Developing an Accessible Survey Completion Tool for People with Disabilities

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Abstract. Introduction*: Surveys are a key method for collecting data, used in contexts ranging from national censuses to customer satisfaction assessments. Despite their clear utility, recent literature highlights their inaccessibility to people with disabilities.* ***Objective:*** *This paper outlines the development of a survey completion tool accessible to people with disabilities.* ***Methodology****: Key steps included identifying requirements for designing an accessible survey completion tool, implementing them, testing the tool with people with disabilities, and refining it based on identified issues and suggested changes.* ***Results:*** *Overall, the tool was found to be accessible to people with diverse disabilities.*

Keywords *Accessibility, Surveys, Survey completion tool, People with disabilities*

1. Introduction

Surveys are a fundamental means of collecting information that can be applied in various contexts, from gathering statistical data at a national level, to satisfaction surveys of service providers. However, literature still mentions accessibility obstacles - not only in surveys[Nicolaidis et al. 2020, Hakami e Al-Aama 2023, Kosa et al. 2023, Wilson et al. 2013, De Cesarei e Baldaro 2015, W3C Web Accessibility Initiative (WAI) 2023, Beck et al. 2024], but also in the components [Nicolaidis et al. 2020, Nicolaidis et al. 2015] and tools to build and complete them [Gottliebson et al. 2010, Allgood 2021]. Despite the various attempts to address these obstacles, these have not been completely successful [Nicolaidis et al. 2020, Hakami e Al-Aama 2023, Kosa et al. 2023, Wilson et al. 2013, De Cesarei e Baldaro 2015, W3C Web Accessibility Initiative (WAI) 2023, Beck et al. 2024]. Considering that accessibility is a civil right, supported by laws and standards (e.g., EN 301 549 [Dahmen-Lhuissier], Decree-Law no. 83/2018 [acessibilidade.gov.pt 2018], the Brazilian Statute of Persons with Disabilities [Presidência da República 2015]) and reinforced by guidelines such as the Web Content Accessibility Guidelines [W3C Web Accessibility Initiative (WAI)], this situation reflects not only legal non-compliance but also promotes social exclusion of people with disabilities. Given this scenario, a survey completion tool was developed based on identified barriers and accessibility requirements. These requirements, drawn from existing literature, consider the diverse accessibility needs of users with disabilities.

2. Literature Review and Requirements Gathering

To gather requirements for accessible surveys, we adopted a snowballing research methodology [Wohlin 2014]. We began with a literature review, searching for papers

with the term “online survey tools for people with disabilities". Also, references of relevant papers were examined to identify further sources. Papers were excluded if they did not address surveys, survey tools, or guidelines for building accessible surveys; or people with disabilities; or if they were literature reviews. This process resulted in 12 articles for further analysis [Stock et al. 2004, Margellos-Anast et al. 2005, Gottliebson et al. 2010, Wilson et al. 2013, Nicolaidis et al. 2015, Schmutz et al. 2016, Davies et al. 2017, Hughes et al. 2019, Nicolaidis et al. 2019, Nicolaidis et al. 2020, Schwartz et al. 2022, Hakami e Al-Aama 2023]. Each article was analyzed to determine the types of disabilities addressed and the user profiles covered. Also, the researched topics (e.g., surveys, survey tools, guidelines for building accessible surveys) were analyzed to determine their characteristics and construction techniques applied. Moreover, the testing methodology was analyzed to comprehend how the topics were evaluated, which participants were considered, and the feedback they provided.

This review resulted in a set of 47 requirements for building accessible surveys, organized under categories such as: Prefaces and context; Navigability; Assistance tools; Audio; Graphics; Clarity and visual adjustments of text; Types of questions; Minimize external influences; Error handling; Internationalization; Data protection, privacy and conformance with accessibility guidelines and legislation; and Accessible informed consent. For each requirement, its origin was identified (i.e., from authors’ statements or participants’ feedback), the associated WCAG 2.2 Success Criteria, and its application (i.e., tool’s back-end processing, tool’s interface, or survey questions creation). An example of a category of requirements is provided in the Appendix, and all requirements gathered can be consulted in an external repository[1].

3. Implementation of the Survey Completion Tool

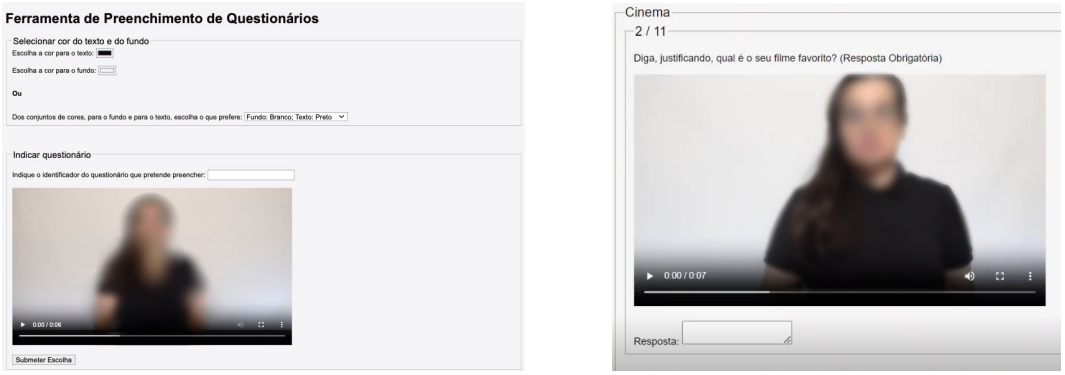
Based on the 47 requirements gathered, the prototype of a Survey Completion Tool was built as a web application. The front-end was developed in HTML, JavaScript and CSS and the back-end in Python using the Django framework. This tool can be used in browsers with JavaScript enabled or disabled, having been tested in various browsers (i.e.,Google Chrome, Firefox and Brave), and on mobile devices with Android or iOS.

The tool includes various accessibility features. Users can personalize the text and background colors of the tool’ pages. It allows survey creators to upload videos with sign language, which are presented together with any textual content in the survey, be it the introductory content, questions, or the answer options. Also, respondents can complete surveys directly within the tool or by downloading a text file with all the questions and options, and then uploading it filled with their answers to the tool. The tool supports various types of questions, such as: open-ended response; short response; response through a numerical scale; choosing images; multiple choice; single choice; response indicating a date or a number.

This tool supports two types of users: Survey Respondents and Survey Creators. The Survey Respondents can fill a survey by providing the survey identifier given by the creator (Figure 1A). The Survey Creators can create surveys by uploading to the tool a file, previously downloaded from it and filled with the survey questions. Figure 1B presents

[1]https://osf.io/9nmzt

an example of a question created using the tool. Creators can access, after authentication, the responses to their surveys.



A **B**

Figure 1. A: Page for indicating the identifier of the survey to be completed. B: Example of question created with the tool. In both cases, a video with a sign language interpretation of the text immediately above is also available.

4. Evaluation of the Survey Completion Tool

After the tool's implementation, an in-depth accessibility study was conducted. Seven frequent ICT users with various disabilities (i.e., visual, motor, cognitive and learning, and hearing), between the ages of 19 and 45, participated in the study. Prior to the tests, a pilot test with a person with a visual disability was conducted.

The study began by welcoming the participants, followed by the collection of their demographic data (e.g., age, disability type, frequency of use of technology, usage of assistive tools, and previous experiences in filling online surveys). Participants were then asked to access and complete a survey in the tool, created by the research team, which had ten questions on the topic of entertainment. Of these questions, there was one open-ended question; one short answer question; one question to answer through a numerical scale; three questions to choose between images; one single answer choice question; one multiple-choice question; one question to provide a date; and one question to provide a number. When applicable, each question and answer options were presented in both text and through videos in sign language. Finally, the participants were interviewed to gather their feedback on the tool's accessibility. The findings from this study were analyzed qualitatively and quantitatively, revealing problems, suggestions for improvements, and positive aspects. These results were divided as to whether they related to the tool or to the survey content.

Problems related to the tool included missing HTML headings or buttons incorrectly interpreted by the screen reader; suggestions offered included hiding the sign language videos for users that do not need them or presenting the section for selecting the background and text colors only on the first page; positive aspects included the one-question-per-page format and the existence of the sign language videos. These findings implied the tool's non-compliance with two of the 47 requirements gathered and some WCAG 2.2 SC.

Findings related to the survey content revealed that three participants considered

the questions to be comprehensible and objective. Nevertheless, there were some interpretation issues in some questions by some participants. Even though the focus of this work is the survey completion tool, these findings also informed a set of recommendations for building accessible surveys.

5. Ethical considerations

The study conducted was approved by the Ethics Committee of the Faculty of Sciences of the University of Lisbon. All participants gave informed consent.

6. Refinements to the Survey Completion Tool

Considering the evaluation findings, the tool was refined to improve its accessibility. The improvements implemented focused in: **Survey submission**, solving problems related to identifying the submission buttons and preventing unintentional survey submissions; **Survey personalization**, allowing users to select which features, signing videos or selection of the background and text colors, they want to be available when completing the survey; **Grouping of radio buttons and checkboxes**, enabling screen reader users to more easily interact with them; **Resolving issues related to buttons being incorrectly processed by screen readers**, to ensure that this technology correctly transmits the information related to the buttons; **Additional changes** to support survey creation (e.g., page with the recommendations for creating accessible surveys) and completion (e.g., refinement of validations performed when completing the survey by uploading the text file) processes, which resulted from problems detected during the refinements or further discussions between the researchers about the tool.

7. Conclusions

Based on the work presented, we concluded that the requirements list represents an extensive guide to promote surveys' inclusiveness and accessibility to people with different abilities.

In addition, the approach adopted in this work enabled direct collaboration with end users to identify areas for tool' improvement. Also, participants' observation during the tests and their statements indicated that the tool is generally accessible to people with different disabilities. This tool constitutes an advancement, since none of the 12 papers reviewed presented a survey completion tool built based on requirements covering the needs of users with different disability types. Additionally, this tool proves to be a useful and accessible means of gathering data, applicable in other research methodologies.

Moreover, it became evident the challenge of considering different, and sometimes contradictory, accessibility requirements of users with different abilities. Such is evident in the papers reviewed, as most focused on one disability type. That said, enabling users to personalize the survey interface, by selecting preferred features to have available during completion, has the potential to address this challenge and increase the interface's accessibility.

This work has some limitations: the tests involved a small sample of participants; the requirements are based on papers published until 2023; the tool currently only supports Portuguese and Portuguese Sign Language. Future work should include: testing the refined tool with a wider sample of users, including with different devices and assistive technologies; assessing the process of survey creation with people with disabilities.

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A. Appendix

A.1. Requirements from the category *Assistance tools*

1. **Ensure compatibility with assistive technologies (e.g. screen readers or screen magnifiers)**
    - Target Audience: People with Visual disabilities [Schmutz et al. 2016];
    - Feedback[1]: Positive indirect[2] [Schmutz et al. 2016];
    - Associated WCAG SC: 4.1.2 Name, Role, Value.
2. **Allow the survey to be completed by uploading an external file with the necessary information**
    - Target Audience: People with Visual disabilities [Hakami e Al-Aama 2023];
    - Feedback[1]: Potential[3] [Hakami e Al-Aama 2023];
    - Associated WCAG SC: 2.5.6 Concurrent Input Mechanisms.
3. **Place buttons below questions that present them in other words, via audio**
    - Target Audience: People with Cognitive and Learning disabilities [Schwartz et al. 2022, Nicolaidis et al. 2019, Nicolaidis et al. 2020, Nicolaidis et al. 2015];
    - Feedback[1]: Positive indirect[2] [Schwartz et al. 2022], Positive direct[4] [Nicolaidis et al. 2015, Nicolaidis et al. 2019, Nicolaidis et al. 2020];
    - Associated WCAG SC: 3.1.3 Unusual Words.
4. **Implement read-aloud functionalities in surveys**
    - Target Audience: People with Cognitive and Learning disabilities [Nicolaidis et al. 2019, Davies et al. 2017, Stock et al. 2004, Schwartz et al. 2022, Hughes et al. 2019, Nicolaidis et al. 2015] and disabilities in general [Wilson et al. 2013];
    - Feedback[1]: Positive direct[4] [Nicolaidis et al. 2019, Wilson et al. 2013, Nicolaidis et al. 2015, Stock et al. 2004, Davies et al. 2017, Hughes et al. 2019], Positive indirect[2] [Schwartz et al. 2022];
    - Associated WCAG SC: Not applicable.

Notes: [1]Origin of the requirement.; [2]Requirements based on authors' observations about the participants.; [3]Requirements based solely on authors' own experience or knowledge reports, without participants' feedback.; [4]Requirements based or supported by feedback given directly by the participants.

A.2. Declaration on the use of AI tools

During the writing of this paper, the ChatGPT AI tool was used for grammatical corrections.