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Website Accessibility Strategies

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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by

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MS, Florida Institute of Technology, 2001

BA, Rollins College, 1995

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Most websites cannot be readily used by people with disabilities, despite the internet

being an essential component for people to be part of a community. Applying web

accessibility strategies means that people with disabilities can better interact with

the web. Grounded in Davis's technology acceptance model, the purpose of this

qualitative multiple case study was to examine strategies used by web designers to make

websites accessible for people with disabilities. The participants were experienced web

developers from organizations in Florida with websites that have a Web Content

Accessibility Guidelines Level 2 of three levels, i.e., AA- rating. The data collection

process included semistructured interviews with experienced web developers ($N = 8$) and

examination of company documents ($N = 9$). Data were analyzed using thematic analysis.

Three major themes emerged: the importance of awareness and experience of

accessibility strategies, the importance of testing websites for accessibility, and the

importance of training developers in web accessibility. A recommendation is for leaders

and developers to advocate the organization about the need for web accessibility. Once

the organization is committed to accessibility, the leaders must agree on evaluating

developed websites. Additionally, there should be a financial commitment to train

developers and accessibility evaluators in web accessibility. The implications for positive

social change include the potential to increase software accessibility for people with

disabilities.

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Section 1: Foundation of the Study

Background of the Problem

The ability to access the web is essential for a member of society (Kurt, 2019). The ability to check a government website for information is vital for a functioning member of civil society, and the ability to watch and understand a video online is beneficial for students. Visually impaired people find web browsing a problematic task (Zhang et al., 2017). Persons who experience a physical impairment, either temporary or permanent, may find using an input device, such as a mouse, challenging to move and click (Chen et al., 2019). Deaf people also have problems when navigating the web (Jensen & Øvad, 2016).

During the past few years, web designers have made significant progress in implementing web guidelines to enhance accessibility for persons with disabilities (PWD, Rodríguez et al., 2017). Simultaneously, a substantial number of organizations have failed to use the techniques known to improve the ability of PWD to use the web (Rau et al., 2016). Low adoption and web accessibility implementation are significant issues in web development (Velleman et al., 2017). Therefore, it is vital to understand why web developers accept accessibility guidelines and how they use accessibility strategies to improve websites.

Problem Statement

While information technology (IT) has become an essential component of current society, PWD often cannot use IT due to user interfaces that do not support various disabilities (Mitzner et al., 2016). For example, in a study on the accessibility of higher

education institution websites in Kuwait, the researchers found that none of the 41 higher education web pages fully conformed to accessibility standards, exposing barriers for PWD to use them (AlMeraj et al., 2021). The general IT problem was that software is being developed for people without disabilities but not for a broader population. The specific IT problem was that some web developers lack development strategies to improve website accessibility for PWD.

Purpose Statement

The purpose of this qualitative, multiple case study was to explore the web development strategies used by web developers to improve the accessibility of websites for PWD. The target population for this study was web developers in Florida who have strategies to create websites for PWD. The implications for social change include the potential to increase the accessibility of software for PWD. The findings of the study may result in positive social change if web developers use the successful strategies shared in this study to create functioning interfaces for PWD. In addition, increased application usage may improve user self-confidence and productivity.

Nature of the Study

I employed the qualitative method in this study. The qualitative approach is used to explore participants in their environment, and the qualitative researcher studies data from many sources (Boddy, 2016). In this study, I aimed to examine how web designers design websites to make them accessible for PWD. Other methodological options included the quantitative approach and mixed methods. The quantitative methodology requires the use of statistics to show how independent variables might affect dependent

variables to confirm a hypothesis (Babones, 2016). When using a mixed-method approach, a researcher is required to use both quantitative and qualitative methods; using both methods provides them with a more comprehensive view of a given phenomenon (McCusker & Gunaydin, 2015). However, because a quantitative approach fails to explore the complexity and richness of strategies developers use to implement web accessibility, neither the quantitative nor mixed methods were appropriate for this study.

A multiple case design used to look at several cases to understand the subject in-depth (Marconnot et al., 2019). I conducted a qualitative multiple case study with the expectation that the research design would allow me to find out why certain website design strategies are working or why an organization does not use them. There are several other designs that a researcher can use to conduct qualitative research, including ethnography, narrative design, and phenomenology (Hammarberg et al., 2016). Ethnography allows the researcher to experience the environment (Lewis, 2019). My aim was to find strategies for web designers not to research the culture, so an ethnographic design was not suitable for this study. A narrative approach is used to explore a person's life from the stories they tell (Burles & Bally, 2018). I did not employ the narrative design because narrative research is concerned with how people understand their experience and my goal was to explore how and why developers program accessibility into websites. According to Lin (2017), phenomenological research should look at the wholeness of the experience and the essence of the experience. It was not my goal to describe the lived experience of a group of people; instead, I explored the strategies of software web developers.

Research Question

What are the website development strategies used by website developers to improve website accessibility for PWD?

Interview Questions

1. What strategies have you used to design accessibility into websites?

2. What guidelines and design methods do you use in developing accessibility into websites?

3. What, if any, challenges have you encountered regarding web accessibility?

4. What aspects of web accessibility do you consider when making a website more accessible to PWD?

5. How do you test your websites for web accessibility?

6. What additional information regarding web accessibility design would you like to share?

7. How do you use users when designing web-accessible websites?

8. What metrics do you utilize to measure the success of web accessibility?

9. How do you train your developers to include web accessibility when designing web sites?

10. How does your organization's culture play into designing for web accessibility?

Conceptual Framework

In this study, I used an information system theory called the technology acceptance model (TAM) as the conceptual framework. In a seminal work on the TAM,

Davis (1989) explained that the user's attitude affects how the user may or may not accept a new technology. The TAM is used broadly to explain users' behavior and predict their acceptance of new technology (Belletier et al., 2018). Two variables called *perceived ease of use* (PEOU) and *perceived usefulness* (PU) are measures that predicate user acceptance of an IT system (Davis, 1989). PEOU are user beliefs about how difficult a system is to operate, while PU is the amount of self-benefit the user expects to receive from using the new system. The TAM provided me with a helpful lens through which to consider how and when a web developer and web development manager adopts a new technology of accessibility.

A knowledge of the TAM and its components, PU and PEOU, are needed to understand technology acceptance. Nikou and Economides (2017), using the TAM, found that the user interface and user perception influence PU, and perception also has a significant effect on satisfaction. Designing a system for disabled users is like creating new technology; therefore, the software user interface design needs to add accessibility requirements so that the interface is acceptable and usable to users with disabilities. The TAM can be used to predict user acceptance of new technology. Following this line of thinking, the model can be used to predict how web developers and managers will accept accessibility strategies and design them into websites.

Operational Definitions

Accessibility: A design concept that focuses on products for PWD. As a result, people can do what they need to do with a product and are not excluded from using it because of a disability (Crespo et al., 2016).

PEOU: An element of the TAM concerning the amount of difficulty or ease a user believes will be needed to interact with a system (Davis, 1989).

PU: An element of the TAM regarding the amount of benefit a user believes they will receive from using a system (Davis, 1989).

PWD: Persons with impairments that limit activity or participation. The impairment may be short term or permanent. The person will have difficulty when executing a task or action. Five limitations of disabilities include hearing, vision, cognitive, ambulatory, and independent living (Harrell, 2017). The limitation is not just a health problem but also reflects the interaction between the person's body and the environment that the person needs to perform, such as using the internet.

TAM: A model that contains the elements of PU and PEOU that combine to predict how and when a user will adopt new technology (Davis, 1989).

Web accessibility: Features that allow a website to be accessible to the most significant, possible number of people, especially for PWD. By removing potential barriers to access, PWD may perceive, understand, and use the website (Aizpurua et al., 2016).

Assumptions, Limitations, and Delimitations

Occasionally, conditions and circumstances affect the research data (Karkouch et al., 2016). I describe conditions that might have restricted the data in the following subsections.

Assumptions

Assumptions are conditions and circumstances accepted as accurate and valid (Deeb & de Chaisemartin, 2019). The first assumption I made regarding this study was that the participants provided truthful and unbiased answers to interview questions without concealed purposes. Thus, accurate results were indicated by internal validity, which shows how well a study was conducted (see Farquhar et al., 2020).

The second assumption was that the number of participants was sufficient to produce representative results. To ensure the amount was sufficient, I continued to interview participants until the resulting themes repeated. Repeating themes within the data signifies data saturation (VanRijnsoever, 2017).

Limitations

Limitations are restrictions or constraints that the researcher cannot control that may influence the research (Connelly, 2013). For example, this study was limited by participants' experiences shared during their interview responses, which may not be generalized to all website developers. Additionally, the sample came from a relatively small number of web developers.

Delimitations

Delimitations outline the boundaries of the study so that the goals of the research do not become hopelessly large and impossible to finish (Theofanidis & Fountouki, 2018). Delimitations differ from limitations in that the biases of boundaries are inserted into the study (Theofanidis & Fountouki, 2018). This study was limited to the state of

Florida in the United States. The participants interviewed were software developers designing web pages from several organizations within the state.

Significance of the Study

Contribution to IT Practice

IT practitioners may benefit from constructing user interfaces that are accessible to disabled persons. According to the World Wide Web Consortium (W3C), building accessibility into interfaces may benefit websites by improved search results, lower maintenance costs, and more visits to that organization's website (Henry, 2020). Developing interfaces for PWD may also drive innovation since such design means creating ways for users to interact with the interface, resulting in broader uses. For example, the typewriter was invented for blind users but had another far-reaching use (López, 2000). More examples of accessibility design driving innovation are the contrast on devices, such as smartphones, for people with low vision and for all people in bright light (Henry, 2020).

IT practitioners may also benefit from hiring a PWD. PWD are a class that may have the knowledge but lack the opportunity to use the web without accessible interfaces (Dobransky & Hargittai, 2016). With web-accessible sites, IT practitioners may use the untapped knowledge of PWD.

Implications for Social Change

This study may encourage positive social change by exploring how to develop software strategies for usable user interfaces. Currently, many user interfaces restrict usage to nondisabled people by not designing with PWD in mind (Gerard, 2016). The

result is the disenfranchisement of a significant population of users. Moreover, most

people will experience many of the effects of PWD as they grow older (Bong et al.,

2018). Therefore, when designing accessible user interfaces for PWD, many of these

interfaces will improve the user interfaces for everyone (Bong et al., 2018). As a result,

users will be better connected with accessible technologies (Bong et al., 2018; Harte et

al., 2017).

The findings of this study about accessible user interfaces could be helpful to

society as a whole as well. The U.S. Center for Disease Control and Prevention (CDC;

2019) estimated that 1 in 4 people in the United States have a disability. The number of

PWD will grow as the population ages. According to the National Council on Disability

(NCD; 2011), during economic downturns, PWD are the first to lose their jobs and the

last to be hired when the economy turns around. In discussing electronic networks and

digital media technologies, NCD outlined how people collaborate using new technologies

and stated that PWD may find using computing devices different to operate. PWD also

face barriers to electronic communication when using the web and mobile phones

(Newman et al., 2017). Making an accessible interface for PWD should allow them to use

IT with increased benefits for everyone using IT.

A Review of the Professional and Academic Literature

The purpose of this qualitative, multiple case study was to explore the web

development strategies used by web developers to improve the accessibility of websites

for PWD. I used Davis's (1989) TAM model as the conceptual framework in the study.

The TAM can be used to explain and predict the acceptance of an information system;

therefore, it was an appropriate model to use when considering PWD interactions with IT. In this study, I applied the TAM model to understand PWD acceptance and continued use of technology from a PWD design perspective. In this literature review, I focus on web accessibility, the PWD population, the classification and challenges of web-accessible technologies, and the TAM model.

Overview

My goal with this literature review is to inform the reader about web accessibility and the conceptual framework for this study. The literature review is an objective assessment of the existing research and gaps in that research where the researcher concentrates and becomes the purpose of their study (Winchester & Salji, 2016). Christmals and Gross (2017) argued that in the literature review, the researcher details and evaluates current knowledge on a research topic.

To locate literature for this review, I used the following online databases: Google Scholar, Wiley Online Library, ProQuest Central, SAGE Journals, and Science Direct. The following search terms were used to find pertinent references: *user experience, technical acceptance model, software engineering web accessibility TAM, software coding standards, developer perceptions acceptance factors, user experience disability, dimensions of user experience, developer perceptions acceptance factors, user experience disability, software standards for web accessibility, web accessibility testing, web user satisfaction technology acceptance model, software standards for web accessibility, champion of web accessibility,* and *helping behavior in software development.*

This research study includes a total of 296 references. There are 95 references cited in the literature review subsection.

In this literature review, I examine several disabilities and provide information about how PWD have issues when using a website. In the first subsection, I present background information on web accessibility guidelines and standards as well as examine recent research studies regarding the implementation of web accessibility. In the second subsection, I survey testing websites for accessibility and address the relationship between web accessibility and user experience. In the third subsection, the conceptual framework of Davis's (1989) TAM and other frameworks are reviewed. In the last subsection, I discuss the applications to the specific IT problem.

Web Accessibility

The ability to use the web is essential to be a part of contemporary society. However, two key access issues stand in the way of PWD enjoying the benefits of the web: using assistive technologies to enable specific devices and ensuring that websites follow web accessibility standards to use assistive technologies (Brown & Hollier, 2015).

Population Needing Website Accessibility Technologies

The CDC (2020) defined a disability as a condition that significantly impairs compared to a standard group or individual; a disability denotes physical, sensory, cognitive, and/or intellectual impairments. Recognizing individuals who could benefit from web accessibility and understanding their particular barriers to use should aid web developers in making usable websites (World Health Organization [WHO], 2018). Using 2010 census information, the U. S. Census Bureau (2016) reported about 20% of the U.S.

population had some disability. The WHO (2011) approximated that 15% of the world

population has a type of disability and suggested that IT services should be provided to

PWD. Using improved technologies for PWD will assist them in better participating in

society and feeling more independent.

Classification of Web Accessibility by Disability

The WHO (2018) endorsed the International Classification of Functioning (ICF)

by all WHO member states in 2001 as an international standard to describe and classify

disabilities. As defined by the ICF, disabilities can be one or more of the following: body

structure and function, activity, and participation.

A disability limits a person's ability to interface with their environment, ranging

from total obstruction of usage to a slight activity restriction (WHO, 2018). Disabilities

include physical limitations but also sensory, cognitive, and mental health disabilities

(Morales et al., 2019). Wobbrock et al. (2018) explained the definition of disability by the

ICF, which is an interaction between a person, activity, and environment that may be

social and physical. Disabilities are subdivided into the following eight types:

mobility/physical, spinal cord, head injuries, vision, hearing, cognitive/learning, mental

health, and invisible (WHO, 2018). Mobility disabilities may limit the ability of an

individual to move within their environment. Spinal cord injuries may become a

sustained condition occurring from accidents, resulting in complete loss of the sensory

organs (Harvey, 2016). Head injuries may result in emotional and behavioral problems

(Prien et al., 2018). Vision disabilities range from minor to serious impairments (Levy &

Gandy, 2019). Hearing disabilities include people that are partially or completely deaf

(Campos & Cartes-Velásquez, 2019). Dyslexia or numerous other learning issues make up cognitive impairments (Ramus et al., 2018). Related to the current study, the overreaching aspect of a disability is that it slows or stops the use of a web interface. Each disability may cause barriers to access a website.

Challenges of Web Accessibility

Persons with cognitive disabilities need a website that is easy to use without extra visible and auditory outputs (CITE). Cognitive disabilities may influence the nervous system and affect how people hear, see, and understand information (Outcalt et al., 2015). Navigating a website may be challenging for a person with a cognitive disability to understand and use (Smith & Abrams, 2019). Complex text that is difficult to read and moving, blinking content that cannot be turned off will also pose issues for the cognitively impaired person. Web developers should understand the difficulties of persons with cognitive disabilities to create accessible content.

Physical disabilities include weakness and lack of muscular control, such as tremors or lack of coordination (Macías et al., 2018). Websites that lack a full keyboard backup as an input device will be difficult for people with physical disabilities to use as will online forms that do not allow enough time to complete the task (Marino & Mason, 2020). The World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI; 2021) reported that if the website contains an overly complicated navigation method, the physically impaired user may find it difficult to use. Users with speech disabilities have difficulties when creating speech that others or a voice recognition system recognizes

(Alfonso & Flanagan, 2018; Lawton, 2021). Text input is used for interactions with people with speech disabilities.

Guidelines for Website Accessibility

PWD access the web in different ways based on particular needs and preferences. Craven and Nietzio (as cited in AkgÜL & Vatansever, 2016) observed that PWD access the web by either configuring standard software or using assistive technologies. IT used to support accessibility must conform to guidelines to be compatible to the access methods of PWD. Guidelines provide a roadmap on how to develop web applications that are accessible and accessibility requirements may be met if standards are followed (Moreno & Martinez, 2019). Guidelines are essential to the design of web accessibility (Schmutz et al., 2016). One such standard is the Web Content Accessibility Guidelines (WCAG), a universally accepted example of a usable web accessibility design (Cooper et al., 2016).

The WCAG standard has gained a consensus from the W3C's WAI. The WAI began working on guidelines in 1997 (CITE). The first guidelines published in 1999 were known as the WCAG 1.0. An update published in 2008, known as WCAG 2.0, is the benchmark for web accessibility used by many governments (Moreno & Martinez, 2019). Finally, in 2018, WCAG 2.1 was introduced. The WCAG has three levels: principles, guidelines, and success criteria. The principle level is broken down into sublevels of perceivable, operable, understandable, and robustness.

WCAG addresses many issues that concern the disabled; for example, images may be challenging to see or understand (Caffrey & Simone, 2019). This visible barrier

may be reduced by adding alternative text to the code, and the visual element may be read to the user (Ng, 2017). In addition, the WCAG suggested that an alternative input device should be available to benefit users who may have issues using a mouse (Dorrington et al., 2016). By using the many suggested WCAG items, the accessibility of a website should be improved.

The WCAG provides checklist items for designing web pages and defines levels or metrics based on how well the websites conform to the defined guideline (Ismailova & Inal, 2018). A website may have a zero, A, AA, or AAA qualification depending on the satisfied accessibility (Lorca et al., 2018). However, Lorca et al. (2018) asserted that the metric does not show the complete picture of accessibility. For example, suppose one website scored a Level A and a second website contained all values for a Level AA except it is missing one item. In that case, the second website will also be scored at the A level even though the website is more accessible than the other. Web developers should not blindly use the WCAG but look at each accessibility guideline and improve the entire website.

Web guidelines pose issues and challenges for developers to implement. Most developers come to website design with little or no experience designing for accessibility (Abuaddous et al., 2016). Syafiq et al. (2018) asserted that developers are not trained or exposed to web accessibility guidelines in college but found that developers would begin to perceive how PWD might experience a website if education and guidelines were provided to developers. Their awareness of web accessibility will be increased; thus, they will produce better web experiences for PWD. Syafiq et al. added that recognizing

diverse disabilities helps people understand the demands of web accessibility design. Software developers should know and follow WCAG when developing websites. However, guidelines were often not followed in many of software projects that Skierniewska and Skroban (2018) studied. They reported that the guidelines should be applied in both the software design and development cycles.

Successful web accessibility development should include web accessibility design guidelines that are beneficial for everyone (Kulkarni, 2019). It is thought by many in the web design field that designing for web accessibility will produce side effects for a nondisabled population; however, this may be incorrect. Schmutz et al. (2017) found that not only does design and development for web accessibility help PWD, but it may also improve performance for a general population of users. Higher conformance to WCAG translates to benefits for all users.

Following standards and guidelines may increase accessibility. Al-Khalifa et al. (2017) found a measurable improvement with Saudi e-government accessibility from 2010 to 2016; although, it was unclear if developers design systems out of concern for the disabled or if a government policy caused the improvement. Much previous research has focused on those organizations not meeting the intention of accessibility guidelines. WCAG 2.0 guidelines are accepted as the standard when comparing website accessibility (Almourad et al., 2019). Acosta-Vargas et al. (2018) showed that the homepages for 348 main universities in Latin America do not meet accessibility criteria as defined in WCAG 2.0. Designing websites that meet WCAG-accepted guidelines may increase website accessibility.

WCAG 2.0 is used in other types of devices and applications. According to Silva et al. (2019), formal guideless are needed to assist the development and evaluation of mobile applications, which like web applications for standard web interfaces, lack essential accessibility. The website for WAI's WCAG shows many different application tools available for cost and some free of charge. These tools analyze a given webpage or website for conformity to WCAG 2.0 (AkgÜL & Vatansever, 2016). Some tools suggest updates to fix found problems, and some attempt to repair issues found. Yeratziotis and Zaphiris (2018) found that a different checklist is needed to evaluate web applications for deaf web users when using similar WCAG items. WCAG may also be used to measure accessibility in other types of applications other than websites. WCAG is much too complex to quickly apply by novice developers (Yoon et al., 2016). Thus, it is expensive to deploy a fully WCAG 2.0 Level AA website. Several checklist programs will analyze an organization's website. However, 60% of the guidelines do not apply, and about 30% of the guidelines were impossible to test with an automation tool (Castro, 2018). Awareness of website accessibility enhances accessibility. However, even awareness may not be enough to fulfill web accessibility.

Web developers play a large part in creating accessible websites since they write and manage the code (Crespo et al., 2016). Web accessibility guidelines help web developers design websites that can be used by people with different disabilities. The techniques suggested by Crespo et al. use alternative methods to present information that helps inform developers of web implementation issues. At this writing, many websites do

not follow accessibility guidelines because doing so would require effort and familiarity with accessibility issues.

Nganji (2018) found that only about 16 % of PDF files were tagged when looking at disabled-related websites, which allows a file to be accessible. In addition, about 11% used alt text to help describe images to visually disabled users. Compounding the issues associated with developing website accessibility, developers lack research on accessibility with people with cognitive or learning disabilities. Radovan and Perdih (2016) were an exception by providing a checklist the measures the degree that web-based learning considers the accessibility requirements of people with learning disabilities.

Web Accessibility Testing

Once a website has been designed and implemented, the website should be tested for accessibility. The first published research on measuring accessibility was done by Sullivan and Matson (Wahbi & Mohammed, 2016). That study reported that 95% of websites are inaccessible. Therefore, accessibility to websites must be improved, and metrics should be collected by testing. However, complete accessibility testing is costly, given that participants need to be recruited (Acosta-Vargas et al., 2019). Inexpensive, quick tests are available but miss many issues that a human tester will catch. However, web accessibility testing is necessary to improve accessibility for PWD.

An organization may use several methods when evaluating accessibility. One technique is to use an expert heuristic review or also called conformance testing. Expert heuristic testing is where an expert evaluates a website using a set of known heuristics

(Bai et al., 2016). However, this technique has been criticized because it is unreliable in finding issues when the same heuristics are used. A persona walkthrough is a testing method where the expert adopts the persona with disabilities while attempting to use the website (Bai et al., 2016). A cognitive walkthrough requires a working prototype and expert web accessibility testing (Bai et al., 2016). Acosta-Vargas et al. (2019) designed a useful heuristic method. After selecting the website to study, they targeted the type of user, identified user objectives, and listed the possible barriers according to the user's viewpoint. Next, they used automatic checker tools to evaluate the website's usability and accessibility. Experts would then assess the website. Data were analyzed, and recommendations about the website were suggested. They found the best test results combining automatic methods with heuristic methods. The use of automated checkers should be part of Agile's continuous integration (Kimmons & Smith, 2019). Errors are found and quickly fixed. When using accessibility testing, simulation kits will make developers more optimistic about using continuous testing than guidelines (Bai et al., 2017). Evaluation of web accessibility using PWD users is preferred since users will interact with the system, and actual problems will be quickly found (Bai et al., 2016). A combination of methods may discover most accessibility problems (Campoverde-Molina et al., 2020).

Metrics are needed to inform if software accessibility is improving or is acceptable for release. Niazi and Kamran (2016) combined a descriptive survey and the Delphi technique to evaluate university websites. They used a technique which has six steps to assess testing. Step 1 is to select the sites that are to be tested. Defining user goals

is Step 2. Step 3 details which characteristics and attributes are evaluated. The next step

is to define a criterion function for each attribute. Step 5 finds if the task or function was

obtained and assigns a satisfaction level from the user's viewpoint to the task. The last

step analyzes and assesses the data.

Using automatic checkers will find issues for developers during development and

can be used to compare websites after deployment. Kimmons and Smith (2019) used

WebAIM Wave as an accessibility evaluation tool. In addition, Arrue et al. (2019) argued

that accessibility test experiment design is complicated since it involves experience

collecting user interactions such as mouse from human factors, understanding hypertext,

and other web technologies.

The Relationship Between Web Accessibility and the User Experience

Software developers conforming to a web accessibility standard when designing a

website is helpful for persons with disabilities; however, Power et al. (as cited in

Aizpurua et al., 2016) found that 50.4% of the issues that confront PWD are addressed by

WCAG 2.0. In addition, Aizpurua et al. (2016) found that some websites that violate

WCAG 2.0 can be perceived as accessible. Conversely, the reverse is that a website that

is WCAG compliant may not be perceived as accessible.

The experience by a user is more than the measurable performance metrics, such

as the number of errors, efficiency, and satisfaction. The user experience consists of

objective performance and subjective emotional or intangible experience (Violante et al.,

2019). However, little research was found on the intangibles of user experience. One

exception that examines the subjective experience is Aizpurua et al. (2016), which argued

that the user experience (UX) research approach should use a more holistic method looking at both the performance metrics and the emotional aspects of the user interaction.

UX is recognized as a vital feature in the design and is indispensable in understanding the user's feelings and emotions (Lin & Cheng, 2017). UX researchers have investigated users' hedonic qualities and emotions by asking users to rate preferences, context, and features (Yang et al., 2019). UX is a complex dynamic phenomenon encompassing feelings, behavioral, and physiological reactions (Mahut et al., 2018). When experiencing a website, users' awareness of product qualities and emotions may change before, during, and after using the interface (Minge & Thüring, 2018). Furthermore, successful software development requires users' satisfaction when using software (Zarour & Alharbi, 2017). Therefore, the website designer should incorporate UX ideas such as how the user would respond to the interface while developing.

Conceptual Framework

TAM is the conceptual framework chosen for this study. It is an information theory that models the acceptance or rejection of technology (Davis, 1989). TAM is one of the most used theoretical frameworks to explain the acceptance of technology by users (Xia et al., 2018). Chen and Chen (as cited by Racero et al., 2020) asserted that researchers have used TAM to develop models for adopting any technology in any field. TAM continues to be the main theoretical framework when assessing the use of technology, and its validity has been universally accepted (Racero et al., 2020).

The intention to use technology is influenced by the attitude of the individual to use the technology. Because the use of technology continues to increase, organizations must find methods to tell if newly developed technology will be used and adopted by users (To & Tang, 2019). Technology developed and deployed will possibly lead to a loss of money people do not want to use it (Hwang et al., 2016). TAM general purpose use in explaining user acceptance across many technical and nontechnical applications (Yang et al., 2016). Based on the effects of external variables, user perceptions, and attitudes, TAM predicts and explores the intention and usage of technology. TAM evolved from Ajzen and Fishbein, who developed the theory of reasoned action (TRA), which assumes that people are rational and will use available information. The TRA theory predicts and understands how a person might adopt a system by looking at behavioral intentions as a predictor of behavior. A person's intention, combined with a person's beliefs, determines the person's actual behavior.

The TAM is used to explain the user acceptance of information systems (Davis, 1989). Dixit and Prakash (2018) verified that TAM might be used to predict user intentions to use new technologies. In addition, to understand user's intention to adopt and use technology, Davis suggested that researchers may use TAM to find features of a newly installed system that are unacceptable to users. Because acceptance of a system may not depend wholly on the functions, several conceptual frameworks have been used to understand how people approach and accept technology. TAM is one such framework established by Davis. Using TRA and the theory of planned behavior (TPB) as a foundation, Davis suggested that behavior measures the use of a system; therefore, the

TRA and TPB may be used to explain and predict the user's behavior. Davis made a few updates to the TRA and TPB models. Davis did not use the subjective norm in predicting behavior (Granic & Marangunic, 2019). Instead, Davis used only the attitude that one has toward the new system. Also, only PU and PEOU input variables are enough to predict the user's attitude.

TAM is a significant model when understanding human acceptance of new technology. Davis tested the model, and PU and PEOU influence acceptance of the technology. External variables excerpt influence both PU and PEOU, which also influences PU. PU and PEOU will affect the user's attitude towards using the system, which becomes sequential and affects the behavior to use the system. TAM prediction value comes from several internal and external influencers (Abdullah & Ward, 2016). PU and PEOU will affect a user's intent to determine when and how to use a system (Jin, 2014).

According to Davis (1989), PU and PEOU are the significant determinants driving technology attitudes, and PU is how the person believes that a system will increase that user's productivity; PEOU is how difficult a system is to use. Curiously PEOU influences PU; however, PU does not affect PEOU (Abdullah et al., 2016). When a system makes a user productive and easy to use, the user perception is that the system is quite helpful. Researchers have established that the usability of a system plays an integral part in information systems. Ease of use determines how useful the system may be for users (Abdullah & Ward, 2016). For disabled users, an easier-to-use interface should allow the system to be used, and therefore, these users will believe that using the new

system will make them more productive. TAM framework is suitable for this study since designing and developing web accessible web pages will meet the requirements of PWD.

TAM has been widely studied in many varied fields (Huang et al., 2019). Researchers suggest that TAM is a tool that may be consistently used when explaining users' behavior toward acceptance of technology (Shih & Chen, 2013). However, there are debates about using TAM across race, sex, and culture. Additionally, Mathieson (as cited in Abdullah & Ward, 2016) contends that TAM lacks precise information about a user has perceived usefulness and ease of use but instead produces only broad information, which might be enough in most situations. Still, the research shows that TAM is accepted and helpful in predicting IT system acceptance (Davis, 1989; Lin, 2017; Shih & Chen, 2013).

TAM has been used as a predictor of software usage. TAM is parsimonious and makes looking for other variables impacting PU and PEOU manageable (Bazelais et al., 2018). Consequently, TAM has been applied to many different applications. PU and PEOU are foundational with software acceptability (Folkinshteyn & Lennon, 2016). TAM has been found helpful as a conceptual framework for the acceptance of Bitcoin. Software development uses TAM to show technology acceptance or rejection.

TAM has been used in software engineering acceptance studies. Wallace and Sheetz (2014) examined the desirable properties of software measures that increase effectiveness and determine PU. These four desirable elements are perceived prescriptiveness, language independence, life cycle, and validity. A prescriptive measure will not only identify a problem but recommend a solution (Wallace & Sheetz, 2014).

Language independence means that the measure does not include a contingent of the programming language used. The life cycle as pertaining to TAM refers to the degree to which a measure can be used through the entire software project. Finally, the validity of a software measuring tool is the amount to which it has been supported with data from the current or past software projects.

TAM is a reliable and valid framework that predicts about 40% of technology acceptance based on the user's reasoned response from perceived benefits from using technology that will affect that user's behavior to use the technology (Leong et al., 2018). Because TAM is parsimonious, it easily explains how PU and PEOU are determinants for technological acceptance, but these determinants are influenced by other external variables (Shih & Chen, 2013). Since TAM has been used in many applications, many external variables are mentioned as input to PU and PEOU. Some external variables are compatibility, self-efficacy, and subjective norms (Jin, 2014). Jin (2014) confirmed Davis's theory that PEOU affects PU and that compatibility influences PEOU more than PU. Likewise, Joo et al. (2014) confirmed the idea that PEOU has a positive effect on PU.

Many external variables may be used with TAM; more than 70 external variables have explained how people obtain new skills (Winarto, 2011, as cited in Durodolu, 2016). Winarto (as cited in Yousafzai et al., 2007) categorizes external variables into four groups: organizational characteristics, system characteristics, user characteristics, and other variables. The organization characteristic variable describes the organization's environment, such as if management supports the adoption, if the organization offers

internal training, and peer influence on technology adoption. Some of the system

characteristics describe the system design and system operation. An example of the user's

personal characteristics variables are age, gender, and experience. Other variables will

describe items such as the social pressure and influence on acceptance.

The behavioral intention to use and apply new skills comes from a willingness to

take any action or not take that particular action (Walker, 2015). External TAM variables

may affect the model either as a positive or negative influence. Information anxiety,

which is access to an overwhelming amount of information, is a factor that may affect

PEOU. When the amount of information surpasses the processing ability of a person, a

negative perception may occur (Naveed, 2017). Computer self-efficacy denotes a

relationship between computer self-efficacy and technical acceptance (Khan & Qutab,

2016). Thus, it is a determinant of PEOU. Yussoff (as cited in Durodolu, 2016) defines

computer self-efficacy as confidence that the user will make the right choice to use an IT

system successfully. Obtaining the computer confidence to use is based on expertise and

the ability to use this knowledge to achieve a correct outcome. Another factor that might

increase PEOU is computer experience, which leads to computer literacy, a determining

factor of PU (Durodolu, 2016). The intention to use a system originates from a

willingness to act.

Without a usability component to web design, the user will perceive a difficult

interface and will refuse or misuse the system. Usability has been recognized as a

significant element of perceived ease of use (Mouakket & Bettayeb, 2015) and should be

used when developing new interfaces (Hsiao & Tang, 2015; Ingham et al., 2015).

Designing usability into a user interface has been shown to increase the usage of the system (Punchoojit & Hongwarittorrn, 2017). Okumuş et al. (2016) found that teachers' comfort level with new software tools aligned with PEOU and their perception of the software's functions. Designing websites with usability in mind aids PEOU and acceptance.

Accepting and using a new technology by PWD may be explained by TAM. Many studies have shown the usefulness of TAM across many applications with many different users (Granic & Marangunic, 2019). However, a literature gap exists in the use of TAM for PWD. Because TAM is shown to be a general-purpose framework, it may be used as a framework for the perceived usage for PWD. When accessing the web, PWD may use different technologies than most users. For instance, using a reader for visually disabled users or the ability to move and select web objects without a mouse are examples of physical access limitations of some PWD (Kirkpatrick et al., 2018). Guidelines for W3C define accessibility as ease of use and understanding of the web interface (Kirkpatrick et al., 2018). The accessibility operation is either an external variable that directly affects PEOU (Djamasbi & Tullis, 2006) or the PEOU in TAM, which means that TAM may be used as a framework for this study.

TAM may be used to explain and understand how software developers evaluate and accept, adopt new technologies. (Saghafi et al., 2017). Learning new tools to help increase software developers' productivity may not be a prime concern since it takes them away from writing software. Afshan et al. (2018) showed that developers follow a similar pattern of perceived usefulness while developing an IT system using TAM. Mezhuyev et

al. (2019) showed that software developers follow a similar pattern of perceived usefulness when using and accepting a search-based software engineering technique. Mezhuyev et al. also found that developers showed that PU and PEOU, organization and team-based factors, perceived maturity, and perceived effectiveness impact developer acceptance. Earlier, Venkatesh with Davis (as cited in Lai, 2017) extended Davis's original TAM to an extended TAM that suggested that the TAM can be used for software development in general. TAM was used to measure and predict how well software engineers accept and use search-based software engineering techniques (Mezhuyev et al., 2019). The culture explains how a developer, instead of taking a direct design route in creating webpages, will design in web accessibility to their web interfaces. Many wide-ranging applications such as object-orientated methodology, computer-aided software engineering tools, and software measurement have shown that TAM might be applied across distinct software technologies (Wallace & Sheetz, 2014).

It is the individual intention of a software developer to follow a methodology of guidelines, not the mandated methodology from an organization, to adopt guidelines such as WCAG. The adoption of software methodology by developers is critical to many organizations' improvement (Senarath et al., 2019). Hardgrave et al. (as cited in Mostafa et al., 2018) reported that many organizations believe that to improve the software development process, software methodologies must be used, and developers are expected to adopt the new methodology which means that they will need a behavior change that will use the methodology. Without developer acceptance of an organizational mandate to use web accessibility guidelines, many websites will continue to be unusable to PWD.

Organizations mandating changes to how employees work create uncertainty and loss of control, which may cause resistance and then fail for the new methodology that the organization wants to deploy (Senarath et al., 2019). Perhaps developers could influence an organization to adopt guidelines from the bottom up. My study takes the perspective of the PWD accepting to use a website that developers created using web accessibility strategies. However, web developers must choose to accept or accept a technical mandate to use web accessibility guidelines. TAM may also be used as a framework to understand the developer's determinants to PU and PEOU. TAM provides an appropriate framework for understanding the user's acceptance of a website.

Many models of acceptance of IT have been based on the TAM; however, other factors, or perhaps TAM variables, directly influence intentions to use technologies. (Yoon, 2018). What was omitted from the original TAM was an explanation of external variables that input to PU and PEOU (Davis, 1989). Yousfzai et al. (as cited in Senarath et al., 2019) listed 79 external variables that could be antecedents of PU and PEOU. Lee et al. (Senarath et al., 2019) used a subset and found all antecedents that significantly affect PU and PEOU. However, the influence is not constant across studies. Many studies have customized a subset of PU and PEOU influencers for their studies. Culture is not a constant antecedent for TAM. Schepers and Wetzels (as cited in Senarath et al., 2019) found that social pressure has a more significant influence on intention to use in Western than non-Western countries.

Further, when studies use a similar subset of antecedent variables, the chosen variables' magnitude differs between studies (Senarath et al., 2019). These effects may

indicate that PU and PEOU contributions are more complex than Davis assumed.

Parsimony is thought to be the main strength of TAM; however, it could be a limitation

for research. Several studies chose antecedents based on the context of the research (Kurt

& Tingöy, 2017). TAM has been criticized for having a small scope, so many studies add

different elements to test. Additionally, Legris et al. (Hwang et al., 2016) concluded that

acceptance and TAM studies have overlooked the software implementation process.

TAM provides little research in guidance to designers and software managers.

The TAM

Venkatesh and Davis (2000) extended the TAM by adding social influence and

cognitive determinants as additional external variables. The fundamental TAM model

remained a component of TAM2. Adding new external variables to an extended TAM

allowed many other studies to use TAM as a conceptual framework. (Abdullah et al.,

2016). One such variable is the subjective norm which is the user's belief how most

people think the user should not perform the behavior to use the system (Patil, 2016;

Yang & Su, 2017). TAM2 is not used as a conceptual framework because PWD's primary

concern is usability. If one cannot even see a webpage without accessible aids, PU and

PEOU are predetermined, and PWD will not use the website. The output quality is the

perceptions users will have related to how well the system will perform the required

tasks. (Wingo et al., 2017).

Applicability to this Study

TAM is the most appropriate model to use for this study. TAM is a leading theory

in IT research and is used in many fields (Mortenson & Vidgen, 2016). The TAM has

worked in many experiential studies and is thought to be more potent than TRA and TPB when explaining technology acceptance (Saghafi et al., 2017). Sun and Zhang (as cited in Saghafi et al., 2017) found that TAM was superior to TRA, TPB, and other theories. Folkinshteyn and Lennon (2016) reported that TAM has been accepted and used in many fields of study. In addition, Hong et al. (as cited in Saghafi et al., 2017) showed that TAM can predict acceptance before deployment of the technology. Hardgrave et al. (as cited in Mostafa et al., 2018) used the seminal work of Davis to explain the intentions of software developers to follow a given methodology by an organization. Their study showed how organizations that move from an informal development process to a methodology involving object-oriented design might make developers resist the new change. Methodologies are formalized processes to follow when developing software, such as designing and coding websites that may increase productivity and improve software quality (Talukder, 2019).

Supporting Models

Two supporting models to the TAM are the TRA and the TPB (Saghafi et al., 2017).

The Theory of Reasoned Action

The TRA model was proposed by Fishbein and Ajzen and is a forerunner to explain technology adoption (Saghafi et al., 2017). The TAM used many constructs from the TRA. First, behavioral intention affects individual behavior, which affects the person's attitude toward the behavior (Dwivedi et al., 2019). Therefore, an individual's behavior is driven by their intention to perform the behavior. Second, the theory predicts

a person's behavior. Third, the subjective norm is what a user thinks about how others believe the user's choice to perform the behavior and accept this new technology (Hussain et al., 2016). The subjective norm and attitude are major contributing factors to acceptance. I did not use TRA since it is limited to being able to predict behaviors that affect action.

Theory of Planned Behavior

The TPB developed by Ajzen (1985) is a framework used by many IT and communication organizations (Saghafi et al., 2017). TPB expands TRA by adding perceived behavior control, which was added because Ajzen found that TRA was limited because the TRA did not account for involuntary control. (Scalco et al., 2017). According to Nigg et al. (as cited in Saghafi et al., 2017), motivational factors are used to forecast behavior, indicating motivation. Attitude, subjective norm, and perceived behavior control are factors that affect the individual decision to accept a new system (Paul et al., 2016). A positive attitude for the desired behavior will result in an inclination to act and perform the behavior. (Kim et al., 2016). I did not use TPB because it disregards users' needs and accessibility before engaging with a system.

Contrasting Models

Two of the most significant of contrasting models of IT acceptance are the hedonic motivation system adoption model and the unified theory of acceptance and use of technology (UTAUT).

The Hedonic Motivation System Adoption Model. The hedonic motivation system adoption model is an information system theory that is a framework to help

understand hedonic motivation systems, including online gaming, virtual worlds, and online shopping (Kim & Hall, 2019). The primary component is the users' intrinsic motivations. The hedonic motivation system (HMS) is an alternative to TAM grounded in cognitive absorption, which is a moderator of PEOU. Kim and Hall (2019) found that cognitive absorption is more predictive than PEOU. HMS is not a valid framework for this study because PWD users do not use websites necessarily for hedonic motivations but because they need and want to use them.

The Unified Theory of Acceptance and Use of Technology (UTAUT). The UTAUT was developed by Venkatesh et al. (2003) to overcome limitations of the TAM, which prevented organizations from completely understanding why users did not accept a system. UTAUT is composed of four concepts: efforts expectancy, performance expectancy, social influence, and facilitation conditions (Williams et al., 2015).

New to the theories that attempt to explain technological acceptance, UTAUT adds that the user believes conditions such as organizational wiliness help with using the new system (Dwivedi et al., 2019). Additionally, four affecting variables were identified: gender, experience, age, and voluntariness. UTAUT is not a match to use as a framework if users cannot perform tasks like navigating a website and was not used as a conceptual framework.

Previous Research Projects That Are Similar

TAM was used in many other similar studies. For example, a similar study is researching how software users will use and adapt to a newly developed operating system from Iran (Saghafi et al., 2017). The Saghafi et al. study differs from my study by

research method used. Saghafi et al. (2017) used a quantitative method with 250 users**.** Nurses were found to adopt an information system by using a willingness to use the system and their perceptions of its usefulness (Hsu & Wu, 2017). The Hsu and Wu study differs from my study in that it used questionnaires to nurses to collect data.

Senarath et al. (2019) used a modified TAM to identify the aspects that affect acceptance. The Senarath study used 149 software developers in a quantitative method, which differs from my study. Folkinshteyn and Lennon (2016) used TAM to understand better and study the technology adoption of Bitcoin. Folkinshteyn and Lennon used an in-depth single case study that differs from my study. One last example of previous research similar to this study is a TAM study by Mezhuyev et al. (2019) examining why software engineers may or may not accept a mandated process that will increase the effectiveness of software development. Mezhuyev et al. research consisted of an online survey sent to 1307 participants, which differs from my study.

Application to the Specific IT Problem

This subsection examines strategies for developing accessible websites as found in the literature. These strategies address the specific IT problem: Some web developers lack development strategies to improve the accessibility of websites for PWD.

Many software developers lack awareness of the kind of problems experienced by the disabled (Velleman et al., 2017). Velleman et al. (2017) argued that developers cannot attempt to design with accessibility in mind if they are not mindful that not everyone will navigate the web the same way. The low implementation of web accessibility is not a lack of technical skill but rather a lack of awareness of the issues

(Leitner et al., 2016). One strategy for developing accessible websites is using a technical staff aware of the possible issues that might arise when PWD use websites.

While guidelines exist to help with accessible web development, web developers are rarely aware of barriers to web pages by PWD and the assistive technologies used by PWD. Most developers come to website design with little or no experience inaccessibility (Abuaddous et al., 2016). Abuaddous et al. proposed a strategy that accessibility topics may be taught to students in classes that introduce user-interface development. Putnam et al. (2016) confirmed that developers are not trained or exposed to web accessibility in college but found that if education and guidelines were taught to developers, they would begin to perceive how PWD might experience a website. They found that most computer science students learn little if anything about accessibility. A software culture allows for insufficient resources when producing graphical interfaces (Andrade et al., 2018). Even when web developers believe that they are trained in web accessibility, many also believe designing accessibility into a webpage should be a top-down approach from project management instead of using both a top-down and bottom-up from the developer's approach (Inal et al., 2019).

Many items that software developers should be aware of are found at the WCAG 2.1 website (Abma et al., 2018). Kirkpatrick et al. (2018) suggested using items from the WCAG 2.1: (a) design software to interact from a keyboard as well as a mouse; (b) the current focus of on-screen should be well-defined, and the focus shall be exposed so that assistive technology can track changes; (c) all displayed images must also be available in the text; (d) applications should not override user-selected contrast and the color selection

or other display attributes; (e) color coding should not be used as the only form to inform

the user about information; (f) software should only use flashing objects that have a

frequency between 2 Hz and 55 Hz; and (g) online forms should be designed so that

assistive technology can access the information and produce directions and cues for the

user. However, even with standards and guidelines, current publications lack

implementation guidance (Sánchez-Gordón et al., 2019). Many disability issues are

issues for people without disabilities. Yesilada (as cited in Valencia et al., 2017) revealed

that when icons are too small, most users find them difficult to use.

The WCAG standards and guidelines include more detailed descriptions about

programming for accessibility; however, many developers find the guideline challenging

to understand and use for implementation (Bai et al., 2019). Andrade et al. (2018)

explained another strategy: when developers use web accessibility during the software

lifecycle, it will contribute to obtaining accessible software products. Sánchez-Gordón et

al. (2019) asserted that developers' lack of depth of knowledge is the most significant

limitation to accessibility software. Andrade et al. also found that software developers

lack accessibility knowledge. In addition, unlike many computer-aided software

engineering tools that software engineers use to make their job easier, there are not many

tools to aid developers with web accessibility.

Crespo et al. (2016) explained a strategy using a content management system or

template coding that supports the web accessibility standard, such as software tools that

help developers add the proper variable name or comments into their developed code

based on local coding standards. Another strategy is to use a design-time computer

language, which includes many accessible constructs, which will decrease the time spent developing web accessibility sites (Valencia et al., 2017). Examples of design-time languages from Paterno et al. (as cited in Valencia et al., 2017) are the User Interface Markup Language, Extensible Markup Language, and Universal Command and Control Extensible Markup Language. Another strategy suggested by Valencia et al. (2017) states that the software producers should consider the input devices used and the user and interface specifications. Additionally, Valencia et al. proposed a technique called transcoding, which changes web code on either the server, client, or proxy to adapt to the current user's needs since a single design may not work with everyone.

Accessibility considered at each phase of the software lifecycle is a strategy explained by Andrade et al. (2018). Accessibility requirements should be added to the system beginning with the requirements stage, and the testing phase should use PWD to receive feedback to find accessibility errors (Andrade et al., 2018). Currently, web accessibility requirements are a low priority with most web projects. Andrade et al. add that software developers who use accessibility during integration will increase software quality. Appropriate during all phases of software development, continuous web accessibility training will increase developers' awareness and learning about the advantages of web accessibility, resulting in a better software product (Vollenwyder et al., 2019). The software engineer plays a fundamental role in developing accessible user interfaces (Andrade et al., 2018). With this role, Velleman et al. (2017) found the successful accessibility developers' belief that web accessibility is just the right thing to

do and, as such, becomes a chief advocate for accessibility. Finding a local accessibility

advocate is a strategy for the implementation of designing an accessible web.

Transition and Summary

In this section, I provided an overview of my intended study, including the

problem statement and a literature review of the study topic with a conceptual

framework. Designing accessibility into websites has the potential to improve the quality

of life for individuals with disabilities. Websites should add the dimension of

accessibility for everyone to access and use.

In Section 2, I will include a plan for conducting the study. My role as the

researcher, population, methodology and design, data collection, and organization with

analysis are described. Finally, I will provide a description of dependability, credibility,

transferability, confirmability, and data saturation regarding my study.

Section 2: The Project

Purpose Statement

The purpose of this qualitative, multiple case study was to explore the web development strategies used by web developers to improve the accessibility of websites for PWD. Web developers in Florida who possessed strategies for making websites more accessible were the target population. The implications for social change included the potential to increase the accessibility of software for PWD. The findings of this study may motivate positive social change if web developers use the successful strategies shared by participants to create functioning interfaces for PWD.

Role of the Researcher

The qualitative researcher is the main instrument for data collection and plays a participatory role in the research (Clark & Vealé, 2018). Data are filtered through the researcher, which differs from a quantitative data instrument such as the direct use of questionnaires (Hanna et al., 2019). In addition, when gathering and then analyzing the data, the researcher may introduce personal biases to the data (Berger, 2015).

As the instrument for data collection, I designed the interview questions (Appendix B) and interview protocol guide (Appendix A) as well as selected the participants. I followed the interview protocol, asking semistructured interview questions and probing questions to get more detailed responses from the participants.

In this study, I adhered to the principles for conducting ethical research provided by *The Belmont Report*. *The Belmont Report* puts forth three principles for conducting research with human participants: respect for persons, beneficence, and justice (National

Commission for the Protection of Human Subjects of Biomedical and Behavioral

Research, 1979). The principle of respect for persons allows persons to make their own

decisions, including participating in a study. Once a decision is made, it must be

respected. The second ethical principle is beneficence, which comprises the idea of doing

no harm to participants, increasing the benefits to them, and negating any possible harm.

The third principle outlined in *The Belmont Report* is justice, which means fairness for all

participants. Participants need to be told that they can withdraw from the study at any

point. I treated all participants ethically before and throughout data collection and

completion of this study. I also completed the National Institute of Health, Office of

Extramural Research's web-based training course on protecting human research

participants (see Appendix C).

When conducting a study, the qualitative researcher will need to mitigate their

personal biases. Qualitative data collection can introduce the researcher's biases during

interviews (Morrison & Stomski, 2015). The participant's biases may also be present

deliberately or inadvertently (Fusch & Ness, 2015). By using an appropriate interview

protocol, these biases may be mitigated (Castillo-Montoya, 2016). I used the interview

protocol and video recorded the interview to help mitigate bias.

The rationale for use of an interview protocol is to adjust for researcher bias

during the interview. I used the interview protocol as a process guide to conduct the

interview. The protocol also listed details about the purpose of the study, intended

privacy, and the consent form. Dikko (2016) suggested that directed conversations with

the interview participants should mediate bias. I am employed as a software developer,

which is similar to the work of web developers, but I did not bring any known biases or assumptions to the study. I kept a research journal to record my personal reactions and reflections over the course of the study.

Participants

The target population were web developers in the state of Florida. Including and excluding criteria determine individuals' eligibility to participate in the study and draw boundaries for the sample (Harvey, 2015). Establishing clear boundaries for selecting participants by asserting the inclusion criteria is important (Dixon, 2015). Suitability criteria for a case study reduce the differences between the study population and more clearly define a case participant (Hanson et al., 2016). The inclusion criteria for participation in this study was that participants must have implemented strategies to improve website accessibility and have worked on web accessibility for at least 6 months. An additional eligibility criterion for participants in this multiple case study was that each participant had to have worked for an organization that produces websites that have WCAG 2.0 AA rating.

Strategies for gaining access to participants can include email, telephone calls (Hershberger & Kavanaugh, 2017), and virtual interviews (Lo Iacono et al., 2016). First, I identified organizations by searching the web for the following: *Florida accessible website*. Additionally, I searched the web for Florida's largest corporations. With that list of prospective candidates, I ran a web accessibility evaluation of those organizations' websites to find WCAG 2.0 AA-rated websites. After determining which organization to contact, I emailed the letter of initial contact to a gatekeeper in that organization along

with the letter of cooperation. The gatekeeper provided me with the names of prospective

participants and their letter of cooperation. When the Walden University Institutional

Review Board (IRB) approved the letter of cooperation, I emailed an invitation letter to

the prospective participants along with the informed consent form. Follow-up contact was

conducted via email and phone calls with prospective participants who did not respond.

Finally, I conducted the interviews using the Zoom platform.

A working relationship between the researcher and participants is vital to the

sharing of information (MacDonald & Montford, 2014). Establishing a working

relationship with participants allowed them to share their design strategies in an open

environment. Ethical conduct requires building relationships, creating trust, and

maintaining confidentiality with all participants (McDermid et al., 2014). Gatekeepers are

the interface between the researcher and the group of participants in the organization.

To ensure a good working relationship, I informed the gatekeeper and

participants about the value of the study and the efforts that I would take to safeguard

their confidentiality. When an organization understands the researcher's role, how data

collection will be performed, and participation in the study, the researcher may be viewed

to handle relationships thoughtfully and caringly, contributing to participation (Collins &

Cooper, 2014). I further built good relationships by telling the participants about how

accessible I found their website. I also discussed web accessibility and how well their

particular organization meets the WCAG 2.0 AA standard.

Research Method and Design

Method

I selected a qualitative multiple case study approach to understand strategies software developers in Florida use to create accessible web pages for PWD. There are three research methods available: qualitative; quantitative; and mixed methods, which involves both the qualitative and quantitative methods (Molina-Azorin, 2016). I chose the qualitative method because my research plan was to gain an in-depth knowledge of what strategies developers use to create websites that are accessible to PWD. Furthermore, choosing a qualitative multiple case study is appropriate when the research will be exploratory and not confirm a hypothesis (Odeyemi, 2017). Therefore, a qualitative case study research method was suitable because the study goal was to gain an in-depth understanding of the participants' perceptions.

I did not choose the quantitative method because it would not have fully supported my research goals. Quantitative research is concerned with measuring variables and the relationships between variables (Babones, 2016). The quantitative researcher uses statistics to analyze the relationships between variables and attempts to show the phenomena of interest (Sagar & Anju, 2019). Since the software development strategies were unknown in this study, it would have been difficult to guess the needed variables for a quantitative study. In contrast, in a qualitative case study, the researcher analyzes data by identifying themes and subthemes without using statistics on variables. In this study, I aimed to find participants willing to share their strategies and not collect

data from random population sets. Since this study involved only one research question and did not test any hypothesis, I chose the qualitative method.

Another possible research method to be considered was the mixed-method approach, which combines both qualitative and quantitative methods. Using the mixed-method approach requires a working knowledge of quantitative and qualitative methods (Holt & Goulding, 2014). However, the quantitative method did was not suitable for this study; therefore, it was not appropriate to choose the mixed-method approach for this study.

Research Design

I used the multiple case study design for this research. A case study design is an in-depth exploration of a phenomenon given a predetermined population and geolocational area (Navroodi et al., 2016). A case study differs from other qualitative methods in that the tools that a case study provides allow the researcher to investigate the phenomenon instead of focusing on the participants involved in the study (Yohannes, 2017). The thoughts and beliefs of the participants are better understood by the researcher using multiple data sources for validation of the data (Carter et al., 2014). I interviewed several participants to explore their strategies to address web accessibility design and asked questions to better understand how web designers plan and develop websites to aid PWD.

Case studies can be explanatory, exploratory, and descriptive in type (George & Strom, 2017). Explanatory case studies are conducted to explain causal links that may be too complicated for a survey type of instrument (Kreindler, 2017). In contrast to the

explanatory case study, in a descriptive case study the researcher defines the phenomenon of interest (Englander, 2014). The current study was not explanatory or descriptive; instead, I conducted an exploratory case study to determine what strategies are used to design for web accessibility.

Exploratory case studies are employed to search for information about the area of interest (George & Strom, 2017). Many times, researchers conducting exploratory case studies use face-to-face interviews and ask open-ended questions. Through the use of analysis methods, researchers develop and explore emergent data for reports, codes, and themes (Brobeck et al., 2014). The analysis methods in this study aided in finding themes that pointed to development strategies used by the study participants. An exploratory case study, therefore, was appropriate for this study. This study was exploratory because the research goal was to find strategies to create usable webpages for PWD. I used face-to-face interviews and asked open-ended questions to accomplish this goal.

Case studies are either single case or multiple case (Killingback et al., 2017). In a single case approach, the researcher explores an issue not against other cases to generalize the data but each case within a single organization. Each case is studied and compared to other cases (Starman, 2013). I did not choose a single case study design because the focus in this study was not on one case within one organization composed of user interface developers. Instead, I selected a multiple-case approach to analyze data within each case and across different cases.

I considered using other qualitative designs in qualitative research, such as ethnography, narrative, and phenomenology, for this study. An ethnographic study allows

the researcher to observe and/or experience the participants and centers on the collection, description, and analysis of cultural groups or phenomena interest. (Lewis, 2019). Ethnographic research describes the people and cultures at the individual level (Dutoit, 2016). In the current study, I investigated and developed a detailed understanding of a case or phenomenon; however, the ethnographic research approach was not considered appropriate because I aimed to find strategies for software interface designers and not to research the culture or environment of developers. A narrative approach is used to explore the lives of persons from the stories they tell (Burles & Bally, 2018). I did not select a narrative research design because this study was exploratory, in-depth, and not focused on the personal information of software developers of web pages. Storytelling is an investigation method aligned with the narrative design (Happel-Parkins & Azim, 2017). I used functionally in-depth interviews for exploration; thus, a narrative research design was not appropriate for this study. The phenomenological design is used to describe the personal experience of phenomena of a person (Haegele et al., 2017). A phenomenological study differs from a case study in terms of data saturation because themes may not repeat as they tend to do with case studies.

Describing the phenomena of accessible interfaces as it might appear to a developer experiencing the phenomena was not the emphasis of this study; therefore, I did not choose the phenomenological design.

Data saturation indicates that further exploration will not generate new information or increase any new understanding in the study (Kline, 2017). Data saturation demonstrates that no new information will be forthcoming but will repeat already

collected information (Fusch & Ness, 2015). Data saturation occurs when data from new participants do not yield any new themes or any new understanding of the research topic (Sim et al., 2018). To confirm data saturation, I continued to collect data with participants until no new information was acquired. I asked questions that produced high-quality, sufficient data until no new information, codes, and/or categories emerged. I ensured data saturation by asking all participants the same interview questions in the same order. Secondly, member checking was used to ensure the correct interpretation of the data to make sure that data saturation was reached. Finally, I used coding to identify themes directed by predefined categories, which also aided in achieving data saturation. I gathered data from participant interviews, organization policies, and design guideline documents that pointed to strategies for web accessibility.

Population and Sampling

The purpose of this qualitative, multiple case study was to explore the web development strategies used by web developers to improve the accessibility of websites for PWD. The target population for this study was web developers who had successfully created websites accessible for PWD in Florida. I selected participants from organizations that publish websites with few accessibility issues. WCAG 2.0 ratings defined these issues and were used to guide my selection of participants.

Participant web developers were employees of either private or public organizations that have obtained the AA level by implementing standards and guidelines defined by WCAG 2.0. Organizations was found by a web search of the100 largest Florida organizations and a web search for "Florida web development companies'

accessibility." Each website was automatically scored from a WCAG checker. The top

WCAG scores determined possible organizations. I identified the organization's

gatekeeper by emailing the head of the IT department for large organizations and

emailing the lead of smaller organizations. At least two web developers from each of at

least three organizations as part of this study.

Determining the proper sample size to use for a study is of utmost importance for

research. Qualitative research usually does not have specifically predetermined or large,

specified sample sizes, as does a quantitative study (Blaikie, 2018; Palinkas, 2014;

Palinkas et al., 2015). Moreover, in contrast to quantitative studies, qualitative research

sample sizes increase until data saturation is achieved (Sim et al., 2018). Therefore, data

saturation should be the goal instead of concentrating on sample size (VanRijnsoever,

2017). Smaller sample sizes are a better tool for more focused research (Malterud et al.,

2016).

For this case study, I collected data about strategies used by organizations to make

websites accessible using purposive sampling. Purposive sampling is used to categorize

and expand the differences between the phenomenon of interest and the absence of that

phenomenon (Palinkas et al., 2015). Benoot et al. (2016) asserted that the researcher must

have some previous information when using intensity sampling and be prepared to do

investigative work to ascertain the differences between those cases that are associated

with the phenomenon of interest and those that are not. (Palinkas et al., 2015).

To gain information to select candidate partner organizations from the population

of Florida companies and other organizations who have websites. I examined websites of

the 100 largest private companies, all the state counties, many cities, schools, and other

organizations in Florida by using tools that check the websites for compliance with the

WCAG 2.0 standard. A resulting score from the compliance tool indicated the goodness

of compliance. Only the top AA-scored websites were considered and ranked in order by

score. The top-ranked organizations were prospective partners; out of those, four partner

organizations were chosen. Websites may be judged for accessibility using the criteria of

coding and high-level usability issues (Almourad et al., 2019). Brajnik and Vigo (2019)

suggested metrics that may be used to judge websites. Websites may be checked to

confirm the WCAG by using one of the many software applications that evaluate a

website (Al-Khalifa et al., 2017; Rau et al., 2016). I developed and ran a program using a

list of top Florida companies and local governments to test for accessibility.

Once a potential organization was found that might provide information about my

research topic, I contacted the organization's chief information officer (CIO) or head of

IT, who served as the gatekeeper for the organization. The CIO of an organization is

tasked with its IT work (Paul et al., 2018). The CIO is the gatekeeper for an organization

(Hütter et al., 2017). Gatekeepers can be supportive in gaining access to a specific

community of employees (Peticca-Harris et al., 2016). I emailed a letter of introduction to

the gatekeeper, along with a proforma letter of cooperation, asking the gatekeeper to

provide a letter of cooperation and the names and email addresses of three potential

participants. As a result, the gatekeeper provided a letter of cooperation, allowing me to

proceed with my study using that organization as a potential candidate source. In

addition, my contact gatekeeper provided the names of prospective participants within the

organization. After IRB approved the letters of cooperation, I emailed an invitation letter to prospective participants with an attached informed consent form. Bruno et al. (2018) advocated sending invitation letters to prospective participants. Sundstrup et al. (2020) suggested that study participants sign an informed consent form. I requested that the participants sign and return the informed consent form if interested. I asked the participant to suggest possible times for interviews.

I ensured data saturation within this study. Data saturation is reached when enough information is collected that additional data from other sources will not continue to generate new information (Veletsianos & Shepherdson, 2016). Additionally, data saturation is realized when data collected will not affect the research question (Suárez-Guerrero et al., 2016) or produce new themes (Coorey et al., 2017). I interviewed the participants and asked questions that generated rich and thick data to ensure no more data were received to confirm data saturation. There is agreement that data saturation may be reached based on rich and thick data types instead of the number of participants interviewed (Azmat & Rentschler, 2017).

To ensure data saturation, I continued data collection until no new information was found. I interviewed two participants in each organization. If both participants reported the same things, I reached data saturation within that organization. If different data were communicated, I continued interviewing a third participant and continued with more participants until I reached data saturation. I used only organizations that have at least several potential participants to ensure data saturation. Once the first organization demonstrated saturation, I began data collection on the subsequent organization. I

repeated the participant interviews looking for data saturation. When data saturation

occurred, I moved to the third organization repeating the process. If the third organization

echoes the data found in the previous two organizations, saturation has occurred. If not, I

continued with more organizations until data saturation was found between the

organizations.

Ethical Research

The Belmont Report, a U.S. government report that most researchers turn to

before performing research with human participants (National Commission for the

Protection of Human Subjects of Biomedical and Behavioral Research, 1979). The report

enunciates three main principles. The first principle states that the researcher should

respect participants by being courteous and respectful and allowing for informed consent.

The researcher, therefore, must conduct themselves in a truthful matter. The second

principle which the researcher should follow is the idea that the study should not harm

the participant. The last principle ensures that the research is collected reasonably and

that the research procedure should be managed equitably. I followed the protocols of the

Belmont Report.

After obtaining IRB approval and sending the Informed Consent Form to each

candidate participant, I began the informed consent process. The informed consent form

informed participants of the purpose of the study, that participation was voluntary,

identification was confidential, that participants may withdraw at any time or any reason,

and that the storage of data would be kept on an encrypted disk in a locked box for five

years. Researchers, while doing research, must plan for any ethical issues that may come

up. Qualitative research must have informed consent from participants (Roth &

Vonunger, 2018). Receiving informed consent tends to lessen risk (Nusbaum et al.,

2017). Informed content builds trust between the researcher and participant and is an

essential part of *The Belmont Report* (Miracle, 2016). I was responsible for participants

understanding informed consent, and the information was accurate.

Gaining informed consent and making the participants knowledgeable about any

ethical issues with participation mitigated bias and confirmed that ethical requirements

were met (Erves et al., 2017). In order to mitigate bias and confirm that I met ethical

requirements, I ensured that the informed consent forms were signed, and I disclosed any

possible ethical issues. I obtained trust with participants by informing them that they

might benefit from the study.

As stated in *the Belmont Report,* Bromley et al. (2015) recommended informing

participants that they may withdraw from a research study verbally or in writing.

Therefore, following the protocols of *the Belmont Report*, participants were told that to

withdraw from the study, they may notify me verbally or in a written format. This

withdrawn communication may be by phone, email, or any online format. Furthermore,

the participant was informed that they might withdraw without any reprisal. Once

withdrawn from the study, I excluded any data collected from the withdrawn participant,

and the data removed from the encrypted disk.

No compensation or incentivization of any kind was given for participation in the

study. According to Bowen and Kensinger (2017), inducements may influence the study

results or cause a bias if the participant wants to please the researcher. In addition,

incentives may involve negotiation, influencing the research results if the negotiation

may produce a particular response (Largent & Lynch, 2017).

The confidentiality of participants is a prime factor when doing qualitative ethical

research (Petrova et al., 2016). Therefore, identification was confidential when I

collected, analyzed, stored, and managed data. To ensure participant confidentiality, I

gave all participants a code (e.g., Participant 1, Participant 2) in the description to conceal

their identity. Only one table containing the code with name and other information such

as organization, which may identify the participant, was kept on an encrypted disk.

Surmiak (2018) suggested that all data collected be securely kept on an external

disk. All data collected from the initial contact, any communication, interviews, member

checking, or follow-up was stored on a password-encrypted external disk that will be kept

in a locked box for 5 years after completing the study. After the 5 years, all data

regarding the participants will be destroyed by using a data destruction program that runs

a low-level format that overwrites the drive with zeros. For example, a table that matches

the participant number to their identity will only reside on the encrypted drive and will be

destroyed with the data at the end of 5 years.

No project research occurred before IRB approval to ensure that ethical research

requirements were met. The informed consent procedure is necessary for qualitative

research and to ensure compliance with ethical requirements. I provided each participant

with copies of the Invitation to Participant Letter and the Informed Consent Form. I

explained the purpose of the study and the interview procedure. I informed participants

that the study would not include the names of the participants or the organization that they are a member of.

Walden University's IRB approval number for this study is 02-19-21-066521, and it expires on February 18, 2022.

Data Collection

This multiple case study explored what strategies developers use to design websites to meet accessibility guidelines using interviews. Thus, participant interviews were an appropriate data collection method to gain knowledge about web accessibility. In addition, interviews are a significant method for collecting data using a qualitative case study (Alshenqeeti, 2014).

Data Collection Instruments

The primary data collection instrument in qualitative case studies is the researcher (Sorsa et al., 2015). The researcher plays an essential role in data collection (Gabriel, 2015) since the researcher may introduce bias into the data. In addition, Bamberg et al. (2018) reinforced by writing that the researcher is a critical component in data collection and may substantially affect how the data is collected and interpreted. In this multiple case study, I was the primary data collection instrument. I used data collection instruments such as the semi-structured interview and interview protocol (Appendix A) to gather data from participants.

Additionally, reflective journals serve also as an instrument in data collecting (Spillane, Larkin, et al., 2017). Researchers record how they make decisions, the foundation for decisions, and any critical thoughts during data collection (Ibrahim &

Edgley, 2015). Further, a reflective journal aids the researcher to document the research

process and issues (Orange, 2016) and expose bias in themselves which they were

unmindful (Vandermause et al., 2014). As a subset of the reflective journal, I included

field notes to record any contextual information about the interview. Dohaney et al.

(2015) argued for taking detailed field notes that include observations that may lead

context to the words spoken during the interviews. Phillippi and Lauderdale (2017)

suggested that field notes will add richness to the participant's interviews. Additionally,

Riveros et al. (2016) discussed using field notes to improve theme coding and gain

richness of data.

I used semistructured interview questions (Appendix B) after gaining participant

signed informed consent with the date, time, and location for each interview to gather

data from the participants. The interview was conducted via Zoom. Interviews were

following the Interview Protocol found in Appendix A. A researcher may adjust the

questions during an interview if something novel occurs (Baskarada, 2014). Case studies

may use many data sources to view different perspectives and validate the data (Ledo-

Andión et al., 2017). Using several data sources increases data credibility and

triangulation (Hanney et al., 2017). I asked the participants for any documents, policies,

and design guidelines that have to do with creating web accessibility, which served as a

secondary data source. I used member checking for the reliability and validity of the data

collection instruments. Member checking confirms with the participant that the data

captured truly represents what was said and meant during an interview (Ghiga &

Lundborg, 2016). Member checking may also enhance reliability and validity during data analysis and interpretation (Balasubramanian, 2017).

Thomas (2017) describeed how a researcher could use the time after the interview to serve as member checking. Following the interview, I scheduled a follow-up interview. Prior to the follow-up interview, I listened to the recorded session, review the transcript, summarize the transcript into a bullet list. In the follow-up interview, I gave the bulleted interview list to participants to read the researcher's interpretations and offer any corrections or additional information to verify that the researcher had understood the participant properly. Member checking improves the reliability and validity of data. Member checking was used for communication between the researcher and participants during each phase of data collection (Simpson & Quigley, 2016). Twining et al. (2017) highlighted member checking participants to review and comment on the provided transcripts and use purposeful sampling.

Data Collection Technique

Multiple sources of data collection mentioned in the Data Collection Instruments section include interviews with participants, semistructured interviews and interview protocol (Appendix A), policies and design guidelines documents focused on strategies to create web accessibility. The prime collection technique for gathering qualitative data is the interview (Heath et al., 2018).

Researchers need to keep participants safe and guard against exposing their identities (Salmons, 2017). Participants need to understand what they agree to give the researcher and why the research is being studied. Before participant interviews, I sent an

informed consent form detailing the benefits and protections given to participants

regarding the study.

Participants were told that they have a right to privacy. Each interview proceeded

with the researcher informing the participants about the purpose of the study, how to

withdraw from the study, and how the study finding are published. The participant

reconfirmed permission to take notes and to record the interview. Telephone and video

interviews were recorded and transcribed. Classifying all data collection instruments

should be clearly stated for a study (Twining et al., 2017). The recording began after

audio devices and associated applications for interviews were tested before any

interviews. I recorded the audio with a digital audio recorder. Two recorders were used

for failsafe backup.

After a brief introductory conversation, the interview began reviewing all aspects

of the informed consent form with the participant. The informed consent review informs

the participant that they are free to decline to answer any question or stop participating at

any time. Participants were free not to answer any individual question. All information

was strictly confidential. No individual names or names of organizations were used.

Moreover, only the researcher had access to the data. The participant was asked if they

have any questions before proceeding on with the interview.

A semistructured interview will allow for emergent trends and interactive

techniques for collecting data (Arsel, 2017). Disadvantages for interviews may be biased

(Qiu & McDougall, 2013) and time-consuming in the amount of time to find, recruit, and

schedule interviews (Quartiroli et al., 2017). Additionally, not all participants make for

good interviewees, and it could be hard to engage and may be reluctant to talk about sensitive information (DeJonckheere & Vaughn, 2019). Nevertheless, interviews are effective (Vogl, 2013) and allow for a richer data collection by identifying and understanding facial expressions (Min, 2017). The interview concluded by asking for relevant documents or information that the participant has agreed to provide to the researcher. Finally, the participant was thanked and informed about member checking with a bullet-point summary.

Member checking creates a conversation between the researcher and participants around data collection to achieve saturation (Simpson & Quigley, 2016). In addition, it allows participants to read the researcher's interpretations and offer corrections (Thomas, 2017). In the follow-up interview, I provided a summary of my interpretation of the participant's answers from the initial interview for the participant to verify that my understanding was accurate.

Data Organization Techniques

Data organization and management are critical with qualitative case studies (Alam, 2020). Hardy et al. (2016) discuss that only when data analysis begins can themes become apparent. Therefore, data must be organized to ensure that data is collected with an organized method to find themes. NVivo is a qualitative data analysis and management software tool (Robins & Eisen, 2017). I used the NVivo software Version 12 to store data and help identify themes. All data were saved using NVivo. Additionally, I also stored field notes, transcriptions, and information from interviews that were recorded into audio files onto the NVivo software.

In an overabundance of caution for confidentiality for the participation of individuals, all data, which includes letters of informed consent, and my reflective journal was scanned and stored onto an external encrypted storage drive as suggested by Surmiak (2018). Once the paper documentation is scanned onto the encrypted disk, the paper was shredded. That drive will be stored in a locked safe when not in use and for 5 years after the completion of this study. It is vital that data collected from the study be kept private (Saunders et al., 2015). Therefore, the confidentiality of the collected data will be maintained, and all collected data and materials gathered for this study will be destroyed after 5 years.

Data Analysis Technique

Triangulation allows the review of data collected using different methods to realize an accurate and valid evaluation of qualitative study results (Chatchumni et al., 2019). Denzin (1978) proposed a qualitative study approach that includes multiple viewpoints to mitigate possible bias that might originate from a single method or single observer. Further, Denzin asserted that qualitative researchers use multiple triangulation forms, including data, methodological, theory, and investigator triangulation. Using triangulation in qualitative research data collection ensures the reliability and validity of the study (Fusch et al., 2018). Methodological triangulation is used to ensure valid and reliable results (Höber et al., 2016). I used methodological triangulation to enhance the), and help validate data interpretation (Hoque et al., 2013). I used other data sources such as web design reliability and validity of the collection instrument. Other multiple data sources was used, such as historical documents and design guidelines documents. Using

multiple data sources that establish methodological triangulation demonstrates reliability and validation of data (Yüzbasioglu & Babadogan, 2016).

Twining et al. (2017) suggested data triangulation by using data from different participants. I purposely chose participants from various organizations and coded the semistructured interviews after the event to provide triangulation. The data collected helped explore the case. All data sources used built a methodological triangulation and secure data saturation (Ray, 2017).

Data collected in this study was obtained, and interviews, policies, and design guidelines documents focused on strategies to create web accessibility, and field notes and reflective journals that contained any issues that came up during interviews. Case study researchers should accumulate all the data sources (Chatchumni et al., 2019). All case data sources should be transcribed (Stewart et al., 2017). I recorded all design guidelines documents from organizations that focused on strategies to create web accessibility. I entered the names of the participants into a password-protected NVivo file that is stored on an external drive and kept in a locked safe for 5 years.

Thematic analysis allows the researcher to understand meaning and patterns from the data collected (Smith et al., 2017). Thematic analysis permits a strategy for interpreting data and makes the shared differences in participants' descriptions of their experiences. A narrative is developed from emerging themes from the data. Thematic network analysis was coded data into descriptive topics to find primary patterns (Crowe et al., 2015). Thematic analysis identified, analyzed, described, and reported on themes

found from the data. Thematic analysis may be used to find unanticipated understandings (Nowell et al., 2017). I used semistructured participant interviews to extract.

I used NVivo Release 12 software to help identify themes. Additionally, I imported all relative documents to help with data organization included with NVivo Release 12. Once interview transcripts and other documents were imported, I began to code interview transcripts using the auto-coding functions built into NVivo Release 12.

NVivo allows users to query emerging themes and transcribe audio (Woods et al., 2016). I used NVivo to find themes in the interviews and help with transcribing the audio. All other types of data, such as my notes and any documents provided by participants, were cataloged. According to Bengtsson (2016), organizing data by theme allows the researcher to affect consistency and reliability.

Throughout the data collection process and during data analysis, I looked through the data for themes and compared the themes to current literature on designing for web accessibility. Thematic analysis is crucial to translating data and observations into understanding the phenomena (Esfehani & Walters, 2018). I developed themes from transcriptions of the interviews and other data sources that I collected. I looked for specific words within the current literature and looked for phrases within the interviews.

Reliability and Validity

The reliability of a study refers to the repeatability of the research process and resulting inconsistent findings (Leung, 2015). In addition, the validity of a study confirms that the study's findings characterize the phenomenon being studied (Dikko, 2016). With

qualitative research, reliability and validity manifest by creating credibility, transferability, dependability, and confirmability (Korstjens & Moser, 2017).

Dependability

The dependability of a study is the degree to the research findings will be stable and consistent over time and conditions (Kanavaki et al., 2016). Watson and Downe (2017) explained that dependability is the importance or usefulness of data collection, analysis, and findings. Clarke et al. (2016) argued that dependability asks if the study can be replicated with similar results. External audits or inquiry audits may address this question to establish dependability (Miles et al., 2014). An inquiry audit confirms that a qualitative study supports dependability (Ibiamke & Ajekwe, 2017). An inquiry audit may be performed by asking an experienced qualitative investigator to examine all data collection and analysis aspects. I used an inquiry audit for dependability. My advisory committee performed the audit as they evaluated and approved my prospectus, proposal, and the full report of my study.

Credibility

Credibility for the qualitative study is the realistic description of the phenomenon that is studied and a logical conclusion from the study (Liao & Hitchcock, 2018). Liao and Hitchcock (2018) suggested several techniques might be used to ensure credibility. These techniques include prolonged engagement, triangulation, and member checking (Liao & Hitchcock, 2018). Amankwaa (2016) asserted that member checking is a valid technique to establish credibility, and Liao and Hitchcock suggested that member checking is the most crucial technique to use to show credibility.

I verified with a second conversation that the data collected with interviews denotes the participant's words with member checking after transcription of the interview. Each participant verified the findings that I draw from the participant's experience. By member checking the interview and research conclusion, a prolonged engagement was checked for credibility. I used methodological triangulation to help validate multiple sources of data collected with interviews and documentation. I asked for the case organization regulations and design guidelines that address web accessibility. In a case study, methodological triangulation uses multiple data sources to add multiple viewpoints, increase reliability and validation of data, and justify the interpretation of data (Durif-Bruckert et al., 2015). I used methodological triangulation when studying transcribed data. I interviewed available participants until there was no new information being given and no new emerging codes.

Transferability

Transferability measures how useful the findings are to others in other environments (Fusch et al., 2018). Clement et al. (2015) argued that researchers may support transferability with rich and thick description of the context, location, and participants studied (Bokaie et al., 2015). To be persuasive, researchers should create a picture to inform and convince readers (Amankwaa, 2016). Henry and Foss (2015) stated that transferability is achieved when a study has enough detail so that other researchers can begin to evaluate if the conclusion drawn from the study may be transferable to other situations. Transferability then is the degree that the findings can apply outside the current study (Hjelm et al., 2015).

I achieved transferability through detailed and clear descriptions during interviews and observations. Additionally, transferability was achieved by logging data to a detailed reflective journal and comparing similar environments with similar participants.

Confirmability

Confirmability refers to how well the data support the findings (Hjelm et al., 2015). Fujiura (2015) stateed that confirmability is how the participants form the findings instead of the researcher's bias or motivation. Audit trails and reflexivity are two strategies to establish confirmability (Willgens et al., 2016). Audit trails may be thought of as a research blueprint that includes procedures (Auger, 2016). Confirmability can be ensured by recording the study's blueprint so that another researcher can attempt replication. If the study can be replicated, confirmability is supported (Billups, 2014). I achieved confirmability with reflexivity by keeping records of what I understood about the participants and myself to offset bias about the research that might interfere with the study results.

Data Saturation

When no new data, or new themes, or no new coding are found, data saturation occurs (Fusch & Ness, 2015). Therefore, further exploration will not generate new information or advancement of the study (Kline, 2017). To find the point of data saturation, I interviewed two participants from an organization. If the two participants' responses were similar, I assumed that I reached data saturation within that organization. However, suppose the two participants disclose information that differs or gives

information not found in the other participant interview. In that case, I would have

interviewed a third member of that organization and continued to interview until at least

two participants duplicated each set of information. I did the same when comparing

information between organizations. If, after collecting data from three organizations, I

found that information discussed by people in different organizations was not the same,

or new information was specified, I added a fourth organization and began interviews

with them.

Transition and Summary

In this section, I provided an overview of my study, including the problem

statement and a literature review of the study topic with a conceptual framework.

Designing accessibility into websites has the potential to improve the quality of life for

individuals with disabilities. Websites should add the dimension of accessibility for

everyone to access and use.

In Section Two, I included a plan for conducting the study. I explained my role as

the researcher, population, research methodology and design, data collection, an

organization with analysis. I provided information for dependability, credibility,

transferability, confirmability, and data saturation regarding my study.

Section 3: Application to Professional Practice and Implications for Change

In Section 3, I present the research findings through the lens of the conceptual framework. The section also contains a discussion of the implications for social change. Section 3 concludes with my recommendations for future study and reflections.

I collected data for this study from semistructured interviews conducted with multiple web developers from Florida and documentation from each participant case organization. My field notes and reflective journals were also a source of data. The research question was: What are the website development strategies used by website developers to improve website accessibility for PWD? Three significant themes emerged from data analysis: (a) organizational awareness and experience with web accessibility, (b) importance of web accessibility evaluation, and (c) importance of web accessibility training. These three significant themes show potential strategies that web developers can use to create websites for PWD. A table is presented with the data related to each theme to explain the findings. Each table consists of columns that show the count and frequency of participants whose responses made contributions to the theme and the count and frequency of organizational documents that had essential contributions to the theme.

Presentation of the Findings

The purpose of this qualitative multiple case study was to explore the strategies that web developers use to incorporate accessibility into websites. The data came from interviews with 8 web developers and organizational documentation from 4 organizations in Florida. The findings showed that securing a commitment from all levels of the

organization, web accessibility evaluation, and web accessibility training are major
factors for making websites accessible for PWD.

Theme 1: Organizational Awareness and Experience With Web Accessibility

Results of Data Analysis of Participant Interviews

The first primary theme involved the awareness that using websites for PWD is
difficult, if not impossible. Appreciation of the struggles that PWD are confronted with is
essential to begin successfully creating accessible websites. Theme 1 contained the
following subthemes:

- Awareness of web accessibility from the whole organization,

- Understanding users' needs when using sites, and

- Knowledge and experience needed to develop web accessibility websites.

According to participants, these subthemes are needed for website developers to create
web accessibility strategies. Table 1 shows three essential elements of web accessibility
as found from this study and the frequency of participants who said they are involved
with these web accessibility design strategy elements. Table 1 also shows the number of
source documents that captured many of these elements of web-accessible design
strategy.

All eight participants reported that, from upper management to the designer level,
their organization was committed to accessibility. Promoting awareness and knowledge
at all levels of the organization is an essential step for organizations that want to provide
accessible results. When beginning a new generation of webpages, Participant #4000's
organization choose to make a commitment to develop accessible webpages:

We made a decision as an organization that we were going to achieve a certain

level of accessibility on our public websites, and so we laid out a policy that said

any new website from this day forward will meet these requirements.

Participant #5001 discovered that accessibility awareness is foundational, stating that

"learning how people with disabilities interact with computers and the Internet can be

very eye opening." Participants #4002 and #6000 mentioned that empathy is a major

force in development and addressing the problem directly. Saying that accessibility "is

both the law and the right thing to do," Participant #5000 reported that "digital equality"

is a shared attribute in the organization.

Table 1

Organization Awareness and Experience with Web Accessibility

Source of Data Collection	Participant count	Participant frequency	Document count	Document frequency
Awareness to design for PWD users	8	25	9	19
Design based on users' needs	8	42	9	39
Knowledge and experience in designing usable websites	8	16	9	3

Accessibility is part of the organization's "culture of inclusion," per Participants

#2001 and #2002. Participant #2001 reported that upper management understands and is

committed to web accessibility. Awareness was a strategy that participant organizations

used to development accessible websites.

All eight participants stated that understanding the needs of the users was an

important design strategy. Participant #2002 said that there are large differences between

accessible and nonaccessible sites. The largest difference being the "frustration" of

nonaccessible sites and how "enjoyable [sites are] when it's done correctly," indicating knowledge of PWD barriers when using a nonaccessible site. Participant #5001 understood the needs of the users after watching videos of PWD attempting to use computers, reporting, "[We watched] videos with people that have different types of disabilities and how they interact with their computers, and I think that's something that people don't see very often." Therefore, developers must understand the needs of the user. The findings confirm that understanding the needs of the users was an important design strategy, which answers the research question.

Participants reported that knowledge and experience of web accessibility techniques are required for accessible websites. Six of eight participants demonstrated experience designing accessible websites, including strategies such as adequate color contrast, design keyboard navigation, create accessible PDFs, add proper alternate text to images, and use of Accessible Rich Internet Applications landmarks.

Five of eight participants reported that color contrast is important for accessibility. According to the WCAG guidelines, the contrast ratio measures the foreground of a display to the background. Participant #4002 said, "Metallic gold color, and so the contrast was not there, you know, because the text was the paper you know. So, there was very low contrast." Therefore, this developer updated the foreground and background contrast. According to Participant #2002, one of the common errors that web designers make is not adjusting the aspect or contrast ratio. "Color contrast plays an important component of accessibility," asserted Participant #6000.

A development technique reported by four of eight participants was that the keyboard should be thought of as an input design only without using the mouse. Participant #2002 developed a website with keyboard only by thinking how a user might make a purchase without a mouse by envisioning how to fill-in and navigate all the online forms needed to purchase an item. Participant #5001 agreed, saying, "I think the thing that I always start with because is probably keyboard navigation. Keyboard navigation is probably one of the easier things to get right, so like you can do a really good job on it." Participant #2002 reported, "We'll use screen readers and make sure that the screen readers are allowing you to navigate in a pretty predictable way."

Five of eight participants reported that PDF format is an issue with website design. Participant #6001 described many old pages of government documents that were scanned into PDFs but not into text, which are difficult for screen readers to access. Confirming the difficultly of accessible PDF, Participant #4001 said, it is "not always as clear what you're supposed to do with PDF, so PDF can be a little bit of a tricky thing for us." Changing a scanned PDF with color has challenges for developers. Participant #4002 found that metallic gold placed on a white background caused a low contrast, which made it hard to differentiate between the colors. Participant #6001 stated that some municipalities have 70 years of minutes in PDF format that have been scanned into PDFs and not yet converted to text, which are needed by screen readers.

All eight participants agreed that adding alternate text to nontext content is an important part of making websites accessible. Participant #6001 adds scalable vector graphics (SVG) with alternate text: "For performance reasons why we stopped using

them, but where things like SVGs with alt tags work a whole lot better. They're a lot

more accessible."

Document #2003 addressed Accessible Rich Internet Applications landmarks by

stating that they could help PWD users to navigate to and past blocks of web

content. This document is an accessibility checklist and defines landmarks as attributes

that are added to webpage elements to define areas. According to Participants #2001 and

#2002, landmarks are useful to screen readers because they help to navigate and orient

the PWD to the website. The findings provided an answer to the research question for this

study because accessibility awareness and knowledge was found to be an essential

strategy when developing websites.

Support From Organizational Documents

I used nine internal documents that mentioned the organizational policy and

awareness on accessibility. Additionally, I researched the study site organizations'

websites that discussed web accessibility for design policies. The documents reviewed

are listed in Table 2.

Table 2

List of Source Documents

Document Number	Document Name
2001	Accessibility Checklist
2002	Organization's Website
4001	Website Terms of Use
4002	Website Accessibility Policy
5001	Accessibility for Content Editors
5002	ADA Compliance
5003	Website Items to Check
6001	Proposal for Website Accessibility
6002	ADA Organization's Whitepaper

Document #2002, a public webpage, noted that their organization designs accessibility into websites. Partly used as a sales document for future clients, this organization document informs the would-be client that accessible websites mean "no one's stuck squinting and trying to tap on microscopic buttons" along with a follow up to suggest that it is the law, and it is "the right thing to do." Document #2002 adds that with an awareness of web-accessible sites, "We create websites that provide an equitable experience for all visitors, no matter their limitations or disabilities." Another organization expresses what accessibility requires in Document #5001 that states, "Our shared goal is digital equality and equal access for all visitors to your website." Document #4001 confirms the organizational policy of web accessibility.

Developers must have the knowledge and experience to design accessible websites. According to the WCAG guidelines, the contrast ratio measures the foreground of a display to the background. Document #2003 suggests that the most inferior ratio that a designer can display is writing black text on a black background, resulting in a 1:1 ratio.

The WCAG 2.0 recommends at least a proportion of 4:1 (WebAIM, 2020). Participant #4002 was given a paper copy with the text printed in metallic gold, which resulted in a poor contrast ratio; consequently, the web developer changed the background and foreground color contrast.

Three of nine documents referenced using alternate text with nontext images or videos. Document #5001 reports that a minimum obligation for images and graphics is using alternative text. According to Document #2001, if the alternate text is missing, the screen reader will not read a description of the image. Document #6001 states that many developers fail to include a simple explanation of the picture on the page. Developers with accessible experience use alternative text to images.

Four of nine documents reference accessible PDFs. Document #4001 states that a PDF file on a web page presents accessibility issues for a website and WCAG recommends making PDF files accessible. Document #5001 offers a service to convert standard PDFs into readable PDFs by screen readers. The suggestion to include a proper title is made in Document #6001. Additionally, in Document #6001, it is suggested that the developer should use Adobe Acrobat's Accessibility plugin to scan the file and add the appropriate tags. Document #2001 recommends that the PDF-scanned image should correctly convert to text with the use of optical character recognition (OCR) text recognition but that the developer should check that the OCR can read the PDF text fonts. Web developers need experience working with PDFs to make them accessible.

Comparison to the Literature

Based on the participants' responses, the developer needs the support and awareness from the organization to implement strategies needed to create accessible websites. In addition, participants mentioned that experience and knowledge to develop accessible websites is also an essential ingredient to web accessibility. Awareness of web accessibility also aligns with my findings in the literature review.

The lack of accessibility awareness is one of the most challenging problems when designing and implementing websites (Leite et al., 2021). After surveying 872 participants in the development of mobile applications in Brazil, Leite et al. found that most participants have some accessibility awareness but little knowledge of accessibility or adoption in practice. Accessibility is not considered in their software development due to the lack of attention of PWD. Most developers do not have a disability or know someone who has one, so not understanding the barriers PWD faces might mean that the websites will not be accessible. Understanding and identifying PWD and their barriers to using the web should help web developers make usable websites (WHO, 2018). Useable websites will be built for PWD as developer awareness increases (Syafiq et al., 2018). Seven of eight participants indicated that without accessibility awareness by the organization, it would be challenging to attempt web accessibility Because no problem exists that the developer needs to address.

The lack of awareness of web accessibility is a common problem (Abuaddous et al., 2016). Abuaddous et al. found that accessibility awareness is a significant challenge for developing accessible websites. All web development team members play a role in

accessibility; however, the project manager ensures compliance to business goals.

Without management support, there will not be any adherence to accessibility.

Abuaddous et al. state that the project manager should encourage the software team to be

involved with accessibility issues when the team lacks the awareness of accessibility.

Furthermore, if team members lack experience, they should consult with a third party to

support accessibility. The lack of accessibility awareness and experience when designing

and building websites may prevent PWD from accessing a website.

Ties to the Conceptual Framework

The current study's findings are consistent with the TAM in that the TAM allows

for external factors as input to PEOU and PU which are influenced by accessibility

awareness and knowledge. TAM predicts the actual system use of technology (Davis,

1989). To overcome barriers to websites PWD use assistive technology when accessing

digital systems, including screen reading software, magnifiers, and voice recognition

(Almaiah et al., 2016). The design and implementation of websites must target assistive

technologies to make websites accessible to PWD. The lack of understanding of PWD

barriers affects PEOU and PU. If the developer is unaware that barriers exist, web

accessibility may not be considered. Based on the current study's findings, I concluded

that without awareness of the possible accessibility issues, the developer would not

address the essential components of web accessibility. The developer may not understand

that barriers exist for PWD using websites.

This study's subtheme of understanding user needs is consistent with the TAM

component of the PU. The PU is the relative benefit or outcome belief that users believe

that using a website will help them achieve their goals (Davis, 1989). Without obtaining

the PWD PU, the user will reject the website for it is not helpful.

In addition to awareness of accessibility and understanding users' needs,

knowledge and experience are needed to develop web accessibility websites. Knowing

the foundations of implementing web accessibility determines PEOU. Without additional

alternate text for images, a PWD user misses the purpose and intended impact of the

context. To gain meaning from the unseen image, the PWD must return to the narrative

text and attempt to find the meaning from the text. Rework is needed to find the intended

image content, and thus, the PEOU becomes a negative experience for the user.

Based on the current study's findings, I concluded that a PWD who perceives the

website as too challenging to navigate would not want to adopt and use the website;

however, a PWD who perceives websites as valuable and easy to learn will likely want to

use the website. The findings support Theme 1 and match the TAM determinants. The

absence of awareness guarantees a negative PU and PEOU, resulting in nonadoption of

the site. On the other hand, awareness of accessibility produces positive external input

into PU and PEOU, resulting in an acceptance of the website.

Theme 2: Importance of Web Accessibility Evaluation

Results of Data Analysis of Participant Interviews

Theme 2 is the importance of evaluating accessibility for websites created by the

partner organizations. Many organizations rely on manual and automated web

accessibility evaluation tools as the main indicator of their accessibility level.

This theme contained the following subthemes:

- Automatic accessibility checkers,

- Manual accessibility checks, and

- WCAG usage.

These elements are needed for website developers to create web accessibility strategies.

Table 3 shows the three important subthemes of web accessibility as found from this

study plus the counts and the frequencies of participants who said they are involved with

these web accessibility design strategy elements.

Table 3

Evaluating Website Accessibility

Source of Data Collection	Participant count	Participant's frequency	Document count	Document's frequency
Automatic accessibility checkers	8	13	9	6
Manual accessibility checks	8	14	9	3
WCAG usage	8	12	9	10

Measurements must be taken to judge the accessibility of a website. All eight

participants reported using the WCAG as a framework for accessibility and as a guide for

accessibility testing. A website may be manually or automatically checked for

accessibility. All eight participants used a combination of automatic and manual testing

to evaluate the website. The computerized version is the easiest to use by inserting the

website address into either a free or paid site that addresses the possible issues with a

website. Participant #2001 used an automatic checker and reported that dropping the

Uniform Resource Locator into the accessibility tester would evaluate the site with a

score and point out issues that should be addressed by the developer. Participant #5001

concurred and said that it is the checker completes a full accessibility audit before any site goes online.

Most of the websites designed by the participants are for a third party. The websites are handed over to the other party for future updates. Participant #4000 said, "The page would be run through an accessibility check, and anything that didn't meet accessibility would be highlighted, and the editor was then responsible for going back and fixing it, making sure it met the guidelines before publication." The editor, in this case, is the client of the organization. Some organizations offer a subscription service that runs the client's website, updates accessibility, fixes minor errors, or informs the client about needed updates. The findings provided an answer to the research question for this study because accessibility evaluation was found to be an essential strategy when developing websites.

The WCAG defines three levels of compliance. These levels are A, AA, and AAA. Level A is the minimum level of accessibility. Level AA includes all Level A requirements and is the acceptable level of accessibility. Lastly, Level AAA is regarded as the gold standard level of accessibility. The customary level of conformance with WCAG 2.0 is AA for all four partner organizations. Two participants mentioned that their organization would charge more for a AAA design. Level AAA is imperative for government and sites that need to be fully accessible. Participant #5001 said,

> the root page of the site and say I want to check for AA or AAA conformance and then just let it let it run. Set it to run it. It takes maybe depending on the site it could take hours.

Participant #6000 concurred, "There are different Americans with Disabilities Act (ADA) graders that once we put something in the design phase that we can run it through and make sure that it passes a certain standard level that we adhere to." However, accessibility checkers are not foolproof. Two different web checkers might return two different results. As an example, Participant #5001 stated, "If you have two testing tools and you're scanning the same website for accessibility issues with those two tools, you're going to get two different sets of results that seem to be a problem." It is up to the developer to understand which possible problems to take seriously and which to note and move on. Therefore, it is challenging to produce a 100% accessible site. All participants said that it is complicated to create a 100% passing grade from checkers.

Accessibility checkers may return results that are questionable. For example, according to the WCAG guidelines, all images must have an associated tag that describes the picture; however, accessibility checkers only verify text that is in the correct place but not if the text correctly explains the image. Participant #5001 observes, "you can be passing and not being within the spirit of the guidelines, so that's not maybe the best metric." Another known issue is when the designer uses a gradient instead of a solid color. Participant #2001 stated, "designers love gradients, and the contrast checker fails when it's on a gradient, 'cause it doesn't know which part of the gradient what the actual color is." Website accessibility checkers are used to find errors that can quickly be fixed, but for missed issues or false positives, a manual check is needed.

All four organizations used a hybrid approach combining automated and manual evaluation. For example, participant #5001 said, "Some of the above can be

programmatically checked for (there are tools to check the reading level of content, for example), but largely these requirements merit manual intervention to conform fully to the spirit of the guideline." Most of the participants mentioned that after development the website goes to a quality assurance (QA) checker and then the client for final accessibility evaluation. Participant #6001 said, "that's part of our manual testing or manual review of the develop development phase of our programming."

Support From Organizational Documents

I used nine internal documents that mentioned automatic and manual accessibility checkers, and WCAG usage. Additionally, I researched websites from these organizations that designed web accessibility. The counts and frequencies are shown in Table 2.

Several documents supported the theme of accessibility testing. Document #5001 notes that the organization will review a periodic automated scan of a client's website and suggest possible corrections with the caveat that WCAG compliance is a moving target because a website is constantly changing. Therefore, accessibility success cannot be wholly automated. The same document also cited the possibility of false positives and false negatives with automatic evaluation scans. Document #2001 states that web accessibility evaluation tools do not catch all problems with a website's accessibility and may report some false positives as errors. False positives report accessibility issues that are not true. In addition, some evaluation tools may report false negatives, which are issues that are not found by the tool.

Document #5001 reported that this partner organization uses a format that reports WCAG compliance. A standard reporting format that the development community would understand is a good idea given the many checkers that are available, and each has differing reports. Some show issues with graphics and others with text. However, no other partner organization said they are using the format. Additionally, Document #5001 states that the organization runs scans that check that all images and charts have associated captions to meet accessibility guidelines with artificial intelligence speech-to-text function to automatically create captions for audio and video. Finally, according to Document #4001 this partner organization will conduct automatic testing audits of all produced web pages.

Manual web accessibility testing is done by all participant organizations. Documents #2002, #4002, and #5003 report that manual checks of websites will be performed before a website goes online. Document #2002 states that manual checks include testing navigation using only a keyboard or a screen reader. These screen reader tests use Voiceover on an Apple Mac and NonVisual Desktop Access a Microsoft product.

To ensure accessible testing evaluates correctly, all organizations test and train for the items found in the WCAG. Document #6001 states that their organization will program to specifications recommended by WCAG 2.1 AA. Document #6002 explained that the W3C created WCAG with the objective of developing accessibility standards and that a WCAG with a level of AA is considered an acceptable level of compliance. Document #5002 concurs stating that WCAG is a shared set of rules that those in the

internet community agrees with to create accessible web content. Document #2002 is also in agreement about using rules from WCAG with examples. WCAG is used by organizations.

Comparison to the Literature

The topic of web accessibility evaluation has been well researched and aligns with this theme. All organizations use WCAG as a guideline and produce a checklist of WCAG items to test. Lorca et al. (2018) asserted that it is difficult to assign a numeric metric to a website, as it is hard to give a website a score of Level A versus Level AA. Automatic checkers should be helpful to point to suspect issues, but developers should not blindly use the results as ground truth.

Current research suggests that accessibility evaluation tools are indispensable. Alsaeedi (2020) suggests that evaluating a website is a difficult task, but it is vital to give feedback to web developers; however, few studies compare the performance and quality of tools. Many tools are available. Over 100 evaluation tools are found on the W3C website (Eggert & Abou-Zahra, 2019). According to Alsaeedi (2020), tools fall into two categories: general or specific. Available tools evaluate most of the guidelines. Examples are WAVE and SiteImprove, which several organizations are using. Testing for color contrast, such as Contrast Checker, is an example of a specific web accessibility test. Several difficulties have been stated in the literature. Interpreting results are the most common failure of evaluation tools. Using guidelines such as WCAG is essential for developers. All participants said that their organizations used accessibility checklists for websites. However, Skierniewska and Skroban (2018) reported that many software

projects guidelines are not followed.

Acosta-Vargas et al. (2019) and Bai et al. (2016) recommended testing with the help of disabled users. Much of user interface testing should be done with the aid of users; however, not one organization used testing with the assistance of disabled users. Most participants said it would be reasonable when asked about user testing, but it is too costly for most websites.

New research from Halbach and Haugstvedt (2021) proposed an online tool that tests and validates accessibility checkers. Clothes4all, the name of the tool, tests the ability of accessibility checkers to find errors by injecting accessibility defects into a website to ascertain if the checker detects and reports on the fault. False positives and false negatives are found, and accessibility problems are correctly detected as positive. Halbach and Haugstvedt suggest that Clothes4all may become a baseline and a metric for accessibility and usability evaluations.

In addition, current research from Alajarmeh (2021) studied public health websites using several different automatic evaluation tools. Unsurprisingly, Alajarmeh found that most public health websites from 25 countries still have critical accessibility barriers. The automatic evaluation tools pointed to barriers to the perception of web content and the operability of the interface. Public health resources provide disability information and should be available to the largest demographic groups. Alajarmeh advocated that website accessibility requirements should be at the WCAG 2.0, Level AA.

Ties to the Conceptual Framework

The goal of testing accessibility is acceptance by PWD and the ability of disabled

people to use the website. TAM predicts and explores the intention to use technology

(Xia et al., 2018). TAM has two significant components: PU and PEOU (Davis, 1989). If

PU and PEOU produce a positive result, TAM predicts that the user will adopt the

system. On the other hand, with negative PU and PEOU, the user should reject the

system. When a website is inaccessible, the user assigns negative results to PU and

PEOU and stops using the website.

PU is essential when using websites such as a government or banking site.

However, the PWD user will fail to use the site if the site contains barriers to use, for

example, not including text with images, making the site hard to use. According to

Hwang et al. (2016), failure to use the website has the potential of a financial loss if

people do not want to use it. Therefore, usability must be a concern and tested when

building websites.

The findings of the second theme are consistent with the TAM. The goal of

testing accessibility is acceptance by PWD and the ability of disabled people to use the

website. The primary function of web accessibility testers is to check a website for

known accessibility problems, which originate from PWD and their experience when

using websites. Since assistive technology helps PWD navigate and interact with

websites, developers strive to make websites accessible to assistive technology.

Automatic tests or checkers evaluate websites for possible problems related to use

by PWD. Most automatic tests measure adherence to the WCAG. One example of an

automatic test is to evaluate for color contrast. This test checks the ratio between the

foreground and background colors. When the resulting contrast ratio is low and difficult

to read text, a PWD negatively interrupts the website; therefore, the PEOU is objectionable.

Manual tests are similar to automatic tests but are done by a human tester instead of by machine. These tests also are aimed at making the interface easy to use. An example of a test would be the manual keyboard test, in which a tester attempts to use a website without a mouse and only the keyboard. This test confirms that a function such as making a purchase is accomplished without using the mouse. This exams for PEOU for PWD.

Evaluations, both automatic and manual, use WCAG as the foundation for accessibility testing. According to TAM, when users perceive a problematic interface, they will refuse or misuse the system. PEOU and PU are tested and measured against the WCAG guidelines regarding PWD. The resulting PEOU and PU indicate the acceptance of a website. The testing theme supports the conceptual framework of TAM.

Theme 3: Importance of Web Accessibility Training

Results of Data Analysis of Participant Interviews

Another discovered theme was the importance of web accessibility training. This theme contained the following subthemes:

- Web accessibility training for developers,

- Web accessibility training for the client, and

- Responding to changing websites.

These elements are needed for website developers to create web accessibility strategies. Table 4 shows three important aspects of web accessibility as found from this

study and the counts and frequencies of participants who said they are involved with these elements of web accessibility design strategy. Table 4 also shows the number and frequencies of source documents that captured many of these web-accessible design strategy subthemes.

Table 4

Web Accessibility Training

Source of Data Collection	Participant count	Participant's frequency	Document count	Document's frequency
Web accessibility training for developers	8	28	9	13
Web accessibility training for the client	8	33	9	2
Responding to changing websites	8	9	9	3

After an organization decides to implement accessibility into their websites, they need to recruit developers with accessible knowledge or pursue training for their current developers. All eight participants noted that web accessibility training is a necessary part of the developer's job. Participants said that training should be a continuous process, and several organizations paid for formal web accessibility training. In addition, all organizations paid the salary of developers to become and stay informed about WCAG.

This theme provides an answer to the research question for this study because the training was found to be an essential strategy when developing websites. Participant #4000 participated in formal web accessibility training:

We availed ourselves training developers, managers, and people who edit websites on our organization's pages. All of our web designers and all of our

content editors have been trained in what's acceptable and what's not and how to approach those things from the moment of design.

Participant #5001 used specialized accessibility company Deque Systems, Inc. for formalized training, which offers classes to prepare for a certificate inaccessibility: "they have a prep course for it, so I took that like the month leading up to it. They actually paid for me to take a prep course." This refers to a Web Accessibility Specialist certificate from the International Association of Accessibility Professionals. Participant #4001 described the advanced Deque Systems training:

> There were various programs, so uhm, you know it varied from you know whether somebody was an editor, web designer, web developer. So, I believe as the web designer I had the maximum amount of the training, and so it was, uh, you know, several, many hours you know, put into that. But that was absolutely great.

All eight participants said that training was needed to produce useable websites. All four partner organizations used web-accessible training as a strategy for website development. The range of training was from in-service training to more formal training.

Accessibility training is a moving target since new WCAG guidelines come online and websites grow old. Participant #2001 believes, "it's kind of a thing where you never stop learning. Because years ago, I took those out tags because of different tests for validation, and they weren't required." Tags are required for accessibility. Training or reevaluation of a developed and deployed site is reflected by Participant #2001: learning is "continual," and "[we have] department conversation because certain projects will be

more challenging to make accessible and we try to have retrospectives where after a project is over, we talk about what was what was successful, and it wasn't successful."

Several organizations have in-service training. For example, participant #6000 said, "We're going to show them our white papers. We're going to talk through. We're going to show them examples. This is ADA (American Disability Act). Therefore, this is ADA compliant. This one is not." An example of an in-service training program was reported by Participant #6001:

> I am a lead developer here, and I've trained a lot of interns, and I've had two or three interns under me. I want them to do is at the end of their internship is to be able to build a full website by themselves. I have in my training program is to teach web accessibility and it's how to read the WCAG.

Interestingly, training for all the participating organizations also entails educating the third party that will control or finance the website. The issue is the third party or client may not be fully knowable about accessibility. To illustrate the point, Participant #2001 said, "we like to explain the value and get them on board because sometimes you know they see it as a line item in the invoice, and they're like what is that?" Participant #5001 agreed,

> when we do analyze a site quite a lot of the things that come back as being points of failure have been introduced by some editors. Basically, not knowing what they're doing and with regards accessibility. It's clients updating their own sites.

"Sometimes our clients aren't as educated in that," reported Participant #6001. The web developers and their organizations invest in helping to train their clients in the best web accessibility practices.

Web developers spend time educating internally and externally that websites evolve and seldom can be totally (100%) accessible according to WCAG guidelines. Participant #5001 finds it challenging to advise both clients, colleagues, and management about the difficulties involved making a website totally accessible. Websites are dynamic and constantly changing. "I have a difficult time explaining, like colleagues including my boss, you cannot promise this because it's just, uh, it's an ongoing process. I think, hard for some people to accept that there is no final finish line."

Given the lack of awareness to accessibility, most developers and their customers do not understand the importance of making the website useable and accessible to PWD. The problem of training clients about accessibility was also reported by Participant #2001:

> We try to educate the client as much as possible about maintaining the website. Clients don't know anything about this, so the clients are just like I want to make a page. I want to slap a picture in there, and then they don't use an alt-text to inform the user.

Educating the client about potential accessibility issues is an ongoing concern for developers.

Support From Organizational Documents

I received nine internal documents that mentioned accessibility training. The documents reviewed are listed in Table 2.

Not many organizational documents mentioned training directly. The lack of considering training is because most organizations are website design organizations, and there was little need to write a statement online or written documents. Only two documents referred to training. Document #5001 states that their organization will assist clients with accessibility training. Continuous training is needed, given the changing environment of websites. According to Document #5001, accessibility is dynamic where content and the legal atmosphere change. One organization says it will help support content managers with tools, resources, and training to enhance accessibility. Document #4001 reports that web accessibility training occasionally occurs since accessibility is not a one-time undertaking but must be a constant effort. Document #2001 is titled Accessibility Checklist. It may also be a training document containing the significant issues that developers need to address. The origin of Document #2001 is from a developer studying the WCAG guidelines and making a four-page outline of the significant points. New developers use the document, the QA department, and a quick checklist for more senior developers to confirm accessibility. Document #6001 lists website accessibility points that this organization will check. It is included with the Terms of Agreement that is sent to a potential client. A summary of internal and external training for outside clients is an integral part of accessible web design.

Comparison to the Literature

The importance of web accessibility training in developing websites was a common theme from participant interviews and consistent with the literature. Specialized training and education are central to creating accomplished web developers that know the need for accessibility (Ismail et al., 2018). However, according to Alsalem and Doush (2018), there is a shortage of training courses for accessibility issues. Therefore, many websites continue to be inaccessible.

Some participants have more formalized training. Others learn from other, more experienced developers. However, most developers have little accessibility experience and training, according to Abuaddous et al. (2016). The interviews support Syafiq et al.'s (2018) findings that if accessibility guidelines were taught to developers, they would better understand website design for PWD. Website accessible training is essential when designing websites that are usable for PWD. Based on the participant interviews, the documents, and supported research, teaching accessibility is vital to help PWD to engage with society.

Current research encourages web accessibility training. AlMeraj et al. (2021) researched the accessibility of higher education institution websites in Kuwait. These researchers suggested that educational institutions invest in accessibility training for developers and account for regular reviews of their websites. Additionally, Cao and Loiacono (2021) state that web accessibility education and training are critical because they allow developers to build accessible websites. Their qualitative findings indicate that education in web accessibility could increase students' use of accessibility guidelines and

therefore should make for accessible websites. Lastly, Zaina et al. (2022) researched the training of participants in the use of accessible design patterns to create better accessible interfaces. The results indicate that accessibility guidelines were applied successfully when prototyping mobile user interfaces in most cases.

Ties to the Conceptual Framework

Without accessibility training, websites would be nonaccessible and, therefore, not used by PWD. TAM is an information theory that predicts the acceptance or rejection of technology (Davis, 1989). TAM is used to chart the influences on users' intention to use the technology. The two determinants of TAM are PU and PEOU, which Gefen et al. (2003) used to affirm that these determinants predict online shopping acceptance. A well-designed user interface has the advantage that includes perceived usefulness and ease of use (Sun et al., 2017). Therefore, a poorly designed website lacking accessible elements such as perceived usefulness and ease of use will not be perceived as beneficial by PWD. In addition, Chevers and Grant (2017) reported that most users would be attracted to user-friendly software with a helpful user interface.

Conversely, users reject the software if their perception of usefulness and ease of use is negative. Therefore, lack of accessibility will influence PU and PEOU, and important sites such as governmental sites will go unused by PWD. Therefore, with accessibility training, these items should be included and verified to work correctly by the developer.

The current study's findings are consistent with the TAM framework. Web developers need accessibility training (Ismail et al., 2018). One skill, for example, is that

developers need to caption each image and video with text that informs the user and be

perceived as a helpful experience. Ribera et al. (2020) noted that many scientific papers

and conference proceedings are distributed in PDF, challenging accessibility. Developers

need to learn about PDFs and make them understandable to PWD. Therefore, to affect the

PU component of TAM, the developer needs to learn this lesson by either training or

experience. Training developers will increase the PU and ease of using websites in

harmony with the TAM.

To create accessible websites, developers need training. The TAM component

PEOU measures the user's perceived ability to use a system efficiently, and PU gauges

the user's perceived usefulness (Gefen et al., 2003). Lack of any amount will influence

the user accepting the system. Therefore, it is vital to create website interfaces that PWD

use by developing accessibility into a website. Knowledgeable developers accomplish

this. Web accessibility must be taught to web developers to increase PEOU and PU. The

first subtheme, accessibility training for developers, aligned with the framework.

Like web accessibility training for developers, clients of the participant

organizations need accessibility training. This subtheme aligns with the TAM framework.

As mentioned by participants, clients often add information content to a website after it is

deployed by the organization that created the web pages, which may not be accessible.

Client webpages need to be accessible to achieve acceptance with the TAM components

PEOU and PU. Lack of any amount will influence the user accepting the system.

Therefore, it is vital to create accessible website interfaces by developing accessibility

into a website. Training clients accomplish this. Web accessibility must be taught to web developers and clients that update websites to increase PEOU and PU.

Websites are dynamic according to the participants. Changes may come from the developer, client, or anyone else in or sometimes outside the organization. Therefore, it is crucial to train anyone who updates a web page or verify that self-updating websites are accessible. Websites periodically must be checked for accessibility. Accessibility training must be given, perhaps to a lesser extent than developers, to anyone who updates a webpage to sustain or improve PEOU and PU.

Applications to Professional Practice

The IT problem researched for this study was that websites do not adequately cater to PWD According to a WebAIM study (2021), 97.4% of home pages have at least one accessibility failure. Most of the Internet is not accessible to PWD because some web developers lack development strategies to improve websites' accessibility. Therefore, based on the results of this research, web development organizations must prioritize strategies to create web accessibility. The study's findings supported current literature on web accessibility strategies and documents supplied by the partner organizations. Results from this study found successful strategies that partner organizations currently use to create useable websites for PWD. Successful strategies may allow web development organizations and developers to use similar strategies to improve their website development. IT professionals may implement these findings and provide guidelines to design, develop, evaluate, and train developers.

Web accessibility design can improve the user experience for all users. The aim of web accessibility is universal access to information by all people, particularly by PWD (Ali et al., 2017). Implementing websites with accessibility could enhance the universal design that improves usability for all users (Schmutz et al., 2016). Using WCAG 2.0, according to Schmutz et al., will be helpful to both users with disabilities and become a more usable website for nondisabled users. Additionally, designing with web accessibility increased performance and higher perceived usability with nondisabled users. Thus, these effects on the nondisabled and PWD may motivate practitioners to use WCAG guidelines with better usability for everyone.

Based on the findings, IT departments should add accessibility requirements into the design pipeline. Adding web accessibility requirements to the software phase development, according to Vollenwyder et al. (2019), are critical to the acceptance and implementation of accessibility. Awareness of web accessibility will rise in IT departments. Awareness is a precondition to implementing web accessibility (Vollenwyder et al.). Web professionals should consider accessibility an essential part of their role. They should become mindful of their responsibility to promote Web accessibility and increase their expertise in implementing Web accessibility. Web practitioners must acquire web accessibility. Positive awareness of web accessibility could begin a period of expanded software and hardware accessibility innovation.

Implications for Social Change

The findings from this study add to the existing body of literature by adding information and knowledge on strategies web developers in Florida may use to create

web-accessible websites. The findings may encourage social change as more web developers begin to understand and use these strategies to create websites that may improve website productivity by PWD. Accessible strategies will encourage PWD to use websites and not quickly leave the site once that they find it difficult if not impossible to use. The findings may expand knowledge in web accessibility and usage of accessible websites. It may also provide web design organizations with knowledge on how to improve PWD satisfaction as many web developers learn successful strategies to build accessible websites.

Allowing more useable websites to be used by the disabled will bring social change. With an accessible internet, about 15% of the world's population may find it easier to use social media, resulting in better communication in the digital world and being less isolated from the rest of society (Bennett et al., 2017). Less isolation may bring social inclusion for most members of society. PWD may have more participation with cultural and political events, which could mean PWD will be better informed. PWD may find activities such as filling out employment applications or conducting online banking functions beneficial. Accessible websites may bring increased opportunities for PWD.

Strategies found in this study show that web accessibility can influence an organization's employees, management, partners, and customers. Building accessible websites is a corporate social responsibility and translates into treating internal and external individuals to the organization ethically. The ethics of accessibility should be incorporated into the organization, and members of the organization should believe that

web accessibility is good for society and is a human right. Therefore, web accessibility is an aspect of corporate social responsibility.

Accessible strategies shown by the findings from this study may bring social change because it may further other technologies apart from websites design that requires accessible interfaces for PWD. In addition, social change may occur from this study because it may provide developers with strategies to impact other associated functionality. One area that may be impacted is software development tools such as Integrated Development Environment.

The research findings may provide developers with strategies to influence other related fields in interface design, which includes most aspects of interacting with the world. Voting, banking, ordering some item from the internet, or simply operating a coffee maker are examples that an induvial must interact with the current social environment. Social change may occur from this research by making more organizations mindful of the issues associated with web accessibility and accessibility in public life.

Recommendations for Action

There is a shortage of developers who know accessibility methods and evaluation tools in website design and development. Training more developers might be a solution; however, only a few college classes in web accessibility or even mention accessibility in software classes. Software and web design classes must address interface accessibility during some part of each course. A key component from all participants from this study mentioned that awareness of the issues that PWD experience. Awareness begins with knowing and understanding how PWD might use or not use websites. During classes,

instructors must show videos on how PWD uses websites. Alternatively, even better, recruit PWD to speak to the class. IT organizations must educate and make developers aware of accessibility issues.

In the website development industry, there needs to be agreement about how to evaluate websites. WebAIM has a listing of many different sites that evaluates websites and assigns a grade and suggests possible fixes to make the site more accessible. However, the same website may receive a different grade using a different evaluation tool. Each participant organization had a different evaluation process. Any universal testing process is missing from the field. Therefore, the recommendation is the website development community should require a collective agreement on how to judge a website as to accessibility.

When designing interfaces, developers must make accessibility a requirement in all new software development projects. As software ages, updates are more costly to implement; therefore, it is important to add the requirement before the project's implementation phase begins. Since most web designers are nondisabled, many non-accessible items are added to website design because the designer does not know how these effects might affect the use of the site by PWD. Organizations that have employees with disabilities should work with nondisabled individuals. Studies have shown that the nondisabled become more inclusive and aware of difficulties that the disabled might experience. in advanced tools

Understanding the WCAG guidelines is challenging. Two participants complained about how to interpret the guidelines. The web development business needs

to make it easy to learn WCAG. Currently, the user experience is the topic that receives the most coverage in the industry and education. Many papers and classes explain that the experience of the interface influences the application, even if the backend of the application has an excellent design. Accessibility for all users should become a part of UX. A key recommendation is to assure that the web be designed for everyone, no matter what software, hardware, or capability, and should also remove the barriers to usage.

Another recommendation is for management to set in writing the organization's web accessibility policy. Organizations should decide which WCAG conformance level the organization wants to design to. The policy should define what it covers. For instance, the policy states that web accessibility content will cover websites and mobile devices. The accessibility policy will need to be periodically reviewed. Website development organizations must appoint one individual to oversee web accessibility policy with the power to ensure all future websites are web accessible. Offer annual training on web accessibility for staff in control of online content. Organizations with websites should conduct accessibility monthly audits. Finally, organizations should create a media campaign inside the organization to increase accessibility awareness.

Once the research results are evaluated, it is valuable to share the results with the stakeholders. A summary of the research results will be sent to the participating organizations that provided volunteer participants and to each participant of this study. In addition, I plan to disseminate my study's results by conferences and training. Findings from this study will be made available to appropriate meetings such as the Smart Accessibility 2022 conference and the 19th International Web for All Conference.

Furthermore, I will make available the results to the Association for Computing

Machinery's special interest group, Accessible Computing. Finally, as an adjunct

instructor at a local college in software development, I will construct and urge teaching a

class on web accessibility.

Recommendations for Further Study

The research goal for this study was to identify strategies used by web developers

to create accessible websites in Florida. One identified limitation of this study was the

experience of participants. This limitation encourages further study on the accessibility

experience levels of web developers in general. Each of the participants for this study had

experience designing web-accessible sites. However, participants for this study had

different levels of accessibility knowledge. Some completed courses and obtained

certification in web accessibility. While other participants learned on the job or viewed

online instruction, which allows further research into how much knowledge a developer

must have to design and develop accessible websites.

Another limitation of this study was the relatively small number of web

developers who contributed to the research. A larger population of web developers could

be studied with a quantitative questionnaire-based study to find the most critical items to

implement from the WCAG guidelines.

Future research should study the reasons why the number of accessible interfaces

is limited. The limited number of developers who acquired the strategies to create

accessible interfaces is a problem for the web industry. However, it also could be the lack

of awareness of web accessibility for website design organizations. New research could point to the major factors affecting the number of accessible websites.

Whether the accessible problem is with the organization or a lack of developer knowledge, this research found that experience with web accessibility is needed to make websites accessible. An interesting research question might be to determine what experience level is needed to design and implement accessible user interfaces. Once known, this information may be included in classes that deal with user interfaces. This new research could tailor user experience education as the most effective way to teach accessibility to developers.

I collected data from web developers who understood the complexities of web accessibility. this knowledge may be generalized to all areas of user interfaces. Another area for possible research is what accessible websites can be generalized to other user experiences. Extending this study to include research that might point to the fundamental reasons why most websites are unusable to PWD may further enhance user interface developers' professional practice. Research may include similar websites such as mobile web research and the internet of things interfaces.

The findings from this study add to the existing body of literature by adding information and knowledge on strategies web developers in Florida may use to create web-accessible websites. However, extending this study to other regions might find other results. Therefore, I suggest increasing the population and geographical area to identify strategies for web accessibility for future research.

Reflections

As I reflect on this study, I remember an event I had at Kennedy Space Center, Florida. I became interested in user interfaces as a software developer, designing and coding graphical interfaces for ground space shuttle engineers. Quickly I understood that PWD would not read and understand the National Aeronautics and Space Administration complex displays for many shuttle data points. Just having color blindness will make reading the screen difficult. I reflected on how interface barriers affect how users will use the graphical interfaces before working on this study.

I have a self-identified bias on this study that all interfaces should attempt to be accessible. For example, a college professor said that making a campus building with staircase entrances would be prohibited. He wanted to do the right thing, but it cost too much enact. I believed in tradeoffs. Perhaps he was correct, but I do not understand why there are zero attempts to make the web-accessible.

I initially assumed that the quantitative approach was better for research than the qualitative approach. Coming from a mathematics and computer science background, I believed that numbers contained all the answers. However, I learned that the qualitative approach would be more effective in understanding strategies deployed to design web accessibility.

I felt that PWD were unfairly treated and wondered if this bias would affect participants' answers to interview questions. I thought I would assign more weight to some interview questions and play down other questions. However, following the

interview protocol using the same order of questions to all participants reduced my perceived bias.

Many participants thanked me after the interview for my research into strategies for web accessibility. Additionally, they added that they thought my study needed to be completed and knowledge about the lack of website accessibility.

Conclusions

This study found that strategies used by web developers included the importance of the experience of designing web accessibility, awareness of web accessibility, and universal design. These findings were significant and reinforced by organization documents and were consistent with the TAM conceptual framework. Not everyone sees and understands the world the same way. Similarly, websites are not experienced the same way by all people. Developers will need first to become aware of the barriers to using websites that PWD experience daily; then, apperception will increase their knowledge of developmental tools to incorporate accessibility into websites.

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Appendix A: Interview Protocol

Study Topic: Web accessibility strategies used by web developers to enhance the interface for people with disabilities.

Sources of data collection:

____Interviews (web based)   ____Organization Records

____Multimedia Data   ____Documents Interview Protocol

Date and Time		
Location		
Participant ID		
Preparation	Technology check and recording reminder for participant.	
Introduction	Thank participant for meeting and provide my information.	
Purpose	Review purpose of the study: The purpose of this qualitative, multiple case study is to explore the web development strategies used by web developers to improve the accessibility of web sites for people with disabilities.	
Participation	Participation in the study, both in interview responses and with any documentation or other sources shared with me, will support my study in partial fulfillment of the degree of Doctor of Information Technology from Walden University. The information gathered during the study might add to academic and professional bodies of knowledge regarding design strategies for web accessibility. There is no compensation of any sort associated with this study.	
Discuss Study Ethics	To maintain ethical standards and respect right to privacy, request permission to record the audio and video of this conversation and keep notes on this entire session. Once audio and video recording start introduce session using Participant (ID) and reconfirm permission	

	to record and take notes on session. Confirm starting to record audio and video.
Start Recording	Turn on recording devices.
Begin Conversation	State my name, Participant (ID) and date. Have Participant (ID) confirm being provided with background information on this study including the purpose, reason for participation, benefits of participation, and approval for recording and taking notes during this session.
Review Confidentiality	Remind each participant: - That they are free to decline to answer any question or stop participating at any time; this is a completely voluntary session. - Free to decline to answer any individual questions or decline to provide any information are not comfortable providing. - All information provide will be treated as strictly confidential and will not be disclosed to anyone, including employer. - Request avoid using organizational or individual names or any indicators that could be used to identify organization(s) or individual(s) in responses. - Names or comments that are mentioned in the interview will be removed from the transcripts and will not be included in the final report. - Request not discussing participation with anyone until the study concludes. - Any information provided in any form in the session will only be used for the purpose of this study, which will be presented in composite form with data from other participants in a doctoral study that may be published. - No responses will be presented in individual form. ~ Research records will be kept in an encrypted and password-protected format, locked in a safe for five years, after which time they will be destroyed. - Only I will have access to this data during that five-year period.
Confirmation	Ask if participant has any questions before continuing.

Interview	Semi-structured interview about understanding participant(s) thoughts on the topic and questions. Questions outlined for which open and honest thoughts are appreciated. May ask for more thoughts or explanations on portions of your responses. Providing as much information on thoughts and perspective is greatly appreciated.
Collect Secondary Data	Conclude the interview portion of the meeting. Request any documents, multimedia presentations, or other information participant has agreed to provide. To ensure interpreted responses are accurate, schedule a follow-up interview and preferred method of communication for rescheduling.
Conclusion	Thank participant

Appendix B: Semistructured Questions

Semistructured Interview Questions	1. What strategies have you used to design accessibility into web sites? 2. What guidelines do you use in developing accessibility into web sites? 3. What methods work best in determining how you wrote accessibility into web sites? 4. What, if any, challenges have you encountered regarding web accessibility? 5. What aspects of web accessibility do you consider when making a web site more accessible to people with disabilities? 6. What proof of web accessibility do you utilize? 7. What additional information regarding web accessibility design would you like to share? 8. How do you use users when designing web-accessible web sites? 9. How do you test your web sites for web accessibility? 10. What metrics do you utilize to measure the success of web accessibility? 11. How do you train your developers to include web accessibility when designing web sites? 12. How does your organization's culture play into designing for web accessibility? 13. What aspects of your design methods ensured that your designed web accessibility will be acceptable to PWD?
Possible Follow-Up Questions	~

Appendix C: Human Subject Research Certificate of Completion

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Gary Hrezo** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 07/13/2017.

Certification Number: 2432006.