

ResearchProposalFinal(2004728)

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Evaluating the challenges of web accessibility for visually impaired users – Research Proposal

Independent Project (ACCA6020)

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Proposed supervisor: Dr Nicola J. Whitehead

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Contents

List of figures	3
Introduction	4
Chapter 1 Background to the proposed research	5
Chapter 2 Aims and Objectives for the project	6
2.1 Expected outcomes/deliverables	6
Chapter 3 Project design	7
3.1 Project process summary	7
3.2 Data collection and its evaluation	7
3.3 Risks and limitations	8
3.4 Generalisability, reliability and validity	8
Chapter 4 Resources and Planning	10
4.1 Project timeline	11
Chapter 5 References	13

List of figures

Figure 1: Project timeline.....12

Introduction

The project's goal is to investigate and critically evaluate web accessibility, especially in relation to visually impaired users. A software resource will be developed to improve their quality of life as well as a website to showcase best practises for web accessibility. Much of the research will focus on the Web Content Accessibility Guidelines (WCAG) 2.1 [1]; reliable accessibility related papers and assistive technology that helps disabled users browse the web such as screen readers.

Whilst the research aspect of this project will thoroughly evaluate web accessibility, the practical side of it will aim to allow disabled users to easily judge whether a website is properly accessible to them, or not. Essentially, disabled users and in particular those of visual impairment wouldn't waste time being confused when trying to understand the contents of poorly configured websites.

The accessibility checker is not exclusively aimed for use by disabled users. Website developers would benefit greatly from using it as they could quickly see whether their website complies with the WCAG 2.1. This project is worth carrying out as it will help boost not only the quality of life but the productivity of those with poor eyesight.

Chapter 1 Background to the proposed research

The WCAG is recognized internationally in regards to its web accessibility guidance [2]. It provides website developers with guidelines to follow; multiple levels of compliance to aim for [3] and covers a range of disabilities [1].

The WCAG 1.0 has been around since 1999 [4] and has been updated in 2008 by the release of the WCAG 2.0 [5]. WCAG 2.1 has since been published in 2018 [1] and has been officially stated that it “does not deprecate or supersede WCAG 2.0” [1], but exists to aide accessibility further. As of writing, WCAG 2.2 is still yet to be fully approved, although will supposedly be “published by December 2022” [6]. WCAG 3 is also in the works, although will not be released for years [7].

As the upcoming guidelines are not fully approved or are drafts, the WCAG 2.1 will be the main WCAG document and guidelines that are referred to in this study.

Initial research into web accessibility finds that there have been similar studies as this study, such as: “Web Accessibility Challenges” from the “International Journal of Advanced Computer Science and Applications” [8]. It boldly claims that “the majority of websites developed remain inaccessible or semi-accessible” [8]. Similarly, another study claimed that “more than 95% of Web sites investigated were classified as NA” [9] when referring to a study of WCAG 2.0’s guidelines being implemented.

This project will use the information from studies like these to highlight the faults of the WCAG; how it could be improved; the levels of accessibility compliance [3]; why websites aren’t following its guidelines, what it does well, and more.

Web accessibility checkers already exist such as “Wave and SiteImprove” [10]. They are an automated way for website developers or any user to check a website’s accessibility performance, rather than doing so manually. They are not to be solely relied on as false positives can occur, as well as “false negatives” [10]. These checkers are being compared in studies such as: “Comparing Web Accessibility Evaluation Tools and Evaluating the Accessibility of Webpages: Proposed Frameworks” [10].

All of the studies mentioned above and more will help form a critical evaluation of web accessibility; its guidelines; the technology helping developers and end users as well as challenges visually impaired users face from modern, dynamic websites [11]

Finally, as a web accessibility checker and website will be developed, the studies above and further research will give valuable insights into what makes a good website and web accessibility checker.

Chapter 2 Aims and Objectives for the project

Aim:

- To investigate and critically evaluate web accessibility for visually impaired users and develop a website with best practises and a tool which reviews WCAG compliance.

Objectives:

- Research and critically evaluate web accessibility as well as technologies that aide visually impaired users to use the web.
- Design a website demonstrating best practises for accessibility and a tool to automatically review other websites compliance with WCAG.
- To develop a website demonstrating best practices for web accessibility and the development of a tool to automatically review WCAG compliance.
- To test and gather feedback on the developed tool to understand if its design and implementation could be improved.
- Evaluation and conclusion of the research and implementations completed regarding web accessibility; final thoughts; suggestions and recommendations.

2.1 Expected outcomes/deliverables

When the project comes to an end, the following goals should be achieved:

- A website will be developed as a symbol of the best accessibility practises that websites should use to help aide disabled users.
- A web accessibility checker program will be developed – it will compare a website's accessibility to the WCAG.
- A critical evaluation of web accessibility, including its current state, its challenges, recommended improvements to WCAG, what WCAG does well and accessibility tools will be discussed. The report will conclude with recommendations of how the WCAG could be improved in order to improve web accessibility. The report will showcase and explain the purposes of the website and web accessibility checker developed and any data collected.
- Data will be collected and analysed, regarding the web accessibility checker and web accessibility. The data that will be collected is explained further in chapter 3.2.

In order to complete the aim and objectives, each objective will be done step-by-step in smaller sub-tasks. A project timeline, as seen in chapter 4.1 is also set out, to ensure that the time management of the project, its aim, objectives and tasks are clear.



Chapter 3 Project design

As suggested previously, a website will be developed with the best accessibility practises, including a program that reviews other websites' accessibility. The program will automatically scan code and its elements from a website that it has been requested to review. It will identify areas such as whether the font is too small; whether alternative text has been used, whether the contrast of the website is good [12], etc.

Data will be collected from the web accessibility checker as it reviews a website. Further data and feedback will be collected from adults (over 18) that are competent to consent.

3.1 Project process summary

Some time must first be spent learning and recapping the programming/scripting languages: CSS, HTML, Javascript and potentially others. After this, more research will be done into the topic for the literature review. WCAG and related peer-reviewed journals will be used to gather more knowledge on the state of web accessibility; WCAG guidelines; technologies that assist visually impaired users such as screen readers as well as existing web accessibility checking programs.

After much of the research is done, the design of the web accessibility checker and website will follow. Only after this will the development of the website and web accessibility checker begin. The majority of data collection methods as outlined in chapter 3.2 will be used throughout the development and after it has progressed a significant amount. Once amendments to the project's web accessibility checker have been made, the project will be concluded with final thoughts and suggestions regarding web accessibility.

All of these factors aim to ensure that:

- A robust critical evaluation of web accessibility has been completed.
- The website built will have the best accessibility practises, in reference to WCAG, but not necessarily exclusively.
- The web accessibility checker program concludes accurate reviews of the websites it assesses.

3.2 Data collection and its evaluation

When researching web accessibility, data will be collected from the literature review via related research – the data will therefore be secondary information. This quantitative data that is collected will for example reveal the most used assistive web technology [13].

Interview with a focus group. A focus group will be established to gain qualitative data regarding the web accessibility checker. Participants are expected to suggest improvements and critique the program.

Experiments – there will be multiple iterations of the accessibility checker tool to make sure it is as reliable as possible by covering WCAG effectively. Quantitative data will be manually collected here by comparing the results of iterations of the program to other web accessibility checkers, such as AChecker [14, 15]. Tables will be used to easily see side-by-side comparisons of the results. By doing this, the web accessibility checker can be modified and improved to become more accurate.

A survey questionnaire will be used to gather primary feedback regarding the web accessibility checker. Quantitative data will be sought after, however, qualitative data will also be collected to ensure that users have a fair opportunity to critique it, suggest changes, etc in their own words. Productive feedback gained from this will be taken note of and credible feedback may result in changes to the accessibility checker.

The use of quantitative analysis techniques such as descriptive statistics [16] will ensure that data is easy to understand, whilst qualitative data will ensure more open and transparent feedback [17] will be received.

3.3 Risks and limitations

Risks and limitations that the project **COULD** fault to, hence compromising the desired end result:

- Running out of time, thus not being able to finish everything [18]. This could be due to trying to polish the program too much, adding too much unnecessary functionality, etc. To avoid this, good project planning [18] and a focus on the ultimate end result must be a priority.
- Illness [18]. An illness such as the coronavirus disease may significantly affect the project planning and timescale. As a result, some features or aspects of the project may need to be scrapped or downscaled. To minimize this risk, the project timeline should account for some time off due to an unexpected illness.
- Difficulties learning the scripting/programming languages: CSS, HTML and Javascript to create the website and develop the accessibility checker program to a good enough standard.
- Loss of data. To avoid losing work related to this project, it shall be backed up in 3 separate locations – the cloud, local PC storage and a USB drive.
- Legal issues. The Data Protection Act 2018 [19] could be problematic when it comes to storing data – if it is personal data. To avoid this, when collecting data from participants, personal data (including personally identifying data) will not be collected, and all participants will be anonymous. Data will only be collected in the UK to avoid legal issues with other jurisdictions.
- Ethical issues regarding data collection is an issue. It would be unethical to collect data from disabled people and unethical and legally questionable to gather data from vulnerable people who cannot properly give their consent to be a participant. Data will therefore only be collected from adults (over the age of 18) that are competent to give their consent.

3.4 Generalisability, reliability and validity

In order for the project's integrity to be robust, it's important that the generalisability, reliability and validity [20] of this project and its research is handled in the right way. To ensure the project's reliability is not questioned, all data that is collected will be included in the report. This would ensure that the "exact replicability of the processes and the results" [20] could be made. Some data collected will be discussed and displayed in charts in the main body of the final report, whilst the rest of the data will be available in the appendices of the report.

Robert Iwan Jamieson (2004728)

Ensuring that “the results and conclusions are valid for the sample and context” [20] in regard to the project’s research is important and is one key way to ensure the project’s validity is secured. This project will therefore ensure that WCAG, peer-reviewed journals and other reliable sources will be used. By only using reliable and trustworthy sources, the validity of the project will be strong.

During this project, data will be collected from consenting participants. Population generalisability [18] is important as it aims to represent a wider range of the population [20]. To ensure that the data collected can be more widely represented, adults of different ages, gender [18] etc will be targeted.

Chapter 4 Resources and Planning

Below all of the foreseen resources required for the project are listed as well as a project timeline plan to ensure the project is properly managed.

Hardware Resources:

- Home desktop PC and its accessories (mouse, keyboard, monitor, headset).
- Desktop PC at the UWTSD campus and its accessories (mouse, keyboard, monitor).

Software Resources

- Windows 10 Home Edition.
- Programming/Scripting languages: Javascript, Cascading Style Sheet (CSS), HyperText Markup Language (HTML) and possibly Structured Query Language (SQL).
- Notepad++.
- Microsoft Excel.
- Microsoft Word.
- Microsoft PowerPoint.
- Visual Studio.
- Bootstrap framework **may** be used.
- Chromium based browser.
- Photoshop (likely used for some web graphics/user interface).
- SQL Server Management Studio 18 **may** be used if data collection from the web accessibility checker exceeds expectations.

Other Resources

- Access to the UWTSD library (including its online library and its included databases).
- Other databases including: Google Scholar, ResearchGate, ScienceDirect, Hindawi and Semantic Scholar.
- Supposed supervisor for the project - Dr Nicola J. Whitehead.
- Consented participants, to gather data/feedback from.

4.1 Project timeline

Objectives and tasks	Start and end date
1 Starting the project	
1.1 Initial research into web accessibility (WCAG, understand how those with disabilities are affected etc, find quality resources in this field).	24th – 31st of October 2022
1.2 Install Visual Studio and other addons and become familiar with the Bootstrap framework.	
1.3 Learn, practise, familiarize and develop skills with CSS, HTML and Javascript.	
2 Research web accessibility in more depth	
2.1 Read WCAG 2.1 and related research papers in more depth, take notes.	1st - 3rd of November 2022
2.2 Research assistive technologies for web browsers.	
3 Review web accessibility checker tools	
3.1 Take note of what other web accessibility checker tools look for in a website and their results.	4th - 8th of November 2022
3.2 Research how to scan website elements and their code so the proposed accessibility checker can function properly.	
3.3 Practise more CSS, HTML and particularly Javascript.	
4 Literature review	
After understanding the study area more in-depth, the literature review will begin.	10th - 18th of November 2022
5 Design	
5.1 Design a website demonstrating the best accessibility practises.	20th - 25th of November 2022
5.2 Design the web accessibility checker.	26th of November to 2nd December 2022
6 Development	
6.1 Begin development of the designed website.	5th - 13th of December 2022
6.2 Begin development of the web accessibility checker.	15th - 31st of December 2022 (A few days break will be had periodically during this time)
7 Presentation for the Interim Viva	
The project itself and its process, including the literature review, design and development will be prepared and presented in an appropriate format for the Interim Viva. Rehearsals will be practised for the presentation.	5th - 15th January 2023 (Presentation begins on either the 16 th /17 th /18 th).
8 Further development/research	
8.1 Intensive, further development will be carried out for the website, but especially for the web accessibility checker.	20th of January to the 28th of February 2023
8.2 Further research may be done, depending on whether it is necessary. For example, some research may have to be done to aide with the development of the web accessibility checker.	
9 Test, gather feedback and implement it	

9.1 Experimenting and tests will be done to ensure the web accessibility checker works properly and to a good standard.	2nd - 6th of March 2023
9.2 Feedback will be gathered from participants from most of the data collection methods outlined in chapter 3.2.	8th - 17th of March 2023
9.3 Analysis of the data gathered.	
9.4 Further development may be done again as constructive feedback will be used to improve and modify the program wherever necessary. Once the program is finalized, tests will be done again to ensure its robust.	18th - 22nd of March 2023
10 Evaluation of the project	
An evaluation and conclusion of the project's research and developments, including closing thoughts, recommendations and suggestions regarding web accessibility.	24th - 31st of March 2023
11 Final Report	
The literature review, design, development, methodology, results and feedback, analysis, conclusion and critiques and recommendations, an evaluation, references etc will be laid out in the final report. All of these will have been worked on beforehand. In the time given, the work will be tidied up, references will be double checked, the report will be proof-read and formatted professionally, etc. This time allocated will also essentially give wiggle room to tie up any loose-ends that could not be finished (due to illness, work taking longer than expected, etc).	1st - 25th of April 2023
12 Exhibition	
A poster will be created as well as a summary to showcase the project.	28th April to May 1st 2023 (exhibition begins 7 th of May)
13 Presentation for the Final Viva	
The project itself, a discussion of the project as well as a demo of the implementations will be prepared, practised and rehearsed before for the presentation.	2nd - 7th of May 2023 (Presentation begins on either the 8 th /9 th /10 th of May).

Figure 1: Project timeline

Chapter 5 References

- [1] A. Kirkpatrick, J. O. Connor, A. Campbell and M. Cooper, "Web Content Accessibility Guidelines (WCAG) 2.1," W3C, 5 Jun 2018. [Online]. Available: <https://www.w3.org/TR/WCAG21/>. [Accessed 5 Oct 2022].
- [2] GOV.UK, "Understanding WCAG 2.1," GOV.UK, 24 May 2022. [Online]. Available: <https://www.gov.uk/service-manual/helping-people-to-use-your-service/understanding-wcag>. [Accessed 5 Oct 2022].
- [3] N. Alajarmeh, "Evaluating the accessibility of public health websites: An exploratory cross-country study," *Universal Access in the Information Society*, vol. 21, no. 3, p. 773, 2022.
- [4] W. Chisholm, G. Vanderheiden and I. Jacobs, "Web Content Accessibility Guidelines 1.0," W3C, 5 May 1999. [Online]. Available: <https://www.w3.org/TR/WAI-WEBCONTENT/>. [Accessed 5 Oct 2022].
- [5] B. Caldwell, M. Cooper, L. G. Reid and G. Vanderheiden, "Web Content Accessibility Guidelines (WCAG) 2.0," W3C, 11 Dec 2008. [Online]. Available: <https://www.w3.org/TR/WCAG20/>. [Accessed 6 Oct 2022].
- [6] S. L. Henry, "What's New in WCAG 2.2 Draft," W3C, 6 Sep 2022. [Online]. Available: <https://www.w3.org/WAI/standards-guidelines/wcag/new-in-22/>. [Accessed 6 Oct 2022].
- [7] S. L. Henry, "WCAG 3 Introduction," W3C, 6 Jul 2022. [Online]. Available: <https://www.w3.org/WAI/standards-guidelines/wcag/wcag3-intro/>. [Accessed 8 Oct 2022].
- [8] Hayfa.Y.Abuaddous, Mohd Zalisham Jali, Nurlida Basir, "Web Accessibility Challenges," *International Journal of Advanced Computer Science and Applications*, vol. 7, no. 10, p. 1, 2016.
- [9] A. S. Sven Schmutz and J. Sauer, "Implementing Recommendations From Web Accessibility Guidelines: Would They Also Provide Benefits to Nondisabled Users," *Human factors*, vol. 58, no. 4, p. 612, 2016.
- [10] A. Alsaeedi, "Comparing Web Accessibility Evaluation Tools and Evaluating the Accessibility of Webpages: Proposed Frameworks," *Information 2020*, vol. 11(1):40, pp. 1, 5, 2020.
- [11] A. Bhowmick and S. M. Hazarika, "An insight into assistive technology for the visually impaired and blind people: state-of-the-art and future trends," *J Multimodal User Interfaces*, vol. 11, no. 2, p. 154, 2017.
- [12] A. Martin, A. Cechich and G. Rossi, "Comparing Approaches to Web Accessibility Assessment," in *Handbook of Research on Web Information Systems Quality*, IGI Global, 2008, p. 196.

- [13] Ibtelhal S. Baazeem; Hend S. Al-Khalifa, "Advancements in Web Accessibility Evaluation Methods: How Far Are We?," *iiWAS '15: Proceedings of the 17th International Conference on Information Integration and Web-based Applications & Services*, p. 3, 2015.
- [14] G. Gay and C. Q. Li, "AChecker: Open, Interactive, Customizable, Web Accessibility Checking," *International World Wide Web Conference*, p. 1, 2010.
- [15] achecks, "AChecker Web Accessibility Checker," achecks, [Online]. Available: <https://achecker.achecks.ca/checker/index.php>. [Accessed 17 Oct 2022].
- [16] D. James and N. Simister, "QUANTITATIVE ANALYSIS," intrac, 2017. [Online]. Available: <https://www.intrac.org/wpcms/wp-content/uploads/2017/01/Quantitative-analysis.pdf>. [Accessed 17 Oct 2022].
- [17] T. O.Nyumba, K. Wilson, C. J. Derrick and N. Mukherjee, "The use of focus group discussion methodology: Insights from two decades of application in conservation," *Methods in Ecology and Evolution*, vol. 9, no. 1, p. 21, 2018.
- [18] R. Jamieson, "Project Management," p. 4, 2022.
- [19] UK Government, "Data Protection Act 2018," UK Government, [Online]. Available: <https://www.legislation.gov.uk/ukpga/2018/12/contents/enacted>. [Accessed 18 Oct 2022].
- [20] L. Leung, "Validity, reliability, and generalizability in qualitative research," *Journal of family medicine and primary care*, vol. 4, no. 3, pp. 324-326, 2015.

FINAL GRADE

GENERAL COMMENTS

67 / 100

Instructor

Intro / A&O (400 words)		
Project title; Identification of a specific problem to be investigated; Well-defined aims and SMART objectives; Explaining why this project is worth doing; Discussion of what the project needs to do in order to be a success; Description any deliverables that will be produced at the end of the project Problem is defined, together with two target user groups. Remember that you can't guarantee that you'll improve someone's life by providing a tool – you'll do something that might help to improve their quality of life. The aim is fine but one of the objectives is repeated and one is about writing the report. You'd be better to say 'Based upon the research finding, develop a set of recommendations for good web accessibility practice'.	20	12
Background to the Project / Literature Review (400 words)		
Description of how the work to be done by in the project relates to the work identified in the literature review; Discussion of any ethical issues raised by the project Identifying what has already been done within the field; Topic familiarity; Brief literature review using appropriate sources – 6-8 journal papers and book chapters rather than just websites; Selection of relevant models & concepts Good idea to stick to WCAG 2.1. Good background and reference to existing studies in the field, although yo	20	13

u shouldn't talk about what you're going to do at this point.		
Project Design (500 words)		
Clear statement of which development methods are to be used and why they are appropriate; Clear statement of which tools are to be used and why they are appropriate; Clear description of how data collected will be analysed What software development methodology are you doing to use? The outline of the process is fine but more detail on the process would be useful. Good summary bullet points. The data collection methods are sensible given the aim and objectives of the project, although you need to say who your user group will be. Good coverage of reliability, validity and generalisability. The data will be explored rather than just tallied, which is good. Risks and ethical issues have been approached sensibly.	30	20
Resources / Planning (200 words)		
List of any deliverables; Clear diagram showing both timing and resource use; Completed ethics form; Limited and relevant appendices The deliverables are described well. Hardware, software, and other resources considered in a good level of detail. Planning table is good, and easier to read than a Gantt chart. The set of tasks given is good but more time is needed for the background research and literature review.	15	11
Document Presentation		
Correct spelling, grammar and punctuation; Flow of narrative/fluency; Coherence; Word processed ; Correct use of referencing with bibliography; Strict word limit	15	11

Good list of references. Well presented with appropriate labelling and tables.		
TOTAL	100	67

PAGE 1
PAGE 2
PAGE 3
PAGE 4
PAGE 5
PAGE 6
 Comment 1 no comment
PAGE 7
PAGE 8
PAGE 9
PAGE 10
PAGE 11
PAGE 12
PAGE 13
PAGE 14