8] is aiming to create a tool that simplifies Spanish texts from the public administration to make them more accessible to people with mild to moderate cognitive impairment. The *FACILE* application seeks to support the *Lectura Fácil* adaptation of documents in a (semi)-automatic fashion [12]. There is also an automatic lexical simplification service for French, named *FrenLyS* [13]. We can also find some multilingual tools such as *MUSST* [14], a rule-based multilingual syntactic simplification tool, supporting sentence simplification for Spanish, English, and Italian. On the other hand, *SUMM AI*[9] is an AI-powered tool aimed at adapting standard text into E2R, and it is available for both German and English. *Capito Digital* [10] is another AI-powered tool, which works for German, English, French (beta version) and Spanish (beta version). It allows the automatic simplification of a given text in 3 language levels (A1, A2, B1). Sabine Manning offers an overview and comparison of the aforementioned tools and others [11][12].

As discussions about ChatGPT [15] continue to spread across various fields, it is worth considering its potential as a solution to the problem at hand. Experiments have been conducted for *Leichte Sprache*, which have shown that ChatGPT-generated texts are simpler than standard ones, but do not meet the E2R criteria [16]. ChatGPT has also been employed for *Lectura Fácil*. Results showed that ChatGPT does not stick to E2R rules and that target users prefer the original E2R version [17].

On the other hand, it is also worth highlighting that there are some well-known proofreading and translation commercial systems such as *LanguageTool* or *DeepL-Write*[13] that are starting to offer adaptations into easier language. These easier variants do not comply with E2R rules. However, it is a sign that more and more companies are interested in offering this service, and that there are probably people out there who are interested in having the option to simplify text. One thing to bear in mind is that the vast majority of these tools are intended to assist E2R translators in their task of adapting texts. The outputs need to be post-edited and the layout of the text needs to be adapted. Therefore, we are still far from being able to offer a tool that the target users themselves can use on their own.

2.1. Limitations

One significant issue is the tendency of NLP models like ChatGPT to produce "hallucinations" [18, 19, 20], that is, instances where the generated information might not be real or might differ

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[6]*LanguageTool* https://languagetool.org/?force_language=1 (last accessed 12-03-2024)

[7]*Simplext* http://simplext.taln.upf.edu (last accesed: 08/03/2024)

[8]*ClearText* project https://cleartext.gplsi.es (last accessed 08-03-2024)

[9]*SUMM AI* https://summ-ai.com/en/ (last accesed: 07/03/2024)

[10]*Capito Digital* https://www.capito.eu/en/capitodigital/ (last accessed 14-03-2024)

[11]Sabine Manning, *Multisprech* https://multisprech.org (last accessed 14-03-2024)

[12]Due to space constraints, not all existing tools and resources could be mentioned in this paper. New opportunities emerge every day, and these are only some of the tools and resources that we considered relevant at the time of writing this paper. We are not making any quality judgement about any of the tools mentioned here, the claims we do are based on information presented in their webpages.

[13]*DeepL-Write* https://www.deepl.com/write (last accessed 12-03-2024)

from that of the source text. This can be particularly problematic in E2R applications, where accuracy and clarity are paramount. In E2R contexts, hallucinations have been identified in the outputs of systems, and they have been considered in checklist evaluation protocols [17]. NLP algorithms can inadvertently perpetuate stereotypes. Since these models are trained on vast datasets that often contain biased language, there is a risk of reinforcing negative stereotypes, especially in sensitive contexts like disability. The propagation of stereotypes through NLP can lead to ableism, a form of discrimination against individuals with disabilities. This is a critical concern in developing NLP tools for E2R, as it can undermine the inclusivity and respectfulness of the content. Many studies or projects involving NLP for E2R do not include members of the target group in their design and testing phases. This omission can lead to solutions that are not well-suited to their actual needs and preferences. Lastly, it is important to recognize that there is no universal solution in NLP for E2R. Cognitive disabilities are diverse, and what works well for one group may not be effective for another. Tailoring NLP solutions to meet diverse needs is a complex challenge that requires ongoing research and refinement.

Addressing these limitations is crucial for the development of effective, respectful, and inclusive NLP applications in the E2R domain. It involves not only technical improvements in NLP models but also a more inclusive approach in design and testing, with active participation from the target user groups.

3. "Disability"

When talking about assistive technologies, it is important to provide a definition of what "disability" means. The most widespread definition, and the one that comes to mind for many people, is probably the following: "When it comes to disability, 'normal' people are quite willing to volunteer solutions, present anecdotes, recall from a vast array of films instances they take for fact [...] disability seems so obvious – a missing limb, blindness, deafness. What could be simpler to understand?" [21] But of course it is not as obvious as Davis ironically points out. Thanks to (cultural) disability studies, we can look at the topic in a more differentiated way. In the context of NLP solutions, it is necessary to reflect as well.

3.1. Three different models of disability

The term 'disability' may have many different meanings and interpretations. In an aim to shed some light on this matter, we will discuss three different types of disability models[14].

- **The individual model of disability:**
  A well-known traditional model of disability is the "individual model" which sees disability as a medical condition [23]. This model deals with the difference between the "abled" and the "disabled" and people's "abilities" or "disabilities" in physical, psychological or mental issues. This individualistic-reductionist aspect of disability is often used and describes disability as an individual fate and thus as a personal problem. [24]. The individual model of disability is not an approach advocated by Disability Studies [22]. This model falls

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[14]Some studies discuss more disability models [22], but we focus on these three as they are the most relevant in the scope of this paper

short and therefore appears to be rather unsuitable for the development of appropriate assistive technologies.

- **The social model of disability:**
  While the first model equates disability only with impairment, the social model makes the distinction between two categories: "impairment" and "disability". In this model's view, being disabled is due to social circumstances [25]. With this, the social model of disability explicitly speaks out against the first model. "Since its introduction in the late 1970s, the social model of disability has changed international disability discourses. This model, as academics and activists with a disability studies background well know, emphasizes that disability is a social construction" [24]. But this model also became criticized, because the physicality of disability was often excluded and reference was mainly made to the social barriers. [22].

- **The cultural model of disability:**
  Anne Waldschmidt sees several advantages in defining another model of disability, namely the "cultural model of disability" "[...] the cultural model of disability implies a fundamental change of epistemological perspective since it does not deal with the margin but rather with the 'centre' of society and culture" [24]. She defines disability as a discourse and not only as a given entity or fact [24]. With regard to the programming of NLP-based software solutions, the cultural model might offer some good food for thought. Both the individual and social model offer perspectives for something that is a problem and therefore needs to be fixed [25]. In the individual model, disability is a person's own problem due to own limitations and deficits. In the social model, it is a problem of society or something not being designed in a barrier-free way. The cultural model, however, does not define disability as "the problem" but rather as a physical differentiation and diversity as the norm [25]. This cultural perspective allows us to recognize and value heterogeneity [25].

The task of making such cultural techniques more accessible is not trivial and requires not only technical know-how, but also an open mindset and fewer barriers for 'experts in their own field'. However, in many areas of society, people with disabilities are still not sufficiently integrated. We rarely find people with intellectual disabilities in inclusive working groups. This fact prevents the users' valuable experiential knowledge from being incorporated into development processes.

3.2. Ableism and Technoableism

International disability studies use the term "ableism" as a concept that is comparable with sexism or racism. It is also a term that is often used in activist contexts [26]. "Ableism is a set of beliefs, processes and practices that produce – based on abilities one exhibits or values – a particular understanding of oneself, one's body and one's relationship with others of humanity, other species and the environment, and includes how one is judged by others" [27].

In technological topics, Ashley Shew uses the term "technoableism", which opens an interesting view on NLP developments and ableism issues. "Technoableists usually think they have the good of disabled people in mind. They do not see how their work reinscribes ableist tropes and

ideas on disabled bodies and minds. As we consider applications of Artificial Intelligence, it is important to recognize and work against ideas that reimpose and reinforce ableist claptrap under the guise of empowerment." [28]. What Shew points out is something that we should always keep in mind when we talk about NLP tools for E2R and accessibility in general. The tools should be created for the real target users and not for the pre-conceived idea that we have of them. These presuppositions usually hold stereotypes within themselves.

3.3. Inclusive Design vs. Universal Design

Over the years, different terms and concepts have been used to discuss the creation of products that are accessible to all audiences. The most well-known and widely used terms today are *Universal Design* and *Inclusive Design.* According to The Center for Universal Design at North Carolina State University[15], Universal Design is "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design". On the other hand, Microsoft describes Inclusive Design as "a methodology, born out of digital environments, that enables and draws on the full range of human diversity. Most importantly, this means including and learning from people with a range of perspectives"[16].

Therefore, it could be stated that Universal Design leads to a single solution designed to accommodate as many users as possible; this carries the risk of excluding some individuals. The definition also emphasises the end goal of a design rather than the process of getting there. In contrast, Inclusive Design focuses on the design process [29]. How you get there is what makes it inclusive; "designing objects *with* rather than *for* excluded users" [30].[17]

Based on this definitions, it can be argued that inclusive design is the way to go when creating NLP tools for E2R. Nonetheless, these terms are often used interchangeably. Regardless of which one is used, the development of NLP tools for E2R should involve end-users in its creation, as experts in their own cause.

4. Current Practices and Proposals

In this section, we explore some projects that have employed Inclusive Design and we propose practices to be included in the creation of NLP tools for E2R.

4.1. Current Practices

Although there are currently not many E2R projects using inclusive design, we would like to mention two of them.

The project *AInfach – Das Arbeitsleben vereinfachen mit KI* (AIeasy - Simplifying working life with AI) [18] aims to develop a digital learning program that teaches digital and media skills

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[15]Center for Universal Design https://design.ncsu.edu/research/center-for-universal-design/#:~:text=The%20design%20of%20products%20and,for%20adaptation%20or%20specialized%20design. (last accessed 12-03-2024)

[16]Microsoft Inclusive Design https://inclusive.microsoft.design/ (last accessed 12-03-2024)

[17]A case study proposed by [31] exemplifies the difference between these concepts.

[18]*AInfach – Das Arbeitsleben vereinfachen mit KI* https://kopfhandundfuss.de/projekte/ainfach/ (last accessed 12-03-2024)

required to use AI applications. In order to do so, they are employing inclusive design and involving target group members.

Another project that deals with technical reflections and Smart-Home-Solutions is the research project *Intia* [19]. The question they want to answer is "How can digital technology be developed as participatively and inclusively as possible with its users?". *Intia* also offers the opportunity to network and exchange ideas with other *Intia* users via Facebook, in an aim to help users and developers stay in contact and share ideas.

4.2. Proposals

There are numerous recommendations to make products more accessible, as well as recommendations for specific disabilities. For example, the UK Government provides a list of *dos* and *don'ts* for when creating digital products [20]. In the realm of E2R content creation and adaptation, guidelines focus on the end product's language, structure, and presentation, ensuring it meets the criteria that make it accessible and understandable to its intended audience. These guidelines also provide valuable insights into user testing, that is activities for the verification of the understanding of the document. However, they do not extend into a detailed framework for the Inclusive Design process. The W3C highlights the need to include target users in the E2R content creation process [21]. To the best of our knowledge, the idea of Inclusive Design in NLP tools for E2R has not been deeply explored yet. Recognizing this gap, we aim to present a set of recommendations that encapsulate good practices in the Inclusive Design process for the creation of NLP tools for E2R. These practices are informed by a combination of established guidelines, empirical observations, and our own experiences in working with target users. Our goal is to offer a more holistic approach, one that not only addresses the final output but also enriches the process of getting there, ensuring that the creation and adaptation of E2R materials are as accessible and inclusive as the materials themselves. This approach is crucial in fostering an environment where both content creators and end-users are equally considered and supported.

- **Inclusive Design:** including target users in the development phase of NLP tools for E2R texts and conducting discussion sessions with them (refer to 4.2).
- **Interdisciplinary team:** collaborating with a team that includes not only E2R content creators but also other professionals such as accessibility experts.
- **Training for developers and UX designers:** training the developers and UX designers in the principles of E2R and already existing resources.
- **Sensitization for developers and UX designers from the target users:** sensitizing the developers and UX designers on ableism and technoableism. The end-users themselves could be referents or co-referents in the training, as they provide very valuable insights of the challenges they face and their needs.

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[19]*Intia* https://intia.de/ueber/plattform (last accessed 12-03-2024)

[20]Dos and don'ts on designing for accessibility https://accessibility.blog.gov.uk/2016/09/02/dos-and-donts-on-designing-for-accessibility/ (last accessed 12-03-2024)

[21]Making Content Usable for People with Cognitive and Learning Disabilities https://www.w3.org/TR/coga-usable/#working-with-users-with-cognitive-and-learning-disabilities (last accessed 12-03-2024)

- **Accessible content creation tools:** content creation tools should be intuitive and require minimal technical expertise. This allows creators who are not coders or developers to easily produce and modify materials.
- **Multiple formats:** offering materials in various formats (digital, print, audio) to cater to different user preferences and needs. Some users may have multiple disabilities, and therefore may not be able to access all formats.

As it has been mentioned, it is usual to conduct user testing for E2R text. That is, target users read the final output written in E2R and provide opinions on that. Even though general information on how to conduct them is provided in some standards, we believe there are some ideas that we can provide:

- **Tailored content:** testing content that is interesting for the user groups, so that you keep their interest. For example, if a user is interested in sports, it is more likely that they are going to be willing to read something related to that topic, and not e.g. politics.
- **Relevant examples:** when using examples, make sure that users can relate to them.
- **Discussion sessions:** when conducting the user testing, it is important to collect all ideas, even if they are not explicitly related to text understanding, Target users might provide ideas on pictures, layout, the need for more context, or multimodal implementations, among others.

In addition to everything mentioned so far, we believe that collaboration between professionals is essential to advance the field of NLP for E2R. Although there is not anything similar to a centralized webpage yet, the idea to create a platform where practical approaches can be presented and where discussions, seminar concepts or course models could easily be found has been discussed [22].

5. Conclusion

This paper highlights the pivotal role of Inclusive Design in the creation and adaptation of E2R content. Although specific guidelines provide a foundation for addressing some specific needs and provide rules to create E2R content, little information is provided on how Inclusive Design methodologies for E2R. While we acknowledge the complexities in the E2R content creation process, we believe that adopting a methodology that prioritizes user engagement and feedback can help navigate these complexities more effectively.

The potential of emerging NLP tools that automatize or ease the creation process of E2R is noteworthy. Despite their current limitations, these technological advancements offer significant potential for helping to create more accessible content. However, it is important to remember the purpose and audience of these materials. As we embrace these technological advances, our focus should remain steadfast on the individuals for whom these materials are created, ensuring that their needs and preferences are at the forefront of all development efforts.

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[22]Standpunkt·papier zur Tagung „Expert:innen in eigener Sache in Forschung, Lehre und beruflicher Bildung" https://www.ph-heidelberg.de/fileadmin/sonstiges/Tagungen/AW-ZIB-Tagung_2023/Standpunktpapier_20240125.pdf (last accessed 12-03-2024)

Looking ahead, there is ample opportunity for further research and development in this area. Expanding the scope of inclusive design in E2R content creation holds the potential to not only improve the quality of these materials but also to contribute significantly to a more inclusive, accessible, and informed society. As such, we call upon content creators, developers, UX designers, educators, and researchers to embrace these principles in their work. In doing so, they will not only enhance the quality and usability of their materials but also champion a more equitable approach to information accessibility.

Ethics Statement

Our primary aim in this paper has been to promote understanding and inclusivity. The terminology employed throughout the article is purely descriptive, free of any value judgements, and based on the aim of promoting comprehension for a wide audience. If any aspect of our discussion or the terminology used appears to have unintended connotations, we sincerely apologise.

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