

Developing an Accessible Web Journal with WCAG Guidelines, Fitts's Law, and Capital T Concept

Carlos Mercado

Master of Engineering in Computer Engineering, Software Engineering

Dr. Jeffrey Duffany

Department of Graduate School

Polytechnic University of Puerto Rico

Abstract — *In the ever-evolving digital landscape, enhancing web accessibility and user experience remains a paramount objective. By expanding the application of Fitts's Law to user interface design, the researcher unlocks the potential to create web experiences that are both efficient for all users and exceptionally inclusive, including the tactile and digital advantages of interactivity. By harnessing the Capital T Concept, the researcher craft an accessible reading experience where users, including those with disabilities, can effortlessly navigate pages and embark on a journey of exploration. This article delves into the innovative fusion of the WCAG guidelines, Fitts's Law, and the Capital T Concept principles with accessible web design, illuminating the path to a more inclusive digital world.*

Key Terms — *Capital T Concept, Fitts's Law, Web Accessibility, WCAG.*

INTRODUCTION

The capability of being reached is the purest form that defines accessibility. People with visual, cognitive, or physical impairments struggle to get physical, mechanical, reading, and digital objects. This is often referred to as disability. People with disabilities, with all due respect, might not be able to have the same user experience with digital content because of the difficulty for them to access and interact with objects.

The main objective of this article is to inform about the importance, values, and solutions that will create digital accessible content for people with visual impairment disabilities.

Web accessibility is a contribution of technical implementation so that people with disabilities can have access to and navigate websites. As Tim Berners-Lee says, "The power of the Web is in its

universality. Access by everyone regardless of disability is an essential aspect" [1], every person capable of reaching websites will reap the benefits of this age digitalized era.

The Web Content Accessibility Guidelines (WCAG 1.0) were published by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C). It has accessibility guidelines with levels of priority. As web technology progressively developed over time, the WCAG 1.0 guidelines required broader and more adapted specifications. So, the guidelines were revised, expanded, and addressed the priority levels as A, AA, and AAA as best, now recognized as WCAG 2.0 [2].

Psychologist Paul Fitts studied the human motor system in 1954 and concluded that the time required to move a target depends on the distance to it and inversely to its size. This law is widely applied to user experience because it reduces user travel distance and increases productivity [3]. More oversized buttons, pop-up menus, and shorter dropdown menus are the results of applying Fitts's Law for better user attention to the task. This law is widely used in user experience and human-computer interaction studies.

The Capital T is the concept creation for designing good web-accessible content. The researcher defines it as "conceptualizing a grid view of nine squares of spaces in one document page and only design content inside the areas of the T shape formed by five squares.". This article aims to facilitate, as a contribution, the design process of web accessibility.

BACKGROUND

Inclusivity has evolved, helping people with disabilities. This has helped people who are

workers, students, professionals, and family members with visual impairments. This is 8.2 million American population have uncorrected refractive error [4]. This type of disability is more present in people of age 65 and older.

The WCAG guidelines, as well as Fitts's Law, help improve the creation of accessible web-based content. The lack of knowledge in developing website corporations undervalues accessibility and impedes potential customers from completing transactions. People with disabilities must not be forgotten. They live among us.

The researcher is a senior programmer. Working at a respectable corporation, he has seen code, especially from junior programmers, that does not accomplish web accessibility. It is a matter of knowledge, and he did not have this knowledge when he was a junior programmer too.

People with visual impairment will be able to read comfortably and navigate web content through the web-accessible journal, which is the materialization and the results of this article. This reading content will follow the WCAG guidelines, Fitts's Law, and the contribution of the Capital T concept. The journal will serve as an example of these three ideas to achieve accessibility for web content.

Ordinary people will have a better user experience by having an accessible user interface with a less time-consuming interaction. The users will have better intuition about the page's usability and will get faster access to content, which will lead to a more relaxed state for the user that builds confidence. This helps with a potential payment if the website provides such a service. A web-accessible page creates the feeling of a secure and professional website that will generate customer goodwill.

The company that pays for software development might only have to spend a little time and money adapting the web page with web-accessible standards, especially before the code implementation in the requirements phase. Including the WCAG guidelines, Fitts's Law, and the Capital T concept in this requirements phase

will facilitate the creation of user interaction in the design phase. Reaching people with visual impairment means getting more people to their website content, which means more customers will potentially buy or subscribe to a service.

PROBLEM

Thus, website content development corporations, no matter how many laws and accessibility guidelines, do not know about the true potential of following web-accessible standards and thus do not follow the standards even though some might know about the WCAG guidelines. Most software developers do not know Fitts's Law, nor the WCAG guidelines exist. Without this knowledge, three points of view are compromised negatively:

- The ease of use for an average user
- The web page content is accessible to people with visual impairments.
- The remuneration of the corporation by attracting more potential customers.

The corporations without this point of view have a perception that web accessibility is expensive and takes more time to implement. This is also a bold perception, not realizing it is not that expensive and not much time investment to make an effective web-accessible page. Better-informed managers and developers will create value for web accessibility and their business model. Still, this lack of essential importance, because of the little or no information about web-accessible content, makes user experiences difficult and, therefore, fewer customers.

Objectives

The primary objectives of this project are to design and develop an interactive web-based journal that emulates the look and feel of a physical document and to ensure that this digital reading experience is fully accessible to users with disabilities.

Project Scope

The project scope includes designing and developing a web-based journal that emulates the structure and aesthetics of a physical document. The journal will feature interactive pages, bookmarking, and a responsive design for various devices.

METHODOLOGY

The project will utilize HTML, CSS, and JavaScript to create the web-based journal. Accessibility considerations will include semantic markup, keyboard navigation, alt text for images, and compatibility with screen readers. Usability testing will involve users with disabilities to ensure the effectiveness of the design.

Design and Development

The design phase will focus on creating an intuitive and aesthetically pleasing layout that mimics the appearance of a document. The development process will involve translating the design into functional web pages, integrating interactive elements, and ensuring compatibility across browsers.

Novelty

The project will use the Capital T Concept, where every object must be organized as a T pattern. Imagine a document with a grid of 9 tiles where you will focus on the first three tiles from the top left to the top right corners and the middle tiles from top to bottom. The project will also use, as a combination, the Web Content Accessibility Guidelines (WCAG) and Fitts's Law to ensure best practices for web accessibility.

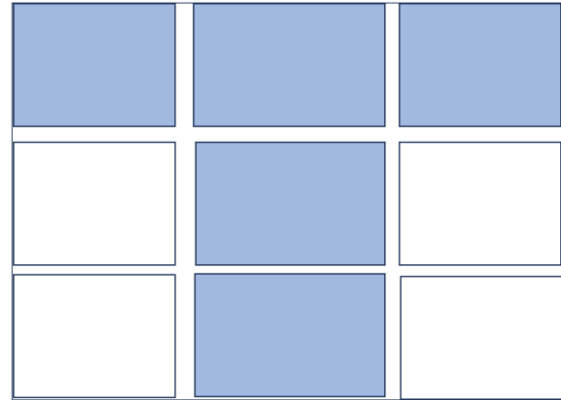


Figure 1
The Capital T Concept

ANALYSIS

The web journal that explores the relationship between WCAG guidelines, Fitts's Law, and Capital T Concept and web accessibility is a valuable contribution to the field of web accessibility and inclusive design. This analysis assesses the journal's key points and their significance in advancing our understanding of how WCAG guidelines, Fitts's Law, and Capital T Concept can be harnessed to improve web accessibility.

Explicit Integration with Web Accessibility

The journal integrates WCAG guidelines, Fitts's Law, and Capital T Concept with web accessibility considerations. It elucidates how these principles can be applied to enhance the usability of web interfaces, particularly for individuals with disabilities.

Practical Applications

One of the journal's strengths is its emphasis on practical applications. It demonstrates how designers and developers can implement WCAG guidelines, Fitts's Law, and Capital T Concept to create more accessible web content.

Inclusivity Focus

The journal places a strong emphasis on inclusivity. It highlights how applying WCAG guidelines, Fitts's Law, and Capital T Concept can lead to web interfaces that are more inclusive and

user-friendly for everyone, regardless of their abilities.

Usability Testing

Including usability testing with users, including those with disabilities, adds empirical support to the journal's claims. This aspect strengthens the practical relevance of the research.

The researcher tested two people (V. Alvarez and G. Soler), who favored the accessibility version without using glasses for reading.

Future Implications

The journal concludes by discussing the potential future implications of this research. It encourages further exploration of the Capital T Concept in the context of web accessibility and suggests that this approach can be extended to various digital platforms beyond web design.

Accessible Presentation

The journal itself is an exemplar of good design and accessibility. It adheres to best practices, ensuring that its content is accessible to readers with disabilities, which reinforces the principles it advocates.

RESULTS

This section reports the effective product result of integrating the WCAG guidelines, Fitts's Law, and Capital T Concept.

Design Version

The design version integrates the WCAG guidelines, Fitts's Law, and Capital T Concept. In addition, it has bookmark and control capabilities added for some web accessibility on a complex design. The researcher means by a bookmark that the page, for example, page 5, remains if the user closes the browser, and on another day, the user enters the website on the same page 5. Also, mean by controls that the keys "a" and "d" from the keyboard are used for left and right, respectively, for written content navigation for the left-handed

user. For the same reason, the left and right arrow keys but for the right-handed user.



Figure 2
Applied WCAG Guidelines with the Bigger Font Size in the Design Version

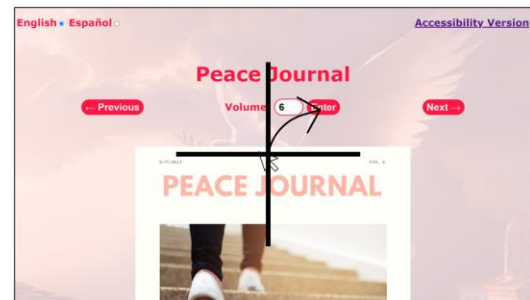


Figure 3
Applied Fitts's Law with Distance from the Middle to the Destination and Oversized Buttons in the Design Version



Figure 4
Applied Capital T Concept in the Design Version

Accessibility Version

The accessibility version integrates the WCAG guidelines, Fitts's Law, and Capital T Concept. This user interface is plainer and has no JavaScript. The reason for a more straightforward interface is to give a digital program reader more control of the page.

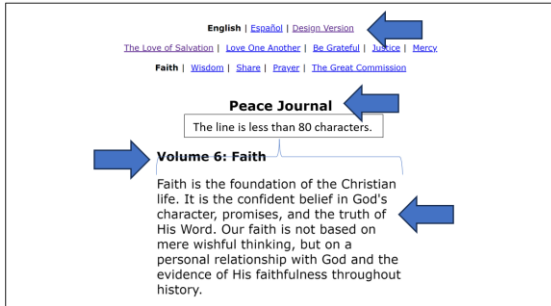


Figure 5

Applied WCAG Guidelines with the Bigger Font Size and Text Line Character Count of Less Than 80 in the Accessibility Version

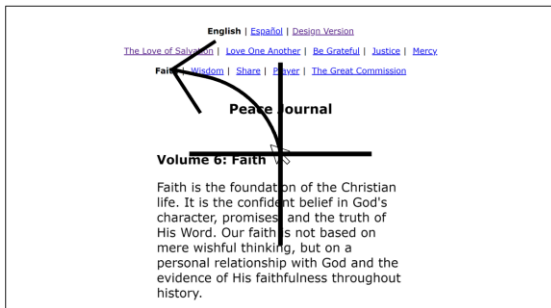


Figure 6

Applied Fitts's Law with Distance from the Middle to the Destination in the Accessibility Version

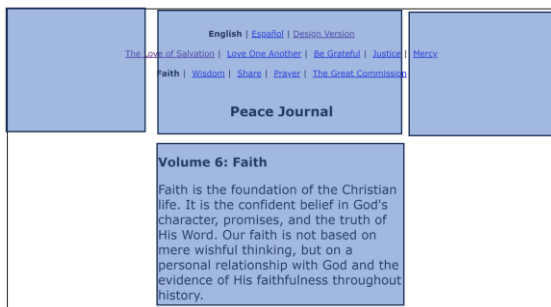


Figure 7

Applied Capital T Concept to the Accessibility Version

Features and Most Relevant Code

The code in CSS is usually to center elements and work with fonts. The code in JavaScript detects keyboard keys to replace reading content. Beyond the relevant code, it is found in JavaScript the bookmark and language features.

```

CSS
body {
  font-family: Verdana; /* Verdana is popular with visually impaired people. */
}
nav, h1 { /* Compliant with the Fitts's Law and the Capital T Concept. */
  text-align: center; /* Centering text, people will have easier eye movement. */
}
nav {
  margin-top: 50px;
  font-size: 20px; /* Compliant with the WCAG */
}
h2 {
  font-size: 30px; /* Compliant with the WCAG */
}
#center-parent, footer { /* Compliant with the Fitts's Law; parent for centering. */
  display: -webkit-flex;
  display: flex;
  -webkit-justify-content: center;
  justify-content: center;
  -webkit-align-items: center;
  align-items: center;
  width: 100%;
}
#center-child, footer p { /* Compliant with the Fitts's Law; child for centering. */
  width: 600px;
}
p {
  font-size: 30px; /* Compliant with WCAG */
}

```

Figure 8

The CSS Code Applies the WCAG Guidelines, Fitts's Law, and the Capital T Concept

```

JS
// Keyboard keys to change reading content for the design version.
// A and D keys for the left hand and Left and Right arrows for the right hand.
window.document.onkeydown = function( event ) {
  var event_code = event.code;
  if( document.activeElement.type != "radio" ) {
    if ( event_code == "ArrowRight" || event_code == "KeyD" )
      next_volume();
    if ( event_code == "ArrowLeft" || event_code == "KeyA" )
      previous_volume();
  }
};

```

Figure 9

The JavaScript Code that Applies the Keyboard's Page Content Controls

Architecture and Tools

The project architecture design document used was a C4 model. The project was hosted on Amazon Web Services (AWS). The project was developed using the web browser Google Chrome, the code editor Notepad++, and the operating system used was Windows 10. You can find the hosted project at (<https://www.peace-journal.com/>).

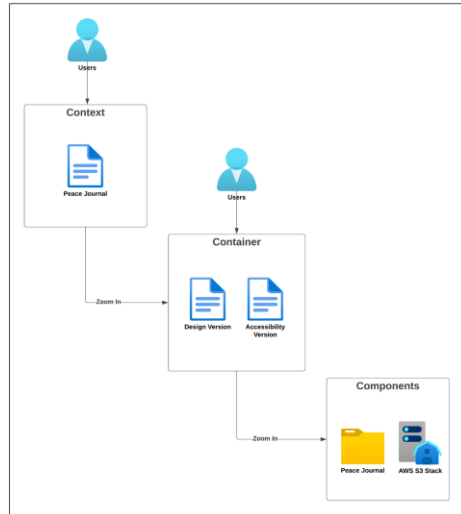


Figure 10
Context, Container, and Components of the C4 Model

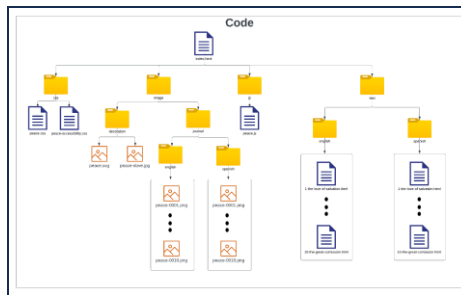


Figure 11
Code of the C4 Model

CONCLUSION

In summary, this journal is a significant contribution to the field of web accessibility and user-centered design. By bridging the gap between the Capital T Concept and web accessibility, it not only provides valuable insights for designers and developers but also promotes a more inclusive digital landscape. This research can potentially influence how the programmers approach web design, making digital content accessible and user-friendly for everyone.

Recommendations

As a programmer, it is always recommendable the use of the WCAG guidelines, Fitts's Law, and the Capital T Concept while developing user interfaces with a combination of highlights and

indicators for active, focus, and hover events to create a more compelling user experience. As a recommended example, the researcher made two versions with accessible content. The design version with accessibility does not compromise much of the design, including keyboard navigation with the buttons “a” and “d” for left and right, respectively, for replacing reading content and “left” and “right” arrow buttons for the same reason. Still, the previous choice is for left-handed people, and the arrows for right-handed people. The accessibility version is simpler and has more reading contrast. Simpler to allow reader programs to take control of the page. More contrast and bigger font for those with more acute visual impairment. By having additional independent, accessible content, programmers invite more people to enjoy our reading content.

REFERENCES

- [1] Education and Outreach Working Group, “Introduction to Web Accessibility”, *Web Accessibility Initiative*, March 31, 2022. [Online]. Available: <https://www.w3.org/WAI/fundamentals/accessibility-intro/>. [Accessed: October 10, 2023].
- [2] Web Accessibility Initiative, “Web Content Accessibility Guidelines (WCAG) 2.0,” 2008. [Online]. Available: <https://www.w3.org/TR/WCAG20/>. [Accessed: August 25, 2023].
- [3] Interaction Design Foundation - IxDF. “*What is Fitts’ Law?*” Interaction Design Foundation – IxDF [Online]. Available: <https://www.interaction-design.org/literature/topics/fitts-law>. [Accessed: October 10, 2023]
- [4] JAMA Ophthalmology, “Visual Impairment and Blindness in Adults in the United States: Demographic and Geographic Variations from 2015 to 2050” 2016 Jul 1. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5116104/>. [Accessed: October 17, 2023]
- [5] Contrast Ratio. [Online]. Available: <https://www.siegemedia.com/contrast-ratio>. [Accessed: August 25, 2023].
- [6] Web Accessible Evaluation Tool. [Online]. Available: <https://wave.webaim.org/>. [Accessed: August 25, 2023].
- [7] U.S. Department of Justice, Civil Rights Division. Section 508 Surveys and Reports. [Online]. Available:

<https://www.justice.gov/crt/section-508-home-page-0>.

[Accessed: October 13, 2023].

- [8] U.S. Access Board. Comparison Table of WCAG 2.0 to Original 508 Standards. [Online]. Available:

<https://www.access-board.gov/ict/wcag2ict.html>.

[Accessed: October 13, 2023].