

December 2017

Perceptions of Web Accessibility in Future Web and App Developers

Darien J. Gaudet

Worcester Polytechnic Institute

Kyle Quinn Savell

Worcester Polytechnic Institute

Michael James Aquino

Worcester Polytechnic Institute

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Web Accessibility Perceptions Survey and Interview

An Interactive Qualifying Project
Submitted to the Faculty of Worcester Polytechnic Institute
In partial fulfillment of the requirements for the Bachelor of Science

Approved by Eleanor Loiacono, PhD
Professor in Information Technology

Submitted by:
Michael Aquino, Darien Gaudet, and Kyle Savell

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Authorship List:

Michael:

- A. Managed project timeline
- B. Helped record notes for advisor meetings
- C. Wrote the Methodology of the report
- D. Helped with writing the interview script

Darien:

- A. Wrote drafts for and developed the finished survey
- B. Contributed to writing the interview script
- C. Attended some of the interview sessions
- D. Collected and organized all survey data
- E. Conducted analysis of survey data
- F. Wrote the Data and Analysis section of the report
- G. Results & Discussion:
 - a. Wrote the Results of the report
 - b. Contributed to the Discussion of the report
- H. Conclusion:
 - a. Contributed to the Summary of Findings subsection
 - b. Contributed to the Recommendations of Future Work subsection
 - c. Contributed to the Reflection subsection

Kyle:

- A. Wrote agendas for all advisor meetings
- B. Helped record notes for advisor meetings
- C. Wrote all Email drafts to students and professors
- D. Wrote the Table of Contents of the report
- E. Wrote the Abstract, Context, Background and Introduction of the report
- F. Wrote the Executive Summary of the paper
- G. Wrote the Literature of the paper
- H. Results & Discussion:
 - a. Contributed to the Discussion of the report
- I. Conclusion:
 - a. Contributed to the Summary of Findings of the report

- b. Contributed to the Recommendations of Future Work of the report
 - c. Contributed to the Reflection of the report
- J. Wrote the Works Cited and Glossary of the paper
- K. In the Appendix:
 - a. Added Appendices A - F
- L. Worked on formatting for the paper
- M. Helped with writing the interview script
- N. Emails:
 - a. Sent out emails to Computer Science email alias
 - b. Sent out emails to Computer Science Professors teaching classes on Web design or User Interface design
 - c. Sent out reminder and follow-up emails to all interview participants
- O. Advertised project during Human-Computer Interactions class at WPI
- P. Set up the Time Slot online sheet and reserved space for interviews
- Q. Conducted all of the interviews for data collection

Abstract:

Web Accessibility is the concept that anyone, regardless of the disabilities or situation, should have access to the Web. Organizations such as the World Wide Web Consortium (W3C) have developed guidelines outlining specific features that website developers and application developers can implement in their designs. The goal of this study is to determine the general knowledge that future Web developers have of Web Accessibility and to find out their perceptions of it. We want to find out where the biggest holes are in people's knowledge and perception of Web accessibility so that future endeavors can be made to fill in these gaps.

Context:

The Interactive Qualifying Project (IQP) is a major project part of the WPI Plan and its project based curriculum. It is designed to give every WPI student the opportunity to work in interdisciplinary groups and assess global and or local problems pertaining to the scientific and social realm of society. It is completed by a group of students and is overseen by at least one academic advisor.

Executive Summary:

The goal of our project was to gather data about the perceptions of Web Accessibility among Web design and application development students at Worcester Polytechnic Institute. The concept of Web Accessibility is that everyone should have equal access to the internet, regardless of any disability or situation. Since the internet is ubiquitous in most aspects of life, it is important that this standard is upheld. Specific design features of websites and user interfaces can assist people who would otherwise struggle to use the Web, and there are guidelines under Web Accessibility that lay out what features are needed. However, there are many designers that are unaware of these guidelines, and do not consider accessible groups when creating websites or applications.

The team's plan is to collect quantitative and qualitative data about what future designers know of and think about Web Accessibility. It was planned it collect the quantitative and demographic information using a survey, and use interviews to collect the qualitative data. The purpose of this data is to form to the foundation for future endeavors on the topic. Through the data collected our group hoped to be able to provide insight into where student's knowledge of the subject is lacking, and what can be done to improve this.

This project was spaced over two WPI academic terms, and thus each term was assigned its own goals and milestones. Each term is approximately seven weeks long, and milestones were assigned to be completed either by the end of a school week (Friday), or by the time of the subsequent advisor meetings (in our group's case, Wednesday).

For the first term, the main focus of the project was to complete all background items such that we would be able to start distributing surveys and conducting interviews. The first milestone for this term was preliminary research on the topic and complete any administrative work that needed to be done before starting surveys and interviews; we hoped to complete all research on Web Accessibility, write all subsections of the final paper that could be done at the time (such as the Background and Introduction), and complete certification for testing on human participants. These milestone was scheduled to be completed by the second advisor meeting, which was the third week of the academic term.

The milestone for the rest of the term was to be completely prepared for conducting the surveys and interviews. This included research on survey and interview techniques which would lead to a finished online survey and written interview, all completed subsections of the final paper prior to data and analysis (such as the Literature and Methodology sections), and planning for survey distribution and interview logistics. Our original deadline was the fourth week of the term so that interviews could be conducted before any final exams. However, this

milestone was pushed back to the end of the term with the plan of conducting the interviews at the start of the next term.

Regarding the second term, the first milestone was to start conducting interviews by the end of the first week of the term. To accomplish this, a space was needed for running the interviews, email drafts needed to be ready to send to people about the survey and interview, and the interview needed to be practiced by the researchers. A second milestone was to have all data collected by the end of the fourth week of the term. This means all surveys and interviews needed to have been completed. The third milestone was to complete all data and analysis; this was planned to be done by the sixth week of the academic term, and consisted of organizing the data and looking at it through the lense of analysis questions that needed to be created. Lastly, the final focus of the project was to complete the final paper by the end of the term. This included the results, discussion, conclusion and reflection portion of the paper, as well as any edits to previously completed sections.

At the end of the project the group had a completed data set from the surveys and interviews. With this collected data we have accomplished a means for future projects to be able to figure out how to tackle the issue of Web Accessibility.

Background:

At Worcester Polytechnic Institute (WPI), group work, problem solving, and participation in the global community are key components of all students' learning process. All of these aspects of learning culminate in what is called an Interactive Qualifying Project (IQP); The IQP is a major part of the WPI Plan and its project based curriculum. It is designed to give every WPI student the opportunity to work in an interdisciplinary group of three to five fellow students and assess problems pertaining to technology and societal welfare. Through IQPs Students not only practice their ingenuity and skills learned from coursework at WPI, they use their knowledge and skills critical issues facing our global society today; each project team professionally assesses a global situation and determines how to tackle it.

Projects are determined by project sponsors, ranging from nonprofit organizations to government agencies. The team members act as consultants for their sponsor, working to fill a need that the sponsor has. The students' work on the project is communicated via a written research report and a presentation on how they approached and solved the problem. This IQP focuses on helping the World Wide Web Consortium's (W3C) Silver Task Force.

Additionally, each project receives guidance from an advisor who provides expertise on the issue the students are tackling. For this project, the IQP team was overseen by Dr. Eleanor Loiacono, an Information Technology Professor at WPI, and Shiya Cao, an IT graduate student working with her. Dr. Loiacono specializes in technology accessibility for people with disabilities.

Dr. Loiacono seeks to discover what the perceptions are of Web accessibility from future Web developers. Through information-collecting techniques such as surveys and interviews with Web development students the team aims to collect data on this topic. The goal of this IQP is to determine where the biggest holes in the students' understanding of Web accessibility so that they may be addressed in future projects.

Introduction:

Every year society is becoming more entwined with the Internet and the World Wide Web. Not only is it the world's greatest collection of information and entertainment, but it has become an integral part of every part of our lives. It is how we communicate, read the news, shop, manage our finances and so much more. It has also become a huge part of education, jobs, and our community. People must have access to the Web in order to connect with society. However, for some groups of people, such as those with disabilities, the Web presents many barriers that prevent them from using it to its full potential.

Because the Web is so ingrained in society, it is paramount that everyone have equal access to it. That is what the Web Accessibility Initiative (WAI) aims to accomplish. The WAI is a project run by the World Wide Web Consortium (W3C) that aims to make the Web more accessible to those who have disabilities or encounter barriers to Web usage. They have made guidelines to help encourage Web designers to make more accessible websites and are attempting to educate current and future Web designers about this issue. Despite the efforts by the WAI to spread this knowledge, Web accessibility is still not a widely-known issue and is lacking in many website designs.

1. Literature:

1.1 - What Web Accessibility is and Why it Matters:

In the modern age, the world is becoming increasingly reliant on the Web. Businesses exist completely on the Web, both companies and individuals keep track of and control their finances on it, applications for some jobs are done completely electronically through it, and the Web has become the global hub for social interactions. The Web also contains the biggest wealth of information known to humankind, and the most recent world events can be shared instantly. Given how ingrained this technology is in our society, it is paramount that it is usable by everyone in virtually any situation.

This is the basis for Web accessibility. Even though a large portion of the population is able to access the Web without much trouble, there is also a large group of people who are disabled and need additional tools in order to use the Web. In its simplest form, Web accessibility means that people with disabilities can use the Web. This includes people with temporary or changing disabilities and means that everyone is able to perceive, understand, navigate and contribute to the Web (Lawton, 2005(a)).

The necessity for Web accessibility is apparent in multiple situations. Since the Web is integrated into every aspect of society, it is important that people with disabilities are able to take advantage of this to participate in society as a whole. For example, if a job only has online applications for its positions, a person with a disability would need to be able to navigate and understand the online application just as well as someone without any disabilities. Additionally, in some instances Web accessibility is required by law. Using the example of a job application again; if the website is not accessible to everyone, then the company cannot legally call the job equally available. Making the Web accessible is socially responsible (Lawton, 2005(a)); it is a human right for everyone to have equal access and equal opportunity (Lawton, 2017).

In addition to being a requirement, Web accessibility provides benefits, not only to the disabled population, but to society as a whole. The Web provides access and opportunities that might not be afforded otherwise. If someone is physically disabled, the Web provides opportunities for interaction that might not be available without it. The Web also supports social inclusion on a local and global level; people from any background or situation can contribute to a worldwide online community, and those with disabilities should have access to this. Accessible websites can also hugely benefit companies. A website that is well-designed and accessible provides better search-engine optimization (SEO) and usually requires less maintenance (Lawton, 2017) Inaccessible websites not only hinder Web usage for people with impairments, but also be an inconvenience to people without disabilities as well. Websites such

as this for Alfred Sung (<http://www.alfredsung.com>) have a clean looking design, but usability in terms of navigation is frustrating for the majority of people (See *Figure 1*).



Figure 1.1: An example of bad website design (<http://www.alfredsung.com>), where poor menu navigation makes the site confusing and frustrating to use.

1.2 - Who Web Accessibility is for:

When talking about Web accessibility, it is important to identify who is impacted by barriers to Web usage. In general, the people impacted the most by Web barriers are those with physical, cognitive, auditory, speech or visual impairments. This general blanket statement does not cover every person who has trouble with access, as there is a great diversity of disabled people that use the Web. Someone who is older may experience disability due to a lack of computer skills, impeding their access to the Web. People are sometimes temporarily disabled when they have a broken bone or another health problem. Disability can be situational, such as if a loud environment is impeding what people can hear. Also, people could be suffering from multiple disabilities. For this case especially, and for all cases, it is important that accessible features are designed to cover the whole disability spectrum (Abou-Zahra, 2017).

Each category of disability presents unique barriers to the disabled user and unique challenges to those designing to work around the person's disadvantages. Each category encompasses a wide range of ability, so the whole range of ability must be taken into account. For instance, for auditory disability someone could just be hard of hearing, or they could be completely deaf. Someone who's hard of hearing might need some way to adjust the volume of media on a Webpage, but someone who's deaf would need an alternative to audio media.

Additionally, if sign language is a deaf person's primary means of communication, they might not be as fluent in their written language as those who constantly use it, so that would need to be taken into account as well (Abou-Zahra, 2017).

On the other hand are people with visual disabilities, which could range from poor eyesight to complete blindness, or could be a form of color blindness to just a sensitivity to bright light. Instead of an alternative to audio media, an alternative to visual media and text would be necessary. People who are blind sometimes use external hardware as well, such as a text-to-braille translator, and this must be considered. People with physical disabilities also use external hardware to use the Web. This group consists of people with muscle limitations or movement-limiting pain, sense limitations or joint pain, and those with missing limbs. Those with physical disabilities rely heavily on external hardware such as mouth sticks, alternate devices for hands-free interactions. Additionally, people with limited mobility will likely take longer to navigate and type. Though not often thought of, people who have speech disabilities, including those whose speech is hard to recognize by people, also have barriers to some aspects of the Web. Any voice-based software would be difficult to use for this group of people (Abou-Zahra, 2017).

People with cognitive disabilities are those with neurological or behavioral mental health disorders, and the disabilities vary and cover the whole disability spectrum. These impairments could limit someone's senses, how they learn, or their motor abilities, so the barriers from all of the previous categories of disabilities applies or this group. Like for physical disabilities, those with cognitive impairments use tools to support their specific need, and all must be taken into account for Web accessible design. Additionally, people with cognitive disabilities rely on logical and consistent Web design and simpler text to use websites (Abou-Zahra, 2017).

1.3 - History of Web Accessibility (Origin of W3C and WAI):

To understand how the Web can be designed to be accessible and what is currently being done today to address this issue, it is critical to know how this initiative started. Its foundations originate in the creation of the World Wide Web Consortium, known as W3C (<https://www.w3.org/>, See *Figure 2*). It was created in 1994 by the proposer of the World Wide Web, Tim Berners-Lee (<https://www.w3.org/Consortium/facts>, 2016), with the goal of creating guidelines to promote long-term growth for the Web (<https://www.w3.org/Consortium/mission>, 2017).

The screenshot shows the W3C home page. At the top left is the W3C logo. To the right, there are view options: desktop, mobile, and print. Below that are navigation links: STANDARDS, PARTICIPATE, MEMBERSHIP, and ABOUT W3C. On the left side, there are two main menu sections: 'TECHNICAL REPORTS' and 'WEB AND INDUSTRY'. Under 'TECHNICAL REPORTS', there are options for 'By date' and 'By group'. Under 'WEB AND INDUSTRY', there are links for Automotive, Publishing, Entertainment (TV and Broadcasting), Web and Telecommunications, Web of Data, Web of Things, Web Commerce, Web Payments, and Web Security. Below these is another section 'WEB FOR ALL' with links for Accessibility, Internationalization, and W3C A to Z. The main content area on the right features a list of news items, each with a date and an 'Archive' link. The first item is 'W3C releases video introducing Web Accessibility and W3C Standards' dated 4 December 2017. The second is 'First Public Working Draft: Payment Method Manifest' dated 12 December 2017. The third is 'Web Content Accessibility Guidelines (WCAG) 2.1 final Working Draft' dated 7 December 2017. The fourth is 'Update to the Candidate Recommendation: CSS Writing Modes Level 3; First Public Working Draft: CSS Writing Modes Level 4' dated 7 December 2017. The fifth is 'First Public Working Draft: Cognitive Accessibility Roadmap and Gap Analysis' dated 7 December 2017. The sixth is 'Call for Review: ActivityPub is a W3C Proposed Recommendation' dated 5 December 2017. The seventh is 'W3C opens Technical Architecture Group (TAG) election' dated 1 December 2017.

Figure 1.2: The World Wide Web Consortium home page.

The Consortium stands on five statements for its mission. The first of these is “*Web for All*”; this belief is that the Web contains many intrinsic values such as communication, global knowledge-sharing, and business opportunities among others, and that these values should be available to all people regardless of barriers. To this extent, internationalization of the Web is a huge focus, making sure that the Web is available in as many languages as possible (<https://www.w3.org/International/>, 2017). This facet of the mission also explores how technology such as mobile devices can be used to make the Web available to developing nations (<https://www.w3.org/2008/MW4D/>, 2013).

Secondly, the W3C believes in “*Web on Everything*”. This is the initiative to get the Web on as many devices as possible so that anyone can be connected to the Web from anywhere (<https://www.w3.org/standards/webofdevices>, 2016). To complement this is their goal to make Web-browsing mobile friendly, given how different navigation methods are between platforms (<https://www.w3.org/Mobile>, 2014). Besides Web usage, this statement also explores Web content-creation, and the initiative to be able to develop for the Web regardless of the tools or language of the creator or any other barriers they may have (McGee, 2016).

The W3C also stands by “*Web for Rich Interaction*”, that the Web should be able to deliver experiences that are personalized to each user. Additionally, this is the belief that the

Web should provide communication and development opportunities to everyone (<https://www.w3.org/Consortium/mission>, 2017). Thus, guidelines and standards should exist for Web design programming and general Web page development (<https://www.w3.org/standards/webdesign>, 2016), and designers should strive to make Web architecture sustainable so it can be used in the future (<https://www.w3.org/standards/webarch>, 2015).

The pillar of “*Web of Data and Services*” is based on the concept that the Web is a linked collection of both data and services, and that these two should work on tandem (<https://www.w3.org/Consortium/mission>, 2017). This drives the idea of a “*Semantic Web*”, where in the Web of linked data databases can be created and accessed easily (<https://www.w3.org/standards/semanticweb>, 2015).

Lastly is the belief that the Web should be a “*Web of Trust*”, where the Web is created to foster an environment of trust (<https://www.w3.org/Consortium/mission>, 2017). The main goal of this is to keep personal information private on the Web (<https://www.w3.org/standards/webdesign/privacy>, 2016) and to provide security features through platforms like XML (<https://www.w3.org/standards/xml/security>, 2015).

Many of these aspects of the mission highlight a desire from the outset of the W3C to create an accessible Web. However, the focus on Web accessibility originally started as a couple of curated Web pages on the W3C website that redirected to outside projects. The Web Accessibility Initiative (WAI, <https://www.w3.org/WAI/>, See *Figure 3*) sprouted from the passionate people curating these pages. Mike Paciello, one of the maintainers of these pages, proposed a specific W3C initiative to tackle Web accessibility in 1996. At the time there was a lack of cohesion between the individual Web accessibility initiatives and guidelines, and this new project would aim to resolve this. After its approval, the WAI forged ahead in finding ways to fix existing technologies for the Web. One of the organization's main goals is to educate people about Web accessibility and facilitate tools that can assist designers in creating accessible websites (Dardailler, 2017).

W3C Home

WAI: Strategies, i

Web Accessibility Initiative (WAI) Home

- Getting Started
- Designing for Inclusion
- Guidelines & Techniques
- Planning & Implementing
- Evaluating Accessibility
- Tutorials and Presentations
- Getting Involved with WAI

Discover new resources for people with disabilities, policy makers, managers, and you!

繁體中文 简体中文 Translations

"The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect."
— Tim Berners-Lee, W3C Director and inventor of the World Wide Web

Web Accessibility Initiative (WAI)

Highlights

WCAG 2.1 final Working Draft
A final Working Draft of [Web Content Accessibility Guidelines 2.1](#) has been published for wide review before a planned advance to Candidate Recommendation in January 2018. Please comment by **12 January 2018**. Read about the [Accessibility Guidelines Working Group](#) and the [Web Accessibility Initiative \(WAI\)](#) (2017-12-07)

Cognitive Accessibility Roadmap and Gap Analysis First Public Working Draft
The [Cognitive and Learning Disabilities Accessibility Task Force](#) has published a first public Working Draft of [Cognitive Accessibility Roadmap and Gap Analysis](#). It explores user needs for people with cognitive or learning disabilities and identifies where additional web content authoring guidance is needed to help authors meet these needs. This information is important to new guidance being added to Web Content Accessibility Guidelines 2.1. Please comment by **16 January 2018**. Read about the [Accessible Platform Architectures](#) and [Accessibility Guidelines Working Groups](#) and the [Web Accessibility Initiative \(WAI\)](#) (2017-12-07)

New Video Introduces Web Accessibility and W3C Standards
A [Video Introduction to Web Accessibility and W3C Standards](#) is now available from WAI. The video is presented as part of the Internet Society (ISOC)'s [Accessibility Toolkit](#). It is timed in recognition of the United Nation's annual [International Day of Persons with Disabilities](#). Subtitles are currently available in over 15 languages. More [translations are welcome](#). (2017-Dec-04)

Figure 1.3: The Web Accessibility Initiative home page.

1.4 - Guidelines for Web Accessibility:

Today, the WAI has several guidelines in place to incorporate Web accessibility in every aspect of the Web. These include the Web Content Accessibility Guidelines (WCAG) (Caldwell, 2008), the User Agent Accessibility Guidelines (UAAG) (Allen, 2015), and the Authoring Tools Accessibility Guidelines (ATAG) (Richards, 2015). To fully grasp each of these, it is important to understand the different components of the Web that are relevant to and affect Web accessibility (See Figure 4 for a brief description of each).

Guidelines:	What they outline:
Web Content Accessibility Guidelines (WCAG)	Guidelines for creating web pages.
User Agent Accessibility Guidelines (UAAG)	Guidelines for creating web browsers.
Authoring Tools Accessibility Guidelines (ATAG)	Guidelines for creating web development software.

Figure 1.4: Table of existing WAI guidelines for Web Accessibility and what each guideline covers.

The first thing to understand is what exists on a Web page. This is often referred to as the content of the page, the information that the user sees as text, images or any other type of media. Content also refers to what a Web developer sees, such as the actual code of the page

and the markup. All of these components of the Web page content play a role in how accessible the page is. There are also the software tools that facilitate the Web; user agents are the programs used to access the Web such as Web browsers and media players, and there are also authoring tools which are the programs used to create websites. These two types of programs also play a huge role in either helping or hindering Web accessibility (“Essential Components Of Accessibility”).

There are also the external elements to be considered; there are the assistive technologies such as screen readers or alternate keyboards to implement, and then there is the user knowledge of an individual which may already consist of adaptive strategies to Web barriers. To sum up all of these components, “Web developers usually use authoring tools ... to create Web content. People (‘users’) use Web browsers, media players, assistive technologies or other ‘user agents’ to get and interact with content” (“Essential Components Of Accessibility”).

Each component is intimately connected with one another, meaning if one does not support the other well, overall accessibility will suffer. This is the basis of the “Implementation Cycle”; if one element is weak in accessibility, other elements are also likely to be lacking since this disrupts the interdependence between the components. It is possible for one component to compensate when others are weak through a workaround, but this requires much more effort and does not solve the core issue. On the flipside, if accessibility is well implemented in one component, it is easier and more likely for other components to implement accessibility. Each of the guidelines presented by the WAI are in place to support the positive side of this cycle (“Essential Components Of Accessibility”).

The WCAG defines how to make Web content more accessible to disabled people, addressing the creation of the page itself. The first guideline presented is that information on the Web must be presented in a way that anyone can perceive. For example, this means that images or other media must have text alternatives. This also means that there must be alternatives to time-based media like audio or video - a good solution to this being captioning. In addition, all Web elements must be distinguishable from one another, so there must be enough contrast between colors and people should have the ability to resize and manipulate text and images (Caldwell, 2008).

The second guideline of the WCAG is that the user interface (UI) and navigation elements must be operable by everyone. In a broader sense this means that all of the content must be easily navigable, but also means that everything must be accessible in multiple ways, like being able to use a keyboard to navigate everything. Smaller points under this guideline

state that users must have enough time to read content and that developers should mitigate flashing that could result in seizures. The next guideline, also relating to the UI, states that it must be understandable. This means that the interface must be readable for everyone, operate in a predictable manner, and has a way for users to easily correct errors. The last guideline is that content should have the ability to be interpreted by a wide array of user agents, including assistive technology (Caldwell, 2008).

The next set of guidelines outlined by WAI, the UAAG, describes how user agents - namely Web browsers - should complement the WCAG and provide its own set of accessible features. Like the WCAG, many of the UAAG guidelines focus on UI elements. The first of these guidelines on UI focuses on how it is perceived; going off the WCAG guidelines on UI perception, this guideline states how user agents should take advantage of these accessible features and if needed fill in any missing accessible elements. Adding on to the WCAG guidelines, this section discusses how highlighting features should be provided, making text configuration tools available (*See Figure 5*), enabling synthesized speech and volume configuration independent of the computer's volume, and allowing configurable viewports to help orient users to the display (Allen, 2015).

Further guidelines on UI state that it should be operable and understandable. This reiterates that full keyboard access should be available, as well as supports alternate input devices. Alternate navigation methods should exist, such as sequential navigation between the different pages of a site and being able to use text search or structural navigation to move about. These guidelines also state that control and display settings are customizable and can be saved. The UI should also not be confusing and should help minimize and correct mistakes, and the features - most notably its accessibility features - should be well documented. The last couple guidelines say that Web browsers should have programmatic access - that is, it provides information about the controls and users can adjust them - and that the browser conforms to any specifications or conventions, like HTML conventions (Allen, 2015).

To Change Text Size

Most Web browsers include functionality to let you increase or decrease the text in a Web page. For example, to increase text size:

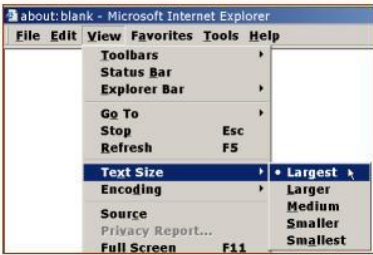
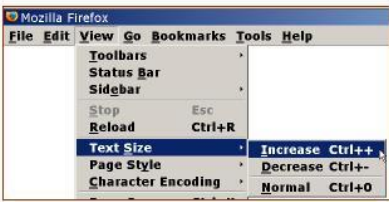
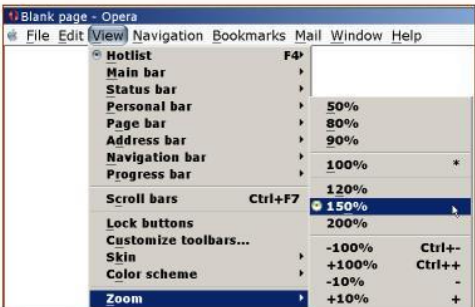
Browser	Example	Menu Items	Macintosh Shortcut	Windows Shortcut
Internet Explorer		View > Text Size > Largest	.	.
Firefox, Netscape		View > Text Size > Increase	Command+	Ctrl++
Opera		View > Zoom > %	Command+	+ or 0

Figure 1.5: The WAI website contains information on how to use accessible features in many different web browsers. Shown is the section about making text bigger.

WAI's last notable set of guidelines are the ATAG, which covers standards for Web-creation programs. The ATAG is split into two parts, the first covering how authoring programs can accommodate Web developers that have disabilities. It insists that for those developing on Web-based platforms, the WCAG should be followed, and for non-Web-based platforms the guidelines for that specific platform should be followed. Authors with disabilities should be provided with alternate content, such that they can interact with authoring tools through this content. This section of the ATAG also goes over standards for the editing views of the program. It states how the editing view should be operable for all people; it should be well optimized, have keyboard access to all commands as well as provide enough time to execute all of the commands, and the display should be configurable and not produce bright flashes.

Additionally, the editing view should be well documented and provide easy ways to correct mistakes (Richards, 2015).

The second part of the ATAG goes over how Web-development programs should make developing Web accessible content simple. Thus, if content is automatically produced by software, it should already be accessible, and if Web accessible content is transformed it should stay accessible. Authors should have the ability to manually make accessible content, and should be guided to do so. Lastly, the authors should have the tools to easily identify and fix accessibility issues, and the software should promote its accessibility features (Richards, 2015).

1.5 - Revisiting How Groups With Disabilities Use The Web and How Web Accessibility Helps:

In the context of all of the WAI guidelines, each category of disabilities can be addressed to minimize or remove the barriers to Web usage. For people with auditory disabilities, the solutions to this from the guidelines vary depending on the degree of the person's hearing ability. For those who are just hard of hearing, good audio quality and the ability to change the volume of media is a good starting point. For those who are completely deaf, an alternative to audio is necessary; this can usually be addressed in the form of captions for a video or a separate transcript (*See Figure 6 for video captions*). Then for those whose main language is sign language, the addition of image-supported text and simpler language would be a huge benefit (Abou-Zahra, 2017).

People with visual impairments also need different accessible features depending on the degree of the disability. Being able to zoom or change the size of text as well as being able to adjust line spacing and font color are designs that can help people with poor eyesight. Also, they might not be able to clearly see the mouse pointer on screen, so being able to fully access a website with the keyboard would also be helpful. For those sensitive to bright light or flashing, minimizing this in the web page media can mitigate discomfort and seizures. If someone is blind, then alternatives to visual media are required; audio descriptions of videos and being able to interface with text-to-speech programs or external text-to-braille hardware are a start (Abou-Zahra, 2017).

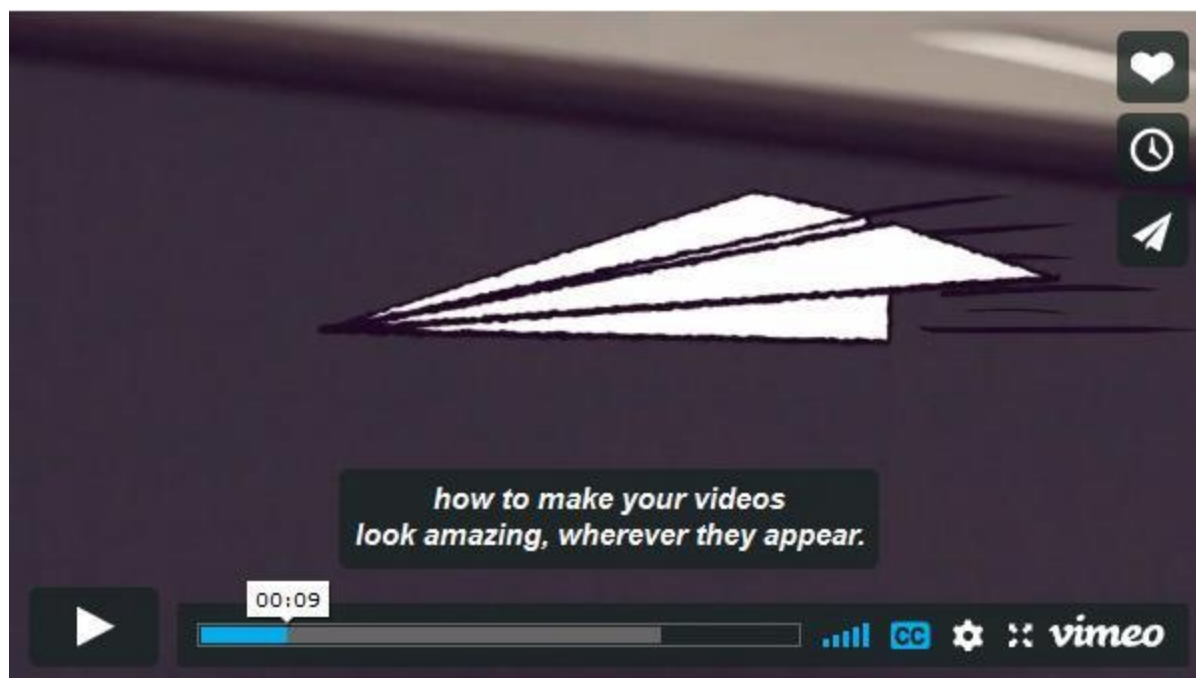


Figure 1.6: Captions at the bottom of the video can help people with auditory and visual disabilities.

Speech disabilities would need an alternative to voice-based software services, including voice-recognition software. Even just having the ability to press a button in place of saying a keyword would be a good solution. Additionally, providing alternate methods of contact information besides a telephone number would be helpful (Abou-Zahra, 2017).

For addressing people with physical disabilities, the most important aspect of Web Accessibility is supporting the various assistive technologies they employ. This would include supporting methods of keyboard-only interaction or any other interfaces such as speech interaction or alternative hardware, making it feasible for these to be used with user agents. Because of their physical limitations, it may take extra time for physically-disabled people to type, so providing enough time to type in information would help with accessibility. Another part of the solution would be to highlight what is currently the focus of the page, for example highlighting what menu button would be pressed when pressing enter, so that precise navigation is cleaner. Other ways of navigating the page, such as links at the top of the page to the relevant content on that page (See *Figure 7*), would also be a benefit (Abou-Zahra, 2017).

▼ Skip to Content | Change text size or colors

Figure 1.7: The WAI website has a button to scroll down to the content of the page.

Cognitive disabilities can be overcome by creating websites that are clearly structured; Consistent labelling, predictable layouts and link destinations and alternative ways of navigating the website such as hierarchical menu systems are all ways this can be achieved (See Figure 8 for an example of a menu system). Again providing simpler text or image-supported text, as well as minimizing distracting content, helps to lessen confusion. And, depending on the various needs or sense disabilities of the individual, many solutions to web accessibility for cognitive disabilities overlap with those of the other categories of disabilities (Abou-Zahra, 2017).

W3C Home

Web Accessibility Initiative (WAI) Home
Getting Started
Designing for Inclusion
Guidelines & Techniques
Planning & Implementing
Evaluating Accessibility
Tutorials and Presentations
Getting Involved with WAI

Figure 1.8: The WAI sitemap. Sitemaps help make website navigation less confusing.

1.6 - More Techniques for Web Accessibility:

These accessible features specific to certain disabilities are just a start to making websites truly accessible to all people. There are many of different techniques that can be used to design websites with accessibility in mind. One category of techniques that can be used are navigational efficiencies. These can include:

- Adding links to the top of the web page to link to other content on the page,
- Making sure the navigation can be done exclusively from the keyboard,

- Saying where a link goes before going to what is linked,
- Ordering the content of the web page in a meaningful way,
- Providing a site map for the web site,
- Showing the user's current location on a collection of web pages,
- Descriptive titles for web pages, and
- Consistent labelling of web pages.

(Cooper, 2016).

The WCAG additionally covers a lot more additional information about accessible features targeted at the previously described impairments, including:

- Making speech audio clear for audio related media,
- Making content elements not accessible to certain disabilities have text equivalents,
- Providing enough contrast between text and the background color,
- Limiting the length of sounds that automatically play when opening a web page,
- Providing extended audio descriptions in videos,
- Providing synchronized videos with sign language or audio descriptions
- Providing the ability to change the type of CAPTCHA test
- Providing a zoom function and making sure no content is obstructed when zooming in
- Implementing ways for external disability tools to read the web page for custom and non-custom content,
- Using simplified wording or visually showing ideas,
- Providing the option to complete a task without a time limit, and
- Reducing all flashes that could be seizure-inducing.

(Cooper, 2016).

The guidelines also discuss several "quality of life" accessible features that help not only those with disabilities, but every user, such as:

- Providing useful tools such as a link to a help page and a search function,
- Providing context for words and abbreviations,
- Making a glossary or dictionary of words people may not know,
- Providing typing tools like the ability to increase line spacing, spell checking and the ability to jump to errors,
- Showing a warning when opening a new window,
- The ability to postpone updating content,
- Providing users the option to save user-settings for the user agent or web page, and
- Providing confirmation for actions.

(Cooper, 2016).

Lastly, the WCAG provides useful tips for features surrounding filling out electronic forms or tests:

- The ability to review and correct answers,
- The ability to recover deleted data and save data,
- Providing formats for fields, providing examples for fields,
- A description for unfilled fields or fields that are filled incorrectly, and
- Saying when transactions or requests can be modified or cancelled.

(Cooper, 2016).

2. Methodology:

Before beginning the project, the team first established what the objective was, and how they would achieve it over the course of the two terms (A and B term). The majority of A-term consisted of preliminary research to educate the team members on Web Accessibility and proper techniques for gathering information such as surveys and interviews and how to conduct them.

Most importantly, before the team could begin to conduct an interview or a survey to gather data, all had to be successfully certified by the NIH (National Institutes of Health). Moreover, upon certification, the team developed a survey and interview outline to obtain the data. Once B-term began, surveys and interviews were conducted so that the team could obtain data at the beginning of the term, and if need be, open up their target population to other institutions. Once the data was collected, it was analyzed to locate where the biggest gaps are in the perception of web accessibility guidelines. The following sections will go into greater detail on our processes for this project.

2.1 - Project Management:

In order for the team to have a successful project, it was important to set feasible project goals using a timeline with dates of completion. To measure our progress, the team created a Gantt chart using the Smartsheet Project Management app. It consisted of our tasks and goals for each week for fourteen weeks. This gave us the ability to track and virtually measure our weekly progress. In order for work to be accomplished successfully, team meetings were held once or twice per week outside of faculty advisor meetings.

During team meetings, we organized, analyzed, and divided the work between each member, as well as made sure that we were making efficient progress according to our timeline (see Figures 1.1 and 1.2) and agenda. For each advisor and group meeting, meeting minutes were recorded to document what had been accomplished and what tasks were to be completed (see Appendix E). The meeting minutes consisted of the time that the meeting was called to order, where the meeting was located, who attended, what was discussed, and what was to be accomplished by the next week.

Furthermore, the team also met once a week with the project advisors, Dr. Loiacono, and Shiya Cao. For every meeting, one member of the team lead the meeting, going over what had been accomplished, what questions arose since the previous project advisor meeting, and what the goal is for the upcoming week. Following the presentation, the team received feedback from the project advisors, discussing whether or not the team was making sufficient progress

and how they could improve. Weekly meetings with the project advisors were a great opportunity for the team to ensure that project goals and expectations were being met.

2.2 - Project Timeline:

As shown in Figure 2.1, the team began the project by first determining what the objective was, additionally the project outline as also created. Preliminary research was conducted to develop a clear understanding of what web accessibility is and where the biggest gaps are in the perception of it.

The second week consisted of setting up an agenda and timeline, which helped the team schedule what goals were to be accomplished by each weekly deadline.

The team also conducted preliminary research for what a good interview and survey practice should include as well as any previously related studies. Additionally, the team also submitted the IRB form (WPI's Institutional Review Board form for social science research) to Professor Loiacono. During the third week, the team researched current WPI courses that were related to the topic, as well as good examples of interview and survey questions pertaining to our topic.

The following week, the team began formulating their own potential interview and survey questions as well as brainstorming incentives to attract students to partake in the interviews and surveys. Once the interview and survey was outlined, the team set up a script for how the interview would be conducted as well as writing the consent letter which acknowledged that all information gathered from each participant would be kept confidential and private. Lastly, the team decided on its incentive to attract students, which was to award any participant who completed the survey and interview with a five dollar amazon gift card.

During week six, the team developed the final survey using a software called Qualtrics, which enabled the team to receive quantitative data and feedback which was then used for data analysis. Additionally, an interview sign-up sheet was set up for those who completed the survey and were interested in taking the interview.

The final week consisted of setting up a timeline and the goals for B-Term as well as finalized the interview and survey. Moreover, to broadcast the project on a large spectrum, the team gathered contact information of professors who taught courses related to the topic who could inform each of their classes about the team's project. The team also reached out to fraternities, computer science majors (via CS alias) and fellow peers.

Week 1 (8.30.17):	<ol style="list-style-type: none"> 1. Obtain objective and write outline 2. Conduct preliminary background research on web accessibility
Week 2 (9.6.17):	<ol style="list-style-type: none"> 1. Set up agenda, timeline and outline 2. Preliminary research on good survey and interview practices as well as previous studies related. 3. Submit IRB to faculty advisors
Week 3 (9.13.17):	<ol style="list-style-type: none"> 1. Look up courses related to topic 2. Finish setting up outline 3. Research good survey and interview question.
Week 4 (9.20.17):	<ol style="list-style-type: none"> 1. Begin formulating questions for surveys and interviews 2. Brainstorm incentives 3. Gather contact information
Week 5 (9.27.17):	<ol style="list-style-type: none"> 1. Set up survey and interview script and consent letter 2. Finish up shaping survey and interview questions 3. Gather professor's contact information.
Week 6 (10.4.17):	<ol style="list-style-type: none"> 1. Plan for B-Term 2. Set up interview sign-up sheet 3. Develop survey using Qualtrics 4. Prepare for interview
Week 7 (10.11.17):	<ol style="list-style-type: none"> 1. Finalize interview and survey <ol style="list-style-type: none"> a. Age, gender, major demographics 2. Set up email list.

Figure 2.1: A-Term Project Timeline

As shown in Figure 2.2, the team began the first week of B-Term by rehearsing the written interview and survey with peers and other team members. This was to ensure that the questions and the script were fluent and clear. In week two, the team edited and finalized the survey and interview before they began advertising to the WPI campus. The next week, once the survey and interview were polished, the team began advertising to fraternities, sports teams, groups, clubs, and many other organizations around campus. As the week went on, the team received responses from participants who took the survey, as well as those who signed up for

an interview. Week four and week five consisted of more surveys and conducting interviews, as well as continuing to advertise to the WPI campus to gather more and more survey and interview participants. The team aimed to achieve a total of twenty-five total interviews in order to have a sufficient amount of data for the data analysis.

During week six, the team began to analyze the survey data, as well as finish up any last minute interviews. Once the interviews were done, the recordings of each interview were uploaded and transcribed. During the final week of B-Term, the team's objective was to finish analyzing the data, and finish the final proposal and submit it to the faculty advisors.

Overall, the team was able to stay on track, however had a few minor setbacks throughout the project. The team ran into multiple obstacles during the last four weeks of B-Term. During weeks four and five, the team was not getting a sufficient amount of research participants for the interview portion of the project. Thus, the team had to continue to advertise and reach out to student organizations in attempt to get more interview responses. The team originally set a goal to obtain a total of thirty interviews, however, based on the rate that the team was going, the total number had to be reduced down to twenty-five total interviews.

B-Term

Week 1 (10.24.17):	1. Practice interview and survey with peers
Week 2 (11.1.17):	1. Polish survey and interview 2. Begin advertising 3. Begin surveys and interviews
Week 3 (11.8.17):	1. Advertise: Fraternities, sports teams, groups, clubs 2. Conduct surveys and interviews
Week 4 (11.15.17):	1. Conduct surveys and interviews 2. Advertise
Week 5 (11.22.17):	1. Conduct surveys and interviews 2. Advertise
Week 6 (11.29.17):	1. Begin data analysis for surveys 2. Finish interviews 3. Upload interview recordings to google drive

	4. Transcribe interviews
Week 7 (12.6.17):	1. Finish analyzing data 2. Finish final write up.

Figure 2.2: B-Term Project Timeline

2.3 - Research Methodology:

The previous section explained what methods the team used in managing the project. This section explains in detail what methods were used to collect data, as well as how the team implemented these methods into the project.

For research and obtaining data, the team thought it was best to obtain quantitative and qualitative data so that the results could be analyzed on a large spectrum. The team conducted surveys, (quantitative data) using Qualtrics software, which gave a demographic and statistical and numerical measurement of data. Moreover, in addition to quantitative data, qualitative data was also collected through interviews, to determine in detail, where the specific gaps were in the perception of Web-accessibility.

2.4 - Proper Method to Conduct an Interview:

__The team conducted preliminary research on how to properly conduct an interview. The team discovered that an interview is a useful research method that is similar to that of a conversation between two people, with the purpose to obtain information for research (Kumar 2014). It was found that for new researchers, it is best to aim for a total of twelve interviews, each being around thirty minute long (Rowley, 2012).

When formulating questions for an interview, it is crucial that the questions asked are not too vague or general, all questions should be related to the topic and have a purpose as to what it is that the researcher is looking to learn from the interview (Driscoll, 2010). Additionally, when conducting an interview, it is important to order the questions carefully; each question should lead into the next question properly and set the context for later questions asked (Rowley, 2012). Moreover, researchers should test his or her interview with another researcher to make sure that the questions make sense and flow properly.

When beginning an interview, a researcher should first introduce their research and who he or she is. The interviewer should also purpose the anticipated length of the interview, as well as assure that the interviewees responses and information will be kept confidential (Rowley,

2012). Additionally, the researcher should remind the interviewee that he or she can leave or stop the interview at any time. Lastly, the interviewer should ask the participant if it is okay to audio-record his or her answers before they begin (Rowley, 2012).

When conducting the interview, a researcher can use simple techniques to keep the interview moving forward as well as keeping the interviewee engaged. One technique includes using prompts under each question; such prompts include silence, repeating the question, or the use of words such as why, what, how and who to gain further insight and to keep the conversation going (Rowley, 2012). Lastly, when analyzing the interview data, the researcher should listen to the audio-recordings of the interview and either transcribe it or take notes of what the the most important points are (Rowley, 2012).

2.5 - Proper Method to Conduct a Survey:

When searching for quantitative data, one would normally use a survey, which consists of simple and easy to respond to questions. Before a researcher can begin to conduct a survey, he or she must follow important steps. The first step is to identify what the purpose and the objective is of the survey and what information the researcher is looking to gather (Driscoll, 2010). The second step is to meet the required qualifications that legally enables a researcher to begin surveying a target population. For example, for this IQP, in week two of A-Term (see Figure 1.1) the team had to become certified under the NIH (National Institutes of Health) and submit the WPI's Institutional Review Board form for social science research (IRB) to Professor Loiacono in order to be able to conduct research on human subjects.

Furthermore, once a researcher is qualified to research on human subjects, the next step is to determine who it is that the researcher is looking to survey based on what population(s) is within a realistic range. The next step is determining how a survey will be conducted. A survey could be conducted in person by verbal communication, by paper through distribution of the survey, or through the internet (via app or website). Questions should be modified based on which method is used to conduct the survey. The next step is to determine how long the survey should be. Based on how much information the researcher is looking to gather, the number of questions can result in a short or long survey (Driscoll, 2010).

Once these steps have been completed, the researcher can then begin formulating what questions are to be asked. Good survey questions should be reliable and valid, meaning that they should be straightforward and mean the same thing to all participants. Each question should have a purpose and pertain to what the overall goal or objective is of the study. The wording of each question should be easy to understand and not contain complex terminology

(Driscoll, 2010). For example, the researcher should avoid having question that are biased, double-barreled, and or contain double negative phrases (Driscoll, 2010).

Lastly, once the survey is organized and complete, before it is distributed to the target population, researchers should test the survey within the research group to make sure that the survey flows and that there are no errors or mistakes present. Once the survey has been looked over and finalized, the researcher can begin distributing the survey to receive feedback (Donal, 2014).

2.6 - Project Advertisement:

According to the preliminary research, it was found that researchers can use incentives to increase the outcome of research participants for a study. Subjects may be paid or rewarded (e.g., gift card) for participating in a research study (University of Pittsburgh, 2015). The incentive should be reasonable and be based on the complexity of the study. Most importantly, the incentive should not be based on the risk of the study participant (University of Pittsburgh, 2015). For this IQP, the team brainstormed incentives to encourage research participants to participate in the study that was being conducted. The team ultimately decided on an incentive which guaranteed a participant a five dollar amazon gift card upon completion of both the survey and the interview. With this incentive, it encouraged students to complete both the survey and interview, resulting in both qualitative and quantitative data that the researchers used for data analysis.

3. Modifications:

Over the course of the project, the survey and the interview saw significant changes over the process of developing both of them. To start, initial example questions were drafted for the survey and interview to get an idea of how we wanted them structured. In terms of the survey, we experimented with different styles of questions we wanted use such as scales, multiple options, and open-ended questions (*See Appendix A pt. a*). For the questions with scales in particular, we were divided between using an odd number of options and an even number of options. With an odd number of options, the middle option would be the neutral answer, and some of the group were unsure if neutral responses would give us meaningful results. With an even number of options, participants had to either lean to one side or the other which could provide more meaningful results, but discounted to fact that some people might not have an opinion on certain matters. In the end, it was decided that questions with scales would utilize an odd number of options.

For the interview, the team initially brainstormed ideas about what types of questions were needed, and came up with some basic example questions (*See Appendix B pt. a*). It was intended for the questions to be more open-ended so that the interview would be more in-depth than the survey regarding the details. Originally the group planned on repeating questions from the survey to ease them into the interview, but this was quickly changed in later drafts.

These initial drafts were revised with the group's advisor, and secondary drafts were made of the survey and interview to come up with more questions and an adequate structure for each. The second draft of the survey focused on the specific questions that the group wanted to use in the final survey (*See Appendix A pt. b*). At this stage the team solely made the survey about Web Accessibility, and created questions to specify if students had taken any Web or UI design courses at WPI and if they were aware of any accessible features provided by websites or Web browsers.

Originally, the group had considered the possibility of extending our survey to other colleges in the surrounding area. The survey was planned to be much different when this was the case; there either would be two different surveys or the final one that was created would be more generalized. In the two survey option, the current survey would have been kept in its original form however we would have created another more generalized survey to accommodate many different class and school structures for other campuses. In the case of the single more generalized survey, the classes would have been categories of study instead since specific classes vary from school to school.

The second draft of the interview also focused on specific questions, but also the overall flow of the interview (See *Appendix B pt. b*). The interview was planned to have different paths depending on whether or not the participant knew anything about Web Accessibility. After asking this question, the interview questions would not converge until the end of the interview, where a couple of closing questions would be asked. The phrasing of questions was considered, and the group worded them in such a way as to not be construed as antagonistic. For example, instead of the phrasing “Have you used Web Accessibility in your designs?”, the team used the expression “Have you had the opportunity to use Web Accessibility in your designs?”.

A final draft was then created for the survey and interview. The final survey was created using the Web tool Qualtrics, which allows for extensive flow control (See *Appendix A pt. c*). The biggest change from the second draft is that it was decided to also use the survey to gather demographic information such as the participant’s major, year, gender and so on. This way, this data would not need to be collected during the interview process. The group debated about how to accommodate participants who were transgender for the gender portion of the survey; they came to the decision to have an option for “other” where participants could fill in an answer, and also to include a “prefer not to answer” option if participants were not comfortable with answering the question.

At this point the group also developed a time-slot sheet for signing up for interviews using the Web program Slottr; a link would be provided in the survey that would lead to this sheet, and would connect the survey and interview process together (See *Appendix C*). The time-slot sheet contained dates and times for possible interview times, and when someone chose a slot an email would be sent to one of the group members. Signing up for a time-slot required the participant’s email, however the team wanted to connect the interview time information with the survey using the participant’s student ID. Thus, a question asking for the participant’s student ID was added to the survey, and on the question with the link to the time-slot sheet we asked participants to provide their student ID when signing up for an interview time; there was an open spot for additional notes when signing up for a time-slot in Slottr, and the team asked participants to input their student ID there.

The final interview contained many of the questions that were drafted previously, but had big changes to the flow (See *Appendix B pt. c*). Previously the interview was intended to follow two separate paths depending on whether or not a participant knew about Web Accessibility. It was decided to instead to try to have participants answer most of the same questions and have specific sections where, depending on the answer to some question, the subsequent question

or two would be different. This was kept for the question asking about knowledge of Web Accessibility, and this question was utilized to inform participants about Web Accessibility if they did not know about it or did not know the specific definition. We also used this technique when asking if participants had used Web Accessibility in their Web or app designs, and asked similar but differently worded questions afterward depending on the response.

After distributing the survey with the final draft, there were a few additional changes that were made. The biggest changes was to time slot question; initially instead of having an option to choose between an in-person interview or a Skype interview, there was no prompt whatsoever. Soon we added a button to the next question with a reminder to click on the time slot link since some people did not fill in a time slot to do the interview. Later on in the second term this was changed to final version, where the mandatory option for doing an in-person or Skype interview encouraged people to fill in a time slot if they did not know about it. Additionally, many participants were not inputting their student ID into the time-slot sheet when signing up for the interview. Thus, an additional question was added to the survey asking for the participant's email; since an email was required when signing up for a time-slot, the survey and interview could be connected using emails (*See Appendix A for the final Survey and revisions*).

Between the initial interview script that was used for the first interview and the one we ended with there were also some modifications. Initially there was not a question to ask if participants had an experience with web or app development, but after interviewing people did not have any experience we were prompted to add this question in. Also, though it was never changed in the final interview script, the sub-question regarding if participants knew any specific accessibility guidelines was stopped being asked. This is due to the fact that the majority of participants did not know any specific W3C guidelines, and the previous section of the script already explicitly describes several guidelines.

Additionally, when reading the script to interviewees, some phrasing was changed from the final script. For the portion of the script after asking about what participants knew of Web Accessibility, the section for if they did know about Web Accessibility was posed as a question, however we were not looking for an extensive answer to it. For the original interviews, people were trying to answer this as a question rather than as an affirmation, so for subsequent interviews this was phrased as "It is the concept that anyone, regardless of their disability or situation, should have access to the Web". This way we are both corroborating the participants response while also giving them a more formal definition. *See Appendix B for the final Interview script and revisions.*

Changes were also made on the time slot, specifically between the first two weeks and last two weeks of conducting interviews. Originally the event descriptors were not specific to the date, but described the day. For example, we were using “1st Monday”, “2nd Monday” and so on for specific days. This led to some confusion among participants, where people were signing up for dates that had already happened (such as signing up for “1st Monday” instead of “2nd Monday”). The specific day of the month was also added to minimize the confusion. See *Appendix C for the final Time Slot sheet.*

4. Data & Analysis:

Survey data for this project were collected using the online survey distribution and data collection tool Qualtrics. This tool allows users to create a survey and distribute it online through links that lead participants directly to the survey. All responses are recorded, and the data for a survey are available to be downloaded in several formats, including some formats which are compatible with common spreadsheet programs such as Microsoft Excel.

After a significant number of responses had been received, the data for these responses were downloaded and imported into Microsoft Excel; the program used to conduct the survey data analysis for this project. Different responses to each question were counted and put into tables, Excel's calculation capabilities were used to find things such as totals and percentages, and tables were converted into graphical representations of the data in the form of bar graphs and pie charts using Excel.

5. Results & Discussion:

A total of 56 survey responses were received for data analysis. Data analysis was conducted on survey responses collected as of 6:57 pm on December 4th. More responses were received after this time, but these were not included in the analysis. 17 of the included responses were incomplete, leaving 39 responses that were usable. Following are summary and analysis of the most important information from these responses.

5.1 - Exposure to Web Accessibility

One of the main goals of this project is to get an idea of how much exposure people at WPI who may go into web or app development have had to the concept of web accessibility.

One survey question asked participants whether they were familiar with any of the following web accessibility laws and guidelines: ADA, Section 508, WCAG. There was also an option to respond that they were familiar with none of these. 27 of participants were not familiar with any of the guidelines. 4 survey participants were familiar with both the ADA and WCAG; the rest in each category were familiar with only one. This means that 7 were familiar with only the ADA, and 1 was familiar with only the WCAG. None were familiar with section 508.

Response	Number of Participants that Selected This Response
None	27
ADA	11
Section 508	0
WCAG	5

Another question asked participants whether they knew anyone with disabilities. There were 12 types of disabilities listed, in addition to options for “none” and “other”. This question was optional, and one participant chose not to respond to it, so this question has 38 responses, rather than 39. Only 7 of these 38 participants responded that they did not know anyone with a disability. There were 10 survey participants who knew people with 6 or more (at least half) of the listed disabilities.

Table 5.2: Participant Connection to People with Disabilities	
Response	Number of Participants that Selected This Response
None	7
Deafness	10
Orthopedic/physical disability	10
Visual impairment	15
Autism	13
Blindness	4
Learning disability	15
Developmental delays	6
Speech or language impairment	9
Hearing impairment	13
Traumatic brain injury	4
Multiple disabilities	3
Anxiety, depression, and/or stress	22
Other	0

One of the central points of focus for this project was addressed directly in the question that asked participants to rank their exposure to web accessibility on a scale from none to a great deal. 22 participants responded that they had had a moderate amount of exposure. Of the few others, there were slightly more responses on the higher side than the lower side.

Table 5.3: Participant Exposure to Web Accessibility	
Response	Number of Participants that Selected This Response
None	2
A little	4
A moderate amount	22
A lot	9
A great deal	2

One of the survey questions asked participants whether any of their courses had discussed web accessibility. The options were yes, no, and do not remember. About half of the participants, 19 out of 39, responded that they had discussed web accessibility in their courses.

Table 5.4: Participant Discussion of Web Accessibility in Courses	
Response	Number of Participants that Selected This Response
No	15

Yes	19
Do not remember	5

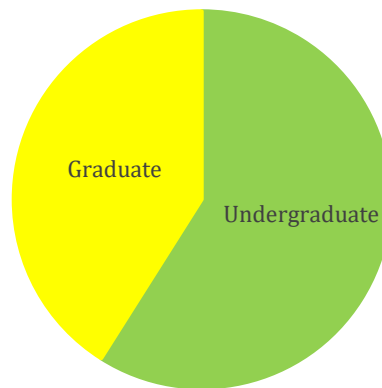
5.2 - Demographics:

In addition to questions about exposure to web accessibility, the survey also included questions designed to collect demographic information about participants.

One question asked participants for their status at WPI. The survey had responses for each of the four years of undergraduate study (freshman, sophomore, etc.) as well as an option for “graduate student”, but the four individual years have been combined here because it is more useful to compare the two more general demographics of undergraduate and graduate students. There are more undergraduate students than graduates who responded to the survey, but there are a decent number of both.

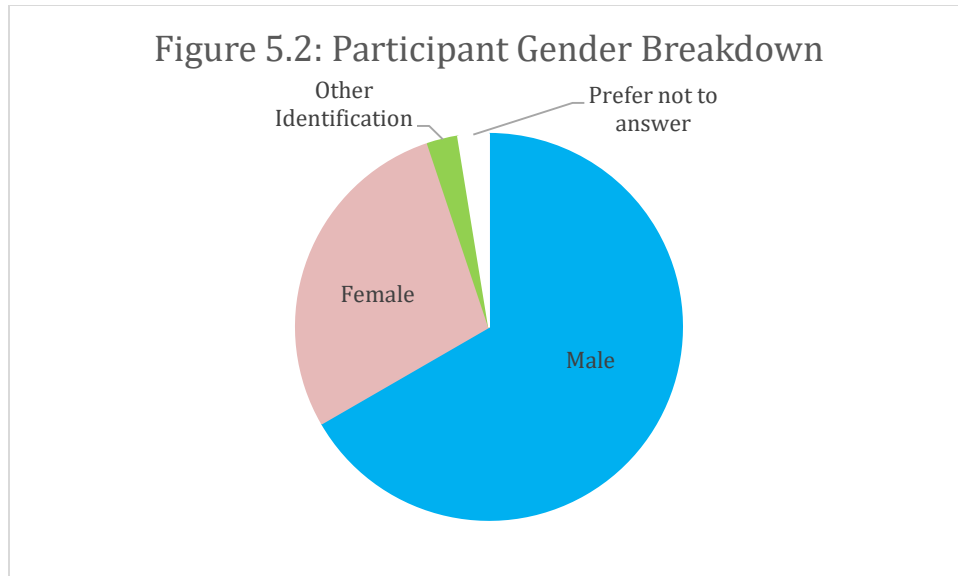
Status	Number of Participants
Undergraduate	23
Graduate	16

Figure 5.1: Participant Status Breakdown



Another question asked participants for their gender. Most of the participants are male, with significantly fewer females. Only one participant each responded with “other identification” or “prefer not to answer”.

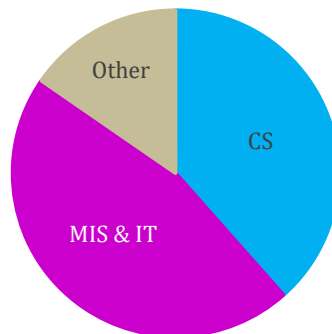
Table 5.6: Participant Gender	
Gender	Number of Participants
Male	26
Female	11
Other identification	1
Prefer not to answer	1



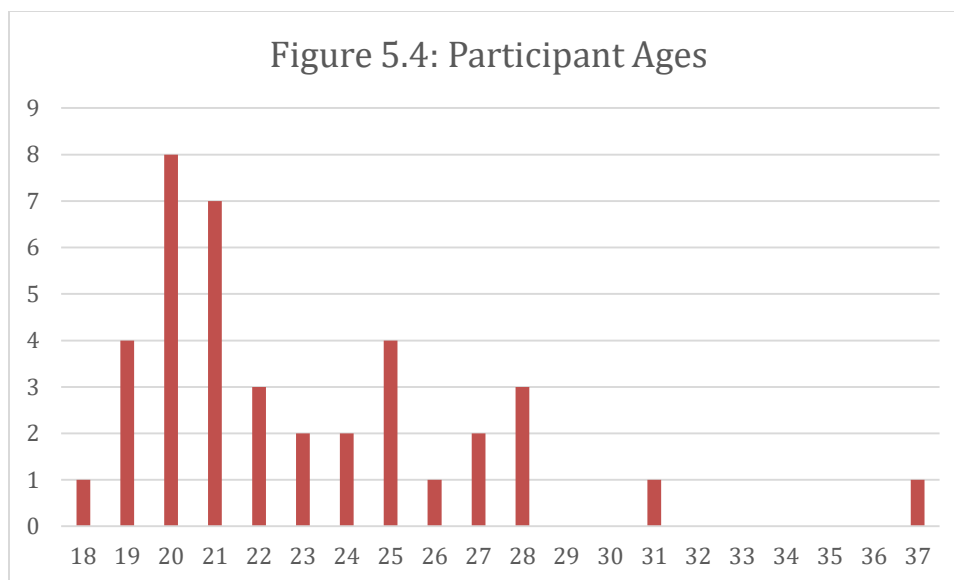
One of the questions asked about participants' programs of study. The survey included sections for participants to give their minors as well as majors, but it was determined that only the majors needed to be analyzed, so only those have been included here. The three most prominent majors are Computer Science (CS), Management Information Systems (MIS), and Information Technology (IT). MIS and IT are equivalent programs of study, with MIS being at the undergraduate level and IT being at the graduate level, so they have been combined into a single category for the purpose of data analysis.

Table 5.7: Participant Major	
Major	Number of Participants
Computer Science (CS)	15
Management Information Systems (MIS) & Information Technology (IT)	18
Other	6

Figure 5.3: Participant Major Breakdown



The last demographic question asked for participants' ages. The responses ranged from 18 to 37 years old, though most of the participants were toward the younger end of this range.



5.3 – Discussion

The data analysis was focused on answering several key questions. Each question and the relevant data analysis results are discussed in the following subsection.

Did people know about web accessibility, and if so, how much did they know?

Approximately 85% (33 of 39) of the survey participants responded that they had had moderate or more exposure to web accessibility. This result suggests that in general, people have a decent amount of familiarity with web accessibility. During the interviews, only a few people did not know anything about Web Accessibility, with the majority expressing some knowledge of it. Many knew about accessibility in a more general sense, but a few interview participants had much exposure on the subject. For those who did have an above average knowledge of Web Accessibility, many mentioned different age groups as a group Web Accessibility would target (Interview 680372734). Specific disabilities that many mentioned were “people with hearing impairments” (Interview 680372734) and people with visual impairments or who can’t “look at the screen properly (Interview 508061699). For the most part, those who did not mention any specific groups also did not know of or state anybody they know who might need to use accessibility features.

Were they familiar with any guidelines?

Only about 31% (12 of 39) of participants were familiar with any guidelines. This, when considered along with the fact that 85% considered themselves to have had moderate or more exposure to web accessibility, suggests that either people are overestimating their own exposure to web accessibility, or the exposure that they have had, while substantial in amount, may not have led to significant knowledge about some aspects of web accessibility. This is further supported by the fact that about 64% (7 of 11) of participants who reported a lot or more exposure to web accessibility were not familiar with any of the guidelines. It is likely this is due to a general unfamiliarity of the WCAG. Of those that were aware of specific guidelines, 28% (11 of 39) of participants knew of the American Disabilities Act (ADA), and only 13% (5 of 39) of participants knew about the WCAG which states the specific guidelines this research was on. It is likely that those familiar with the ADA and not the WCAG may not have known about Web Accessibility guidelines specific to WCAG.

Where did people learn about it; in class, or through some other project/way?

Approximately 42% (5 of 12) of participants who were familiar with at least one set of guidelines had not discussed or did not remember discussing web accessibility in class. Additionally, about 63% (12 of 19) of participants who had discussed web accessibility in their classes were not familiar with any guidelines. This indicates that a significant number of people who know about web accessibility did not learn about it, or at least did not learn much about it, in class, instead having to learn about it through other means.

This is reflected in the interview responses; for those who were familiar with Web Accessibility, only about half had learned about it through their classes. Of those who had heard of it through their classes. Even though half of people did not learn about Web Accessibility through the classes, there were many people who found out about it through doing various school or work projects (Interview 340273531, 319637744, 680372734) or through personally using accessibility features themselves (Interview 571183240).

If they did not know about web accessibility, had they taken any of the listed classes?

About 33% (2 of 6) of participants who reported a little or less exposure to web accessibility had taken one of the listed classes. While others who had taken the classes reported more exposure, there is no guarantee that any or all of this exposure came from classes, and this result suggests that coverage of web accessibility in these classes is not always sufficient for students to feel confident about their level of knowledge.

Did they know of anyone who needed to use accessibility features?

About 82% (31 of 38) of participants who responded to the question about knowing people with disabilities knew at least one person with a disability. Depending on the nature of individual disabilities, it is possible that not all of these 82% of participants knew someone who frequently used web accessibility features, but it is not unreasonable to assume that at least most of them did. This result indicates that a fairly large number of people probably know someone who uses web accessibility features. In the interviews, about half of people knew others who needed to use accessibility features (Interview 652153261, 508061699) and a handful mentioned specific groups when describing Web Accessibility (Interview 508061699, 571183240, 680372734). For those that did know people who might use accessibility features, many stated their parents or grandparents; some mentioned this was because of them not understanding how to use the Web of an application due to the generational gap (“My grandparents cannot use it [the Internet] at all”, Interview 652153261), or because they may have trouble reading text (“She [my grandmother] cannot see properly”, Interview 508061699). A couple interesting cases that were brought up was someone personally needing to use accessibility features due to an auditory impairment (Interview 571183240) and a specific case where a participant had to make a website accessible internationally and make sure language was not an issue (Interview 680372734).

Were they aware of Web Accessibility if they knew people with a large variety of disabilities?

All 10 participants who knew people with at least half of the listed disabilities reported moderate or more exposure to web accessibility, indicating that knowing people with a large variety of disabilities may help people to get some exposure to web accessibility. However, only 30% (3 of 10) of these participants reported a lot of exposure, and none reported a great deal of exposure. Additionally, only 30% (3 of 10) were familiar with any web accessibility guidelines. This indicates that knowing people with a large variety of disabilities probably does not provide more than a very slight advantage in terms of knowing about web accessibility.

How easy did people think implementing Web Accessibility in Web or app designs would be?

For the most part, the interview questions relating to perceptions of Web Accessibility guidelines (questions 9 to 12) prompted similar responses from participants. However, question

10 was the most divisive question for the entire survey; participants either thought that implementing accessible features would be easy (Interview 652153261, 680372734) or would be difficult (Interview 756986722, 508061699), and some people in the middle (Interview 319637744, 802980521). For those that said it would be easy, they stated that “Making the text bigger ... would be easy” (Interview 652153261) and “Most of major things ... for Web Accessibility is just a couple of numbers you need to increase or change” (Interview 680372734). Participants who said it would be difficult mentioned “It would be pretty difficult to make it inclusive for everyone” (Interview 756986722). Those in between mentioned “It was really difficult to understand what is their [people with disabilities] challenges from their perspective ... In terms of designing there were no issues” (Interview 319637744), and that “It depends on your experience” (Interview 802980521).

Given knowledge about Web Accessibility, would they consider implementing accessible features in their Web or app designs?

In the interview, the majority of participants had not had an opportunity to implement accessible features in their designs. When asked if they would consider the possibility of implementing accessible features given the information that was presented to them, the unanimous answer was yes. This indicates that if developers were aware of Web Accessibility and specific guidelines, they would be open to making their designs more accessible to people.

One of the most important questions of the interview was question 13, where participants were asked what they would do in a scenario where their boss did not know about Web Accessibility (*See Appendix B for the interview script*). This question was also answered unanimously, where all participants stated that they would either try “To make them understand what accessibility is” (Interview 821604964), “Try to educate them” (Interview 652153261) or otherwise “Try to keep Web Accessibility in my mind” (Interview 389666226) when designing websites or applications. Even those who did not know about accessibility at the start of the interview, but were given information about it thought that letting their boss know about Web Accessibility would be the best option (Interview 252242676). This shows that if people know about Web Accessibility, they would try to make it a focus in the company they are a part of. Thus, if more students were taught about accessibility in their classes, it is probable more companies would be implementing accessible features in their designs.

How did participants think student developers could be encouraged to use Web Accessibility guidelines?

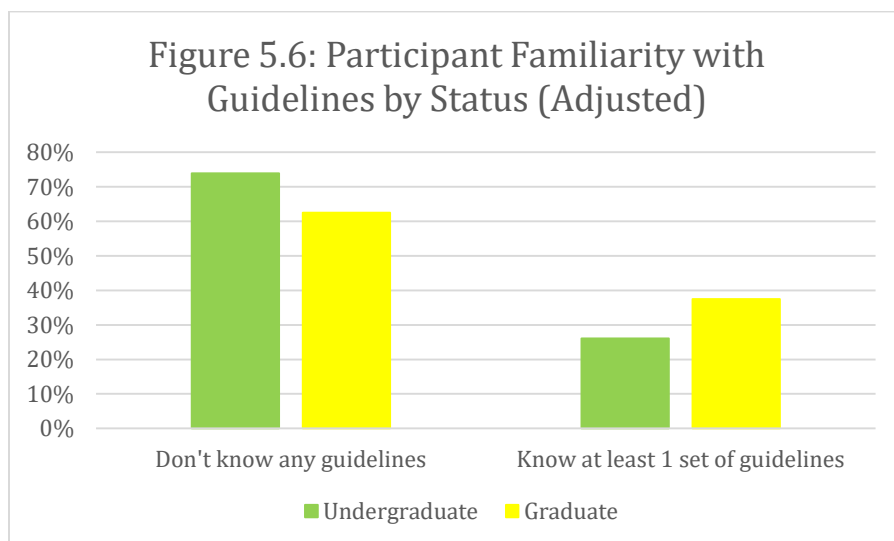
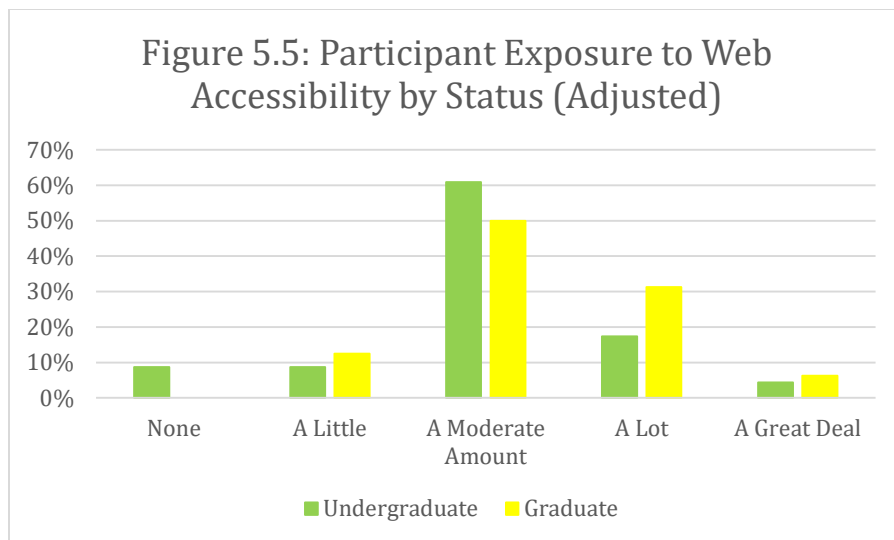
Many people during the interviews who knew about Web Accessibility knew about it through a specific school project they had participated in. However, those people who did not learn about Web Accessibility in their classes may never work on a student project where accessibility is a critical facet. This means that Web Accessibility would likely be better known if more classes were to teach about it. For the interview question regarding what participants' thought would encourage student developers to use accessibility guidelines, the unanimous response was to have classes teach about it as part of their courses. Some participants mentioned trying to "Put one class specifically for this [Web Accessibility]" (Interview 508061699) and also the possibility of dedicating a project or assignment on it (Interview 652153261, 680372734).

Look at demographics to see how different groups responded.

All comparison graphs in this subsection have been adjusted from raw data values to instead show responses as percentages of the total number of participants in a particular group. This is done to account for the fact that different groups have different totals (23 undergraduates vs. 16 graduates, etc.).

Comparison of Responses by Participant Status:

The undergraduate responses seem to have a distribution very similar in shape to the overall distribution for the question about exposure, with most of the responses being moderate, and the rest being distributed almost symmetrically around the center. The graduate responses are still dominated by moderates, but not quite as much, and there is a more noticeable skew toward the side of more exposure, indicating that graduate students may tend to be a bit more familiar with web accessibility than undergraduate students. Indeed, during interviews a higher portion of graduate students knew more about Web Accessibility than the undergraduate students. The second graph gives a similar picture to the first one, suggesting that graduate students tend to be more knowledgeable than undergraduate students with regard to web accessibility guidelines by a rather small but noticeable amount. During interviews, neither undergraduate nor graduate students knew much about specific accessibility guidelines. Neither of these results is surprising, since graduate students are further along in their studies, and have had more time to learn about these things.

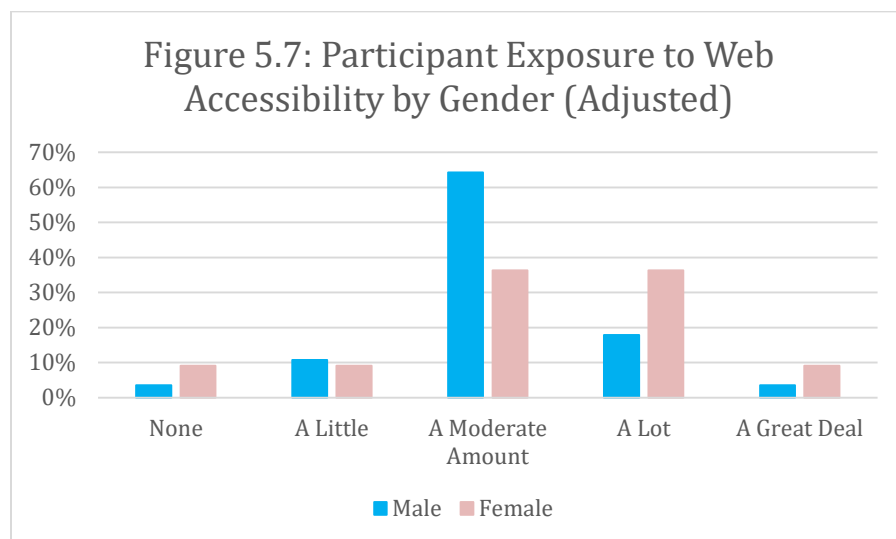


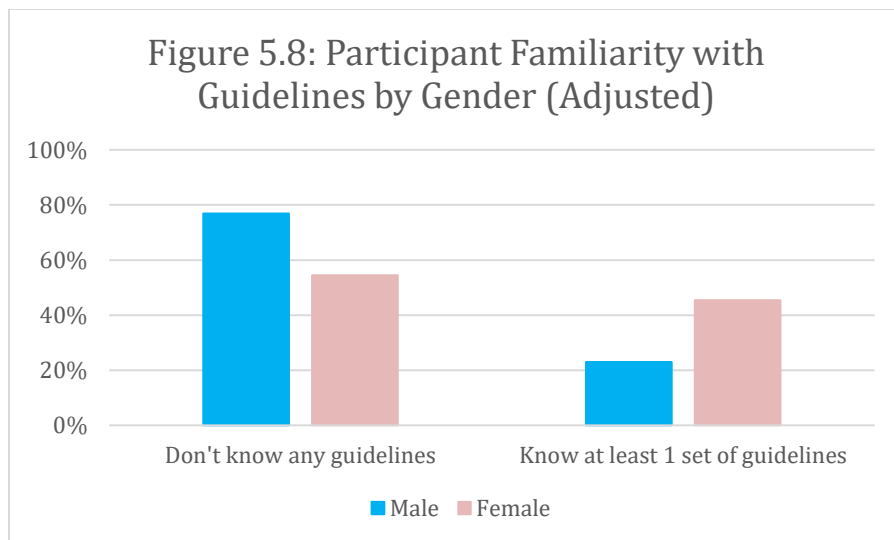
Comparison of Responses by Participant Gender:

Although there are four response categories for this question, the “other identification” and “prefer not to answer” categories had only one response each, so they have been ignored for this portion of the analysis. Much like the undergraduate distribution in the previous subsection, the male distribution for the question about exposure is similar to the overall distribution: mostly moderate, and nearly symmetrical around the center. The distribution for females, however, appears to split the majority of responses approximately evenly between the

“moderate amount” and “a lot” categories, hinting at a slight skew toward the higher end of the scale for females. The second graph also suggests that females tend to be more knowledgeable about web accessibility guidelines, with the female bar being higher for knowing at least one set, and lower for not knowing any. It is worth noting, however, that about 73% (8 of 11) of female participants are graduate students, while about 73% (19 of 26) of male participants are undergraduate students, meaning that this disparity may be, at least in part, caused by the same underlying factors that caused the differences between undergraduate and graduate students.

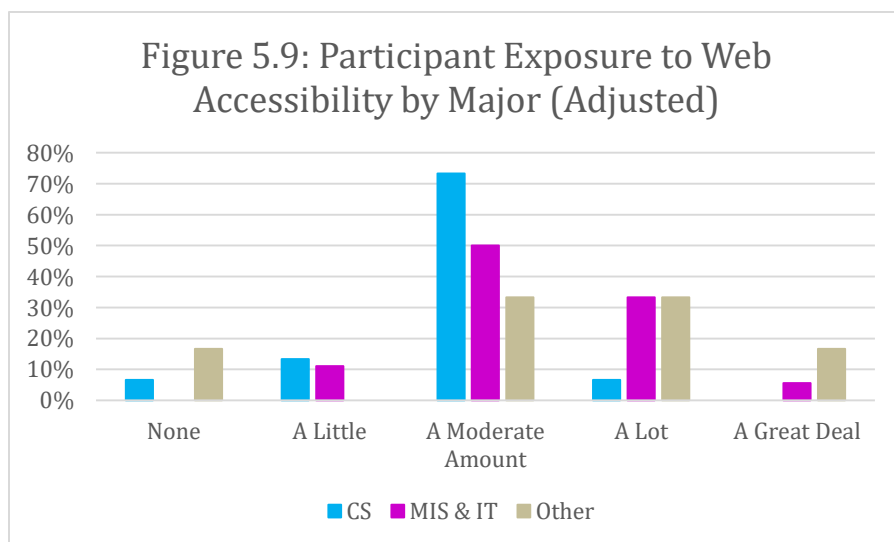
During the interviews, the gender distribution was fairly even, with only slightly more males than females. An interesting note is that the majority of females who participated in the interview had knowledge of Web Accessibility, while many males did not. It is unclear why this is the case; however this does reflect the survey results where more female survey participants stated they had “a lot” of knowledge regarding Web Accessibility than the male participants.

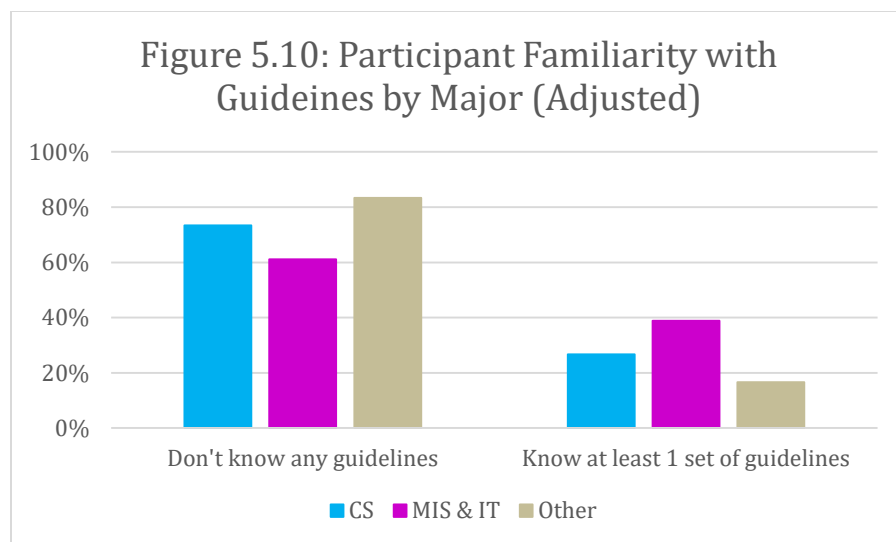




Comparison of Participant Responses by Major:

The distributions of CS majors and MIS & IT majors in both of these graphs looks similar to the distributions of undergraduates and graduates. This is not surprising, since 100% (15 of 15) of CS majors are undergraduates, and about 78% (14 of 18) of MIS & IT majors are graduates, so the same underlying causes likely affect both of these pairs. The other category does not have any particularly high peaks on the exposure graph, indicating a more even distribution than the other categories. However, the graph about guidelines shows that participants in “other” majors tend to know less about accessibility guidelines than those in CS and MIS & IT. This makes sense, since the “other” majors are not as relevant to the concept of web accessibility.





Benefits and Caveats:

Based on the way that the study was constructed, there are several benefits and caveats. The backbone of the study was the fact that it was split between a survey section and an interview section. This came with a couple large benefits; one was that for the interview it allowed us to focus on questions we wanted more detail on, and any demographic and quantitative data could be relegated to the survey. Additionally, even if people who did the survey did not do the interview (*See Reflection*), we still had their quantitative data that we could use for analysis. On the other hand, this issue also a huge drawback, since because we split our study into two different sections many people who did the first section did not do the second section.

Regarding our target population we also have large benefits and caveats. For our population, we decided to not use the entire population of Computer Science majors at WPI, but just students who have taken web design or user interface design courses as well as upper classmen in general. This was a benefit to the study, since for the most part the participants of the study had previous experience with either website design or app development. Even though a few participants had experience with neither, if we targeted all computer science majors the percentage of those with no experience likely would have been higher. If this was the case, then many participants wouldn't have any perceptions of using Web Accessibility.

Some of the major caveats of the study pertain to the population. The biggest drawback is that this study was only done amongst students at Worcester Polytechnic Institute; we intended this study to reflect all student web and app developers, but it is more than likely that in other institutions the percentage of those who have general knowledge about Web Accessibility

will vary. This study was done in the United States, and it is likely the results do not reflect international Web and app developer students. Also, due to only focusing on a small portion of Computer Science students, we had a small population size to draw from, and of that population we were received a small sample size. Additionally, our sample size is meant to reflect all Web and app development student at WPI, but it is possible our data is not representative of the population we drew from.

6. Conclusion:

6.1 - Summary of Findings:

In this IQP project, the team collected and analyzed data concerning the perceptions of Web Accessibility among student Web and application developers. Through this data collection the group hoped to gain an understanding of the current level of knowledge of Web Accessibility for students who had taken web design or user interface design courses at college. By finding out what students did or did not know about accessibility, the team wanted to set the groundwork for future Web Accessibility projects so that they would know what to focus on.

To achieve this goal, the group separated the project into two time periods that were denoted by the two terms in which the project took place. The first term was dedicated to research and developing the materials used for the project, and the second term was used to collect and analyze the data. During the first time period, the team focused research on what Web Accessibility is and who it is for, as well as the specific guidelines that define it. For the study it was decided to use a survey and supplemental interview to collect the data. Thus, additional research was done on how to construct a survey and on effective interviewing techniques. The survey was created to be done online using the Qualtrics program, and an interview script was developed so that each interview was not variable in content.

During the second time period, we decided to distribute the survey through email and also through announcements to classes. A schedule was developed for when interviews could be done, and a time slot sheet was made using Slottr for participants to be able to sign up for interviews. Both the survey and interviews took place at the same time, and emails and various distribution methods continued to be used to spread the word about the project to gain more participants. Lastly, the data was compiled, organized and analyzed to determine trends about Web Accessibility knowledge.

The students targeted by this project seem to generally have moderate exposure to the concept of web accessibility. However, very few of them are familiar with any web accessibility guidelines, suggesting that the knowledge gained through this exposure often does not extend far beyond a basic level. In general, graduate students appear to be more familiar with web accessibility and web accessibility guidelines than undergraduate students, but only by a small margin. Courses at WPI could do a better job providing exposure to web accessibility, and they would do well to improve on the amount of coverage and depth they provide on this topic.

6.2 - Recommendations for Future Work:

Further research on this topic is recommended, in order to gain a deeper understanding through collection of more data. Once more concrete results have been obtained, additional research may explore ways for schools or professors to improve coverage of web accessibility in their classes, or ways for students of website and application design to be encouraged to learn more outside of classes. Implementation of such methods could help the propagation of web accessibility in the future, allowing more of the internet to become available to people with disabilities.

Based on the data collected currently, endeavors could be attempted in order to deepen student's knowledge on the subject of Web Accessibility. Many students, though aware of the general topic of accessibility, did not know any specific guidelines. As a result, many students do not know specifically how to implement accessible features in their designs. Future projects could attempt to encourage classes to teach specific guidelines either through more in-depth lectures on Web Accessibility or through specific projects designed around the topic.

6.3 - Reflection:

Getting participants for the interviews turned out to be much more difficult than anticipated. We think that there were many small factors that all combined to make it difficult to get as many interviews as we would have desired.

One of the first problems is that we overestimated how long it would take to conduct the interviews. In the initial email to computer science majors, we stated that the interview would take approximately 25 minutes to complete. Similarly, in the interview script itself we told participants the interview would last around 30 minutes. In reality, the interview took 5 to 10 minutes on average, with some cases going as long as 15 minutes maximum. The perceived length of the interview most likely discouraged people from participating, and more would probably have responded to the initial email if they knew that the interview did not take long to do. Unfortunately we did not have a basis for the average length until actually conducting interviews, though we did know that the original time of 25 to 30 minutes was an overestimation.

Another factor that may have discouraged people participating in the interview was the size of the incentive. For completing both the survey and interview, we were giving out \$5 Amazon gift cards. Given the original estimation of the interview taking 25 minutes, people could have perceived this as not being a big enough incentive, with a \$10 gift card being more reasonable. Even with the perceived interview time being 10 minutes, having a larger incentive

would most likely have encouraged more people to participate. However, a \$10 incentive would have doubled the cost of this study, and may not have been feasible.

There were also many technical problems for the space between people completing the survey and signing up for interviews. There were many people at first who completed the survey but did not sign up for a time slot to do the interview; in the survey we have a question that has a link to the time slot website, but people did not need to click the link to proceed to the end of the survey. Thus, many people never clicked on the link before finishing the survey. This was later fixed by adding in a mandatory selection for either doing the interview in person or via Skype. Regarding this option, this may have also been in a factor in people not signing up the interview; prior to this option we only conducted interviews in person, but with the greater flexibility of Skype more people may have signed up.

Additionally, there were a couple logistical problems with the time slot website itself. One issue that arose was that there were no available time slots for after people took the interview. This was due to the fact that the interviewing process was intended to only last a couple weeks, but instead lasted much longer. The time slot sheet was originally set up with two weeks in mind, and people completing the survey after the last available time slot time had no way to sign up for interviews. More interview times were added later on, but a few people may not have not been able to participate in the survey due to this. The time slot site was also initially scheduled to close for the end of November, however interviews continued into the month of December. Thus, for the first day of December the site was completely closed and people were unable to sign up for an interview time on that day. The closing period was extended, but participants may have been lost due to this oversight.

Another compounded problem for the interviews was the reliability of the participants. Every participant received a reminder email prior to their interview time, but regardless many participants did not show up for their interview slots. With another reminder email some participants were able to be rescheduled to other times, but some did not respond to this secondary email and thus were never interviewed.

Besides people not participating in the interviews, another problem was participant's prior experience. We conducted interviews on the assumption that the participants either had experience with website or application development. Many people did have an abundance of experience with web or application development, but there were also a few people that had no prior experience. This caused their input to not be as rich as we would have hoped. This also required us to modify our interview script to include in a question asking if the participant had any prior experience.

All of these obstacles caused the interview process to extend much longer than we would have liked, and strained the time we had to complete data analysis and conclusions. From this experience, we now have a better understanding of the different problems that may arise during an interview data-collection process, and now know to anticipate a much longer time frame for future endeavors.

The primary issue with the data analysis was the time constraint. The fact that we had to wait until near the end of the term to even begin the analysis limited the amount of depth that was possible. We were not able to conduct any legitimate analysis on the interviews, instead focusing entirely on the simpler quantitative analysis of the survey data. In addition, more information probably could have been gained from the survey data if we had had more time for analysis.

The lack of responses also contributed to the difficulty. It would have been much easier to draw useful conclusions if we had had a larger sample size. As it is, the best we could do is to make broad statements about what the results seemed to imply. Also, the small amount of total data meant that we had to use very few groups for comparisons in order to have the groups be large enough to be meaningful.

This project may have yielded better results if it had been done over three terms instead of two; in that case the first term could have been used for preparation, the entire second term could have been used for data collection, allowing for a larger quantity of usable data to be collected, and the third term could have been used for analysis, allowing for more time to go deeper and draw conclusions.

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Glossary:

Terms:	Definitions:
Americans with Disabilities Act (ADA)	An American law that is intended to prevent discrimination against people on the basis of disability.
Assistive Technologies	Any software or external hardware that can be used to mitigate disabilities.
Authoring Tools	Software that can be used to create websites.
Authoring Tools Accessibility Guidelines (ATAG)	A set of guidelines to standardize Web authoring software accessibility features, both in the software itself and in creating Web pages.
CAPTCHA Test	Acronym for “Completely Automated Public Turing test to tell Computers and Humans Apart”. A test to determine whether input is from a computer or a human, usually in the form of an audio or visual question.
Content	The elements of a Web page or application interface, including text, visual media, markup and code.
(Web/App) Developer	A person who creates Web or App content.
Hyper-Text Markup Language (HTML)	The code that links web pages and in which web pages are designed.
Implementation Cycle	The idea that if one section of the Web is implemented poorly, other elements of the Web will also be implemented poorly. On the flipside, if one element is implemented well, other parts of the Web are more likely to be

	implemented well.
Qualtrics	An online tool used to create surveys. Contains tools for analyzing and sorting data.
Search-Engine Optimization (SEO)	Creating content in a way that will allow it to appear near the top of search query when typing keywords into a search-engine.
Site Map	A hierarchical menu on a website that contains links to all pages on the web site User - A person using the Web.
Slottr	An online tool used to create sign-up sheets for different dates and times.
User Agent	Software that is used to access or contribute to the Web, such as a Web browser or a media player.
User Agent Accessibility Guidelines (UAAG)	A set of guidelines to standardize user agent Web accessibility features.
User Interface (UI)	How a user interacts with a display, can be a physical piece of hardware like a mouse and a keyboard or virtual like a browser menu.
Web Accessibility Initiative (WAI)	An initiative under W3C that aims to educate people about Web accessibility and provide guidelines and incentives for people to develop Web accessible content, user agents and authoring tools.
Web Content Accessibility Guidelines (WCAG)	A set of guidelines to standardize Web accessibility in Web pages
World Wide Web (WWW)	A system on the internet that allows

	documents and data to be linked together via HTML.
World Wide Web Consortium (W3C)	An organization whose mission is to support the continued growth of the Web.

Appendix:

A - Survey Modifications:

a - Preliminary Ideas:

some possible questions:

- Please list all web design courses you have taken or are currently taking. (Do not include courses that you plan to take in the future.)
- How much exposure (on a scale from 0-5) would you say you have had to the concept of “web accessibility”?

0 - I've never heard of it/ I've heard the term but I don't really know what it means.

1 - I know what it means, but I don't know much beyond that.

2 - I know what it means and some general information about guidelines that are in place for it.

3 - I know about guidelines, and I know some general information about implementing it.

4 - I feel like I could probably implement some common methods for improving accessibility, or could point them out on websites that I visit.

5 - I am confident that I could implement or recognize web accessibility features in real life websites.

- How important (on a scale from 0-5) do you think it is to design websites that can be used by people who have disabilities that may prevent them from using certain features?

0 - It's not even worth thinking about.

1 - It's worth thinking about, but all other aspects of design should take priority.

2 - It's more important than a few other aspects of design, but only the least important ones.

3 - On the list of priorities I would place it roughly in the middle.

4 - Only the most important aspects of design should take priority over it.

5 - It is the absolute top priority when designing a website.

b - Secondary Draft:

- Which of these courses have you taken or are currently taking? (WPI)
 - CS 3041, Human-Computer Interaction, CS 546, Human-Computer Interaction, CS 4241, Webware, CS 4518, Mobile & Ubiquitous Computing, CS 528, Mobile & Ubiquitous Computing, CS 529, Multimedia Networking, CS 540, Artificial Intelligence in Design, CS 568, Artificial Intelligence For Adaptive Educational Technology, CS 565, User Modelling:
- State what web development courses you have taken (other schools)
- Which of these Web features have you used before?

- Zooming
- Searching (not a search engine)
- Links to content on the same page
- Links to word/abbreviation definitions
- Changing the colour of the background
- Saving personalized settings for your web browser
- Have you encountered any of these issues on the Web before?
 - Not enough contrast between text and the background
 - Text that is too small
 - Main text that is not visible at the top of the page
 - Not having the ability to save answers for electronic forms
 - Not having the ability to change the volume for audio on the Web (without using the system volume)
 - Words you didn't know without any definition or context
- How much exposure (on a scale from 0-5) would you say you have had to the concept of "web accessibility"? (With the scale above)
- Have any of your courses discussed web accessibility?
 - If so, which ones?
- Section for any additional comments

c - Final Draft:



WPI

CONSENT FORM

You are invited to participate in a Worcester Polytechnic Institute (WPI) sponsored research project about Web Accessibility Guidelines. The goal of this research is to understand how and what web developers think about accessibility when developing webpages and/or mobile apps.

This survey is the first step in the process and should be completed before your interview. It should take you less than 5 minutes to complete.

Participation is voluntary and you may end your participation at any time, but we hope that you will find your continued participation valuable and worthwhile. We will not disclose any personally identifying information about you and data will only be used in an aggregated format.

The second step, an interview, should last no more than ½ an hour and will be recorded only if you give your specific consent to do so below. Your input is very important to this research and you will be receiving a \$5.00 gift card for your participation for completing both steps .

By clicking “>>” below you are consenting to participate in this study.

Thank you once again for supporting this study.

For questions regarding the research study, please contact the main researcher, Dr. Eleanor Loiacono (eloiakon@wpi.edu). For questions regarding your rights as a research participant, please contact the Human Research Protection Program at Worcester Polytechnic Institute (irb@wpi.edu).



WPI

Thank you for agreeing to participate. The survey should take less than 5 minutes to complete. Please devote this time entirely on the survey and complete in one session. There should be no interruptions. It is essential that there are no external factors affecting the results of the survey, such as talking on the phone, emailing, texting, or other distracting factors.

Please click the ">>" button to get started.



WPI

In order to understand your background in website design, we would like you to answer the following questions.





WPI

Please let us know your status in regards to each of the following WPI courses.

	I...		
	Haven't taken	Am currently taking	Have completed
CS3041 Human-Computer Interaction (undergrad)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS4241 Webware	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS4518 Mobile & Ubiquitous Computing (undergrad)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS528 Mobile & Ubiquitous Computing (graduate)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS529 Multimedia Networking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS540 Artificial Intelligence in Design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS546 Human-Computer Interaction (graduate)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS565 User Modeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CS568 Artificial Intelligence for Adaptive Educational Technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



WPI

Are you familiar with any of the following accessibility laws or guidelines. Please select all that apply.

- Americans with Disability Act (ADA)
- Section 508
- W3C Web Content Accessibility Guidelines (WCAG) 1.0 or 2.0
- Other, please specify
- I am not familiar with any accessibility laws or guidelines

>>



WPI

Do you know anyone who has any of the following disabilities? Please select all that apply.

- | | |
|--|---|
| <input type="checkbox"/> Deafness | <input type="checkbox"/> Orthopedic/physical disability |
| <input type="checkbox"/> Visual impairment | <input type="checkbox"/> Autism |
| <input type="checkbox"/> Blindness | <input type="checkbox"/> Learning disability |
| <input type="checkbox"/> Developmental delays | <input type="checkbox"/> Speech or language impairment |
| <input type="checkbox"/> Hearing impairment | <input type="checkbox"/> Traumatic brain injury |
| <input type="checkbox"/> Multiple disabilities | <input type="checkbox"/> Anxiety, depression, and/or stress |
| <input type="checkbox"/> Other, please specify | <input type="checkbox"/> No, I do not know anyone with a disability |

>>



WPI

How much exposure would you say you have had to the concept of "web accessibility"?

A great deal

A lot

A moderate amount

A little

None at all

>>



WPI

Have any of your courses discussed web accessibility?

Yes

No

Do not remember

>>



WPI

Please add any additional comments here. We appreciate any and all comments/feedback you may have.

>>



WPI

What is your current status at WPI?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate Student

>>



WPI

What is your gender?

- Male
- Female
- Other identification
- Prefer not to answer

>>



WPI

What is your major and minor at WPI?

Major	<input type="text"/>
2nd Major	<input type="text"/>
Minor	<input type="text"/>
2nd Minor	<input type="text"/>

>>



WPI

How old are you?

>>



WPI

Please enter your email.

>>



WPI

Please enter your WPI student ID number.



WPI

Thank you for filling out this survey. Please click the link below to sign up for an interview time-slot. (Please only fill in email and put student ID in "notes"):

[Click here to sign up for an interview time.](#)

- Do interview in person
- Do interview via skype





We thank you for your time spent taking this survey. If you have any questions or concerns, please contact kgsavell@wpi.edu.

B - Interview Modifications:

a - Preliminary Ideas:

- questions are asked directly to the participant by an interviewer, answers are recorded either as audio or in writing by the interviewer
- questions are more open, allowing participants to provide explanations or specification

some possible questions:

- How would you define “web accessibility”?
- What established guidelines for web accessibility, if any, are you aware of?
- How do you feel about these guidelines? (helpful? restrictive? neutral?)

b - Secondary Draft:

- Have any features of the Web frustrated you before? If so, can you please describe these hindrances?
- Do you know about web accessibility?
 - If No, explain a bit what web accessibility is:
 - If the person does recognize it:
 - Go back to the “Yes” answer for the previous question
 - If the person still doesn’t recognize it:
 - What features/tools do you find useful when using the Web?
 - What groups of people do you think might have trouble using the Web? What issues do you think the Web may present to people?
 - How do you think web accessibility would benefit people with disabilities?
 - How do you think web accessibility would benefit people without disabilities?
 - What software have you used to create websites? (Briefly explain some web accessible features, such as text alternatives) Do you know if that software provides that feature?
 - If Yes:
 - How would you define “web accessibility”? Can you explain a bit about what you know?
 - What established guidelines for web accessibility, if any, are you aware of?

- If the person is familiar with the guidelines:
 - In your opinion, how flexible are the guidelines?
- Can you explain about what groups of disabilities are targeted by web accessibility?
 - If they are familiar with a lot of groups:
 - How might we make accessibility guidelines address all types of disabilities?
 - What software have you used to create websites? Do you know of any accessibility features of these programs?
 - Have you had the opportunity to incorporate web accessibility in your website design?
 - How difficult do you think it is to implement web accessible features?
- After either branch:
 - How might accessibility guidelines be easier to use by web developers
 - How might the guidelines be made more straightforward or less confusing?

c - Final Draft:

“Hi, thanks for coming! My name is _____. Please have a seat.”

“As you may know from filling out the online consent form, we are conducting this interview to gain an understanding of how and what students of web development think about accessibility when developing webpages and or mobile apps. Your input is very important to us. Even if you don’t know what web accessibility is, that is fine. I can give you some more information.”

“This interview should only take about 30 minutes. I will be asking you questions related to your experience with web or app development courses and web accessibility. Your personal identifying information will not be used and you are free to end the interview at any point. Your participation is purely voluntary.”

“If it is alright with you, I would like to audio-record our discussion in order to ensure the accuracy of my notes. If you agree to this, the only people, who will hear this recording are the researchers. Is that okay with you?”

“Thank you. Now that you consented, I will ask this question again, after turning on the recorder to confirm your response. Again, you have the right to withdraw from the study at anytime.”

“We’re going to start off with some basic questions about your course background and Web development.”

1. “Could you confirm your major?”
2. “Has any poorly implemented website features or designs hindered your Web usage?”

“Let’s move on to the subject of Web Accessibility.”

2. “Could you tell me a bit about what you know about Web Accessibility?”

If they do know ...	If they do not know ...
<p>“Would you agree that it is basically the “concept that everyone should have equal access to the Web, regardless of their disability.”</p> <p>(https://www.w3.org/standards/webdesign/accessibility)</p>	<p>“Basically, Web Accessibility is the concept that everyone should have equal access to the, regardless of their disability. To accomplish this, guidelines have been put in place for web developers that tells them how to create accessible features.”</p> <p>(https://www.w3.org/standards/webdesign/accessibility)</p>

3. “With this definition in mind, have you or anyone you are close to encountered inaccessible websites? (If so), Do you specifically remember what made that website inaccessible?”

“For Web Accessibility, there are guidelines for making web content accessible. Some of these include text alternatives for video and audio, the ability to navigate pages using only the keyboard, and having the ability to save personal settings for browsers.”

- “Are you aware of any of the specific guidelines for Web Accessibility? (If they know a decent amount)

- 4. “Do you or anyone you know have to use accessibility features provided by web browsers or operating systems?”
 - For example, zooming, changing the color or contrast of the background, using subtitles.” (<https://www.w3.org/TR/WCAG20/>)

- 5. “Have you have the opportunity to develop any websites or applications?”

- 5. “What software have you used to create websites or apps? Do you know if [answer above] has the resources to implement web accessible features?” (<https://www.w3.org/TR/ATAG20/>)

- 7. “Do you feel website accessibility guidelines are helpful/useful to web designers?”
 - (If they don’t know about the guidelines, refer back to question 4)

- 8. “Have you had the opportunity to implement Web Accessibility in any of your web or app designs?” (<https://www.w3.org/TR/WCAG20/>) (<https://www.w3.org/TR/WCAG-TECHS>)

If they have...	If they have not...
9. “Could you give me some detail on how you have used it?”	9. “Could you imagine using them?”
10. “How easy was it to implement Web Accessibility?”	10. “How easy do you think it would be to implement Web Accessibility?”

<p>(https://www.w3.org/TR/WCAG20/) (https://www.w3.org/TR/WCAG-TECHS)</p> <p>11. “How might Web Accessibility guidelines be made easier to understand and implement for web developers?”</p> <p>(https://www.w3.org/TR/WCAG20/)</p> <p>12. “How do you think student web developers could be encouraged to use web accessibility guidelines or tools?”</p> <p>“What encouraged you to follow them?”</p>	<p>(https://www.w3.org/TR/WCAG20/) (https://www.w3.org/TR/WCAG-TECHS)</p> <p>11. “How do you think these guidelines could be easier to implement for web and app developers?”</p> <p>(https://www.w3.org/TR/WCAG20/) (https://www.w3.org/TR/WCAG-TECHS)</p> <p>12. “How do you think student web developers could be encouraged to use web accessibility guidelines or tools?”</p>
--	--

13. “If you were hired by a company as a web designer or app developer and your boss did not know about web accessibility, what would you do?”

14. “Is there anything else you would like to add?”

“Alright, this concludes the interview. Thank you so much for your valuable input.”

“Do you mind if we contact you if we have any additional questions? Before you go, we just wanted to verify your email so we can send the giftcard to you, is _____ correct? Again, thanks so much for coming, have a good day!”

C - Time Slot Sheet:

slottr

Web Accessibility Time Sign Up



Please only fill out email and input your student ID in the "notes" section.

What	When	Who
Interview (Tuesday, Nov. 28th)	Tue, Nov 28 @ 10:00 AM	Full
Interview (Tuesday, Nov. 28th)	Tue, Nov 28 @ 10:30 AM	Slot me in
Interview (Tuesday, Nov. 28th)	Tue, Nov 28 @ 11:00 AM	Full
Interview (Tuesday, Nov. 28th)	Tue, Nov 28 @ 11:30 AM	Full
Interview (Thursday, Nov. 30th)	Thu, Nov 30 @ 10:00 AM	Full
Interview (Thursday, Nov. 30th)	Thu, Nov 30 @ 10:30 AM	Slot me in
Interview (Thursday, Nov. 30th)	Thu, Nov 30 @ 11:00 AM	Slot me in
Interview (Thursday, Nov. 30th)	Thu, Nov 30 @ 11:30 AM	Full
Interview (Thursday, Nov. 30th)	Thu, Nov 30 @ 12:00 PM	Slot me in
Interview (Thursday, Nov. 30th)	Thu, Nov 30 @ 12:30 PM	Slot me in
Interview (Friday, Dec. 1st)	Fri, Dec 1 @ 10:00 AM	Full
Interview (Friday, Dec. 1st)	Fri, Dec 1 @ 10:30 AM	Slot me in
Interview (Friday, Dec. 1st)	Fri, Dec 1 @ 11:00 AM	Slot me in
Interview (Friday, Dec. 1st)	Fri, Dec 1 @ 11:30 AM	Slot me in
Interview (Friday, Dec. 1st)	Fri, Dec 1 @ 12:00 PM	Slot me in
Interview (Friday, Dec. 1st)	Fri, Dec 1 @ 12:00 PM	Slot me in
Interview (Friday, Dec. 1st)	Fri, Dec 1 @ 12:30 PM	Slot me in

The final time sheet with specific days and dates.

D - Email Drafts:**a - Initial Email for Computer Science Email Alias:**

“Greetings CS majors,

We need your help! We are an IQP group that is looking at perceptions of web accessibility in future web developers. For our project we are interviewing students who have taken web and user interface design classes previously about web accessibility. The interview is scheduled to last around 25 minutes, and participants will be compensated with a \$5 Amazon gift card.

If you are interested, please fill out this preliminary survey (available time slots are at the end of the survey):

http://wpi.qualtrics.com/jfe/form/SV_8hKeWHqx6WLcwlT

Thanks for your time!”

b - Reminder Email for Computer Science Email Alias:

“Greetings CS majors,

We still need your help! We are an IQP group that is looking at perceptions of web accessibility in future web developers and app developers. For our project we are interviewing students who have taken web and user interface classes previously and asking about web accessibility; we are still looking for more participants. The interviews have been taking around 10 minutes to complete, and can be done either in person or via Skype. Participants will be compensated with a \$5 Amazon gift card.

If you are interested, please fill out this preliminary survey (available time slots are at the end of the survey):

http://wpi.qualtrics.com/jfe/form/SV_8hKeWHqx6WLcwlT

Thanks for your time!”

c - Email to Computer Science Professors Teaching Web or App Courses:

"Hello Professor _____,

We are an IQP group (IRB #18-0021) that is studying web accessibility, in particular what perceptions are of it in future web developers. As part of this study we are going to be conducting interviews with WPI students who have taken or are currently taking web design or user interface courses. We wanted to contact you because you have taught/are teaching _____ (plus why that course is relevant).

Our team is wondering if we could advertise this project to the students of your class? This could be yourself telling your students about the project, one of our teammates coming in at the beginning of the class to tell your students about our project, or some other way of making them aware of what we are doing.

Please let us know what you think!"

d - Interview Reminder Email for Participants:

"Hey _____,

Just a friendly reminder that you are scheduled for an interview for our Web Accessibility IQP project tomorrow, [day of interview] at [time]. The interview will take place in Washburn Shops at [place of meeting]. We will see you then!"

e - Email asking Participants for Additional Participants:

"Hello _____,

Again, thank you so much for participating in our Web Accessibility project! Right now our group is doing a final push to get as many interviews as possible, and we were wondering if you could pass on this email or the survey link to anyone you know who would be interested in doing the survey and interview for a \$5 Amazon gift card.

Survey Link:

http://wpi.qualtrics.com/jfe/form/SV_8hKeWHqx6WLcwlT

Thanks so much!"

E - Agenda for Weekly Advisor Meetings:

Agenda for 9/13 Advisor Meeting:

- Current outline
 - Missing information for the background (sponsor?)
- Current research for surveys/interviews, how to finish that up and add that to the methodology
 - What sections we specifically need
- Discuss courses that can be used for the surveys/interviews and how to contact the professors and get going with that
- Discuss good/bad website design
- Prepare for the week after (incentives, possible questions, look at previous examples, how we can set up our surveys and interviews)
- Ask how IRB stuff is going and if we need to do anything else about that

Agenda for 9/20 Advisor Meeting:

- Outline
 - Methodology
 - Go over survey/interview research
 - Literature
 - Works Cited
- Questions for survey/interview
- Prepare for the next week
 - Classes we can use
 - Finalize survey questions. Incentives and details
 - Find people we can initially try surveys on.

Agenda for 9/27 Advisor Meeting:

- Survey Questions
 - Plan how to distribute it
- Interview Questions
 - What we found out through testing them
 - What to revise
 - Plan how to distribute it
 - What version of the consent form to do (digital or paper)

- Prepare for the next week

Agenda for 10/4 Advisor Meeting:

- Recap of work this week
 - Interview script
 - Tests on people
 - Any feedback or advice
 - Qualtrics Survey
- Marketing Planning
 - Emails, any other form of marketing media
 - CS email alias
- Planning for B Term
 - Schedule for meetings
 - Timeframe for survey
 - Plan for interviews
 - Schedule for interview blocks
 - Materials and logistics
 - Any additional information we can add to the outline before data collection and analysis

Agenda for 10/11 Advisor Meeting:

- Finalize survey and interview
- Outline review
 - What still needs to be done
- Planning for B Term
 - What we need done in the first week
 - Emails to professors
 - Ask about conference rooms
- Enjoy break

Agenda for 10/24 Advisor Meeting:

- Email stuff
- Any final survey/interview changes
- Work out time slots for interview times

- Locations for interviews

Agenda for 11/1 Advisor Meeting:

- Recap of week
- Interview revisions
- Time slot setup for participants
- Availability for interviews
- Email drafts

Agenda for 11/8 Advisor Meeting:

- Recap of week
- Interviews/promotion plans
 - Availability
 - Who to contact/send emails to
- Think about what to analyze for data analysis
 - What we should focus on

Agenda for 11/15 Advisor Meeting:

- Progress so far
- Think of more ways to get participants
- What to focus on for data analysis
- Plan for the rest of the term

Agenda for 11/29 Advisor Meeting:

- Plan for getting more interviews
- Plan for data analysis
 - Themes to focus on
- Plan for rest of paper

Agenda for 12/6 Advisor Meeting:

- Surveys/interviews; how much do we have left?
- Outline
 - Methodology
 - Analysis

- Any other added things
- What we need to finish
- Things we need to finish before we submit

Agenda for 12/13 Advisor Meeting:

- Outline Revisions
 - Progress so far (Images, edits)
 - Format of paper
 - In-text citations
 - What is left to revise
- What needs to be handed in
 - Interviews
 - Paper
 - eCDR

F - Notes for Weekly Advisor Meetings:

Notes of Team Meeting #1:

August 30, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao.

Meeting called to order: 11:00 am.

1. Action Items:
 - i. Register for IQP (Darien and Kyle)
 - ii. Develop outline, timeline, meeting minutes.
2. Preliminary Research:
 - i. Research web accessibility:
 1. W3C
 2. WAI
 3. Any previous data on topic.

Minutes of Team Meeting #2:

September 6, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao.

Meeting called to order: 11:00 am.

1. Action Items:
 - a. Convert timeline into gantt chart.
 - b. Get IRB certification.
 - c. Set up agenda document.
2. Review:
 - a. Review progress from last week.

Notes of Team Meeting #3:

September 13, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order 11:00 am.

1. IRB paperwork
2. All have certifications
3. Gantt Chart: mark weeks, get rid of key/legend
 - a. Convert using MS Project
 - b. Mark weeks,
 - c. Get rid of legend/key
4. Outline Review
 - a. Background - Service for W3C, elaborate on IQP
 - b. Works Cited for information
 - c. Multiple sources for the same topic for validity
5. Good and Bad Website Design
 - a. Look at sites specifically designed for web accessibility
 - b. Look at prominent websites to see how accessible they are
6. Good presentation techniques
 - a. Get people involved (saying who everyone knows who has disabilities, stats, talking about different groups)
7. Inclusive design for web accessibility (the typical user will find it helpful too)
 - a. Graceful degradation(being accessible for all devices)
 - b. There are no "typical" customers anymore
 - c. Justify by the global region (business case in the US)

Notes of Team Meeting #4:

September 20, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order 11:00 am.

1. Review of the week
 - a. Fixing Gantt chart link
 - b. Current outline setup review
2. Survey/Interview Questions draft
 - a. Scale of 1-5 or 1-7 (neutral option)
 - b. Balance of qualitative and quantitative data

- c. Designing questions that help us formulate our data, not burdening people with too many questions
 - d. For interviews, ease into the questions (slides?)
 - e. Different set of questions for those familiar or not familiar with web accessibility, different analysis for each group
 - i. Make questions flow based on student's knowledge while maintaining the questions
 - f. Precise writing, not putting people on guard
 - g. Retrieving demographic info prior to the survey
 - h. When to do the consent form (online or during the interview)
3. Classes to use for surveys
 - a. Look to students who have already previously completed web design courses
 - b. Using CS email alias for
 - c. Designing fliers for classes
 4. Update works cited with the update/published date for authors

Notes of Team Meeting #5:

September 27, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 11:00am.

1. Possible use of focus groups:
 - a. Demographically diverse, collect data as whole and look at subgroups.
2. Survey/Interview
 - a. Use demographic to connect test survey to interview or vice-versa
 - b. Conducting Interview:
 - i. Ease people into survey/interview, explain what interview is for, introduce ourselves, ask majors, any past or related classes
 - ii. Graduate or undergraduate?
 - iii. Make sure every question has a reason.
 - iv. Make questions flow, after one question, what would be the natural next question.
3. Survey questions

- a. Make open ended questions if needed. If they are not sure of the answer. Give them an example.
- b. When reading into questions, make sure they don't target the audience as having a disability
- 4. Interview Questions
 - a. Ask open ended question, then if they are not really sure, give them an example.
- 5. Data:
 - a. Look at Qualtrics website for demographic data on surveys.
- 6. Have a script: (interview most importantly) so everyone is treated the same, and so we are not a variable

Notes of Team Meeting #6:

October 4, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 12:00pm

- 1. Review of last weeks work
 - a. Look at the wording of the questions to make sure they are descriptive and focus on our goal
 - b. Control variable (someone they might
 - c. See how the "yes" and "no" groups respond to the same question
 - d. For the survey, streamline asking about which questions have discussed web accessibility
- 2. Planning for B term
 - a. Our initial plan based on literature research vs. what we actually did (section for the outline)
 - b. Email professors first week of B term
 - c. Look at conference rooms for holding the interviews
 - d. Explanation for what we are doing/who we are looking for, explain incentives (interest for survey/interview)
 - i. Interest > Sign up for blocks > survey the day before > interview
 - e. Qualtrics to spreadsheet for blocks
 - i. WPI ID for anonymity

- ii. Email so we can contact them and give them time options
- f. Test qualtrics survey to make sure that the responses show up in the correct order/are not broken

Notes of Team Meeting #7:

October 11, 2017

Washburn Shops, Room 229

Attendees: Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 11:00 am.

1. Interview and Survey Finalizing
 - a. Survey
 - i. Dropdown menus for major/minor information
 - ii. Gender demographics
 - iii. Age demographics
 - iv. Set up email for completion

Notes of Team Meeting #8:

October 24,2017

Washburn Shop, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 11:00 am.

1. Options for survey/interview/ and email drafts (Send to advisor) - CS faculty
 - a. Include specific classes (Email drafts)
 - b. Practice interview/survey with peers
 - c. "\$5 gift card to Amazon" - Confirm emails from participants
2. Interview/Surveys
 - a. Take survey, to test out and fill in Qualtrics and see what the data looks like
 - b. Link to Qualtrics survey (non edit) -
 - c. Take survey ~5 times (phone, laptop, etc) to get a feel for it and make sure it flows
 - i. Collect data and make polish survey.
 - d. Work out lime slots for interview times.

3. Location for Interviews
 - a. Washburn 226 & 220 conference rooms (check availability)
4. Timeline
 - a. Plan out B- term timeline
 - b. 10/24/17-10/30 advertise for survey/interview
 - c. 11/1 begin surveys?
5. Transcribe data (record)
 - a. Interviews - use phone to record.

Notes of Team Meeting #9:

October 25, 2017

Washburn Shops, Room 229 (via Skype)

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono

Meeting called to order: 12:00 pm.

Notes of Team Meeting #10:

November 1, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 12:00 pm.

1. Survey/Interview
 - a. Qualtrics: Final page on survey, add a link incase they speed past "sign up for interview slot"
 - b. Add contact information at end of survey in case of any further questions
 - c. Follow up questions for end of survey
 - d. Finalize time slots (spreadsheet)
 - e. End: Student ID number and email at end
2. Location of Interview/survey
 - a. Find a room, check availability
 - b. Record interview on phone, air-drop recording from phone.
3. Go to classes to get people engaged to take survey/interview

Notes of Team Meeting #11:

November 8, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 11:00 am.

1. Interview
 - a. Upload recordings to google drive
2. Advertise
 - a. Advertise surveys/interviews to fraternities, groups, clubs, etc.
 - b. Email professors to ask about announcing project in class
 - c. Office of disabilities
 - d. Other universities (task-force)
3. Survey
 - a. Correction with majors/minors (email?)

Notes of Team Meeting #12:

November 15, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 11:00 am.

1. Interviews
 - a. Need at least 30 samples/interviews and collect data.
 - b. (Michael) Inform/advertise to fraternity about survey and interview
 - i. Email brother alias
 - c. "Transcribe" for transcribing interviews
2. Survey Edits
 - a. People should add in email in case of them not filling out a timeslot
 - b. If people cannot do any of the time slots, have an email they can use to contact us about that
 - c. In the email beforehand, have an email people can contact in case the survey has problems
3. Plan for the rest of the term:

- a. Week after thanksgiving, use whatever we end up with (interviews) as data analysis.
- b. Transcribe interviews
 - i. "Theme we saw - here is an example"
- c. Reminder email to CS alias
- d. Try to contact grad students

Notes of Team Meeting #13:

November 29, 2017

Washburn Shops, Room 229

Attendees: Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 11:00 am.

- 1. Keep reminding people about survey/interviews
- 2. Analytics:
 - a. Comparing different demographics
 - b. Comparing responses between those who did/did not know about web accessibility
 - i. Enriching survey answer from interview
 - c. Right now focus on the survey, supplement with interview data
 - i. Clean data; only take data that is legit
 - ii. Finding quotes from the interviews to support data
 - d. Calculate what percentage of the available population our sub-sample is

Notes of Team Meeting #14:

December 6, 2017

Washburn Shops, Room 229

Attendees: Michael Aquino, Kyle Savell, Darien Gaudet, Eleanor Loiacono, Shiya Cao

Meeting called to order: 11:00 am.

- 1. Try to get more interviews
 - a. Transcribe interviews maybe

2. Outline Progress
 - a. Add comments in to discussion
 - b. Hierarchy for majors for data
 - i. Combine MIS and IT majors
 - c. Fill out remaining empty sections
 - i. Data/Analysis, Results, Discussion, Conclusion, Modifications, Reflection
 - ii. Appendix for survey and interview iterations
 - d. Add email drafts and interview/survey methodology
3. Friday (7th) deadline for first draft of final paper, Friday (15th) deadline for final draft of final paper

Notes of Team Meeting #15:

December 13th, 2017

Washburn Shops, Room 229

Attendees: Darien, Kyle, Michael

Meeting called to order 11:00 am

1. Paper Revisions
 - a. Citations for websites without stated authors, same authors etc.
 - b. Describing the the tables and figures before showing them
 - c. What tool was used to analyze data
 - d. Combine Results and Discussion, combine survey data and interview data
 - e. Quotes from the interviews to exemplify what we are saying in the discussion
 - f. Look at limitations as future opportunities for research.
 - g. For awkward spacing with tables and graphs, explain multiple figures first and then show all of the referenced images
 - h. For Data & Analysis, say how data was organized and collected
 - i. Move current Data & Analysis to Results
2. Send out remaining gift cards
3. Plan for finishing revisions for the the end of this term, combine everything beginning of C term.

G - Notes for Group Meetings:

9/12 Group Meeting:

September 12, 2017

Gordon Library, 2nd Floor

Attendees: Kyle, Michael, Darien

Meeting called to order 5:00 pm

1. Went over what was done and what is still needed to be done.
2. Evaluated/ modified current timeline
3. NIH certification

9/23 Group Meeting:

September 23, 2017

Gordon Library, Tech suite 217

Attendees: Kyle, Darien, Michael

Meeting called to order 4:00pm

1. Survey/interview.
 - a. Set up outline, branches, questions
 - b. For interview: develop the questions
 - i. If the person knows about Web accessibility, how to make questions that range from a lot of knowledge about the guidelines to only a little
 - ii. Making questions for those that don't know about the guidelines, addressing a broad audience
 - c. For survey:
 - i. If the person knows about Web accessibility, how to make questions that range from a lot of knowledge about the guidelines to only a little
2. Sample survey/interview questions
 - a. Send to advisor, make changes based on comments.
 - b. Sample questions, practice surveys
3. Contact information for related courses.

11/30 Group Meeting:

November 30th, 2017

Gordon Library

Attendees: Kyle, Darien

Meeting called to order 2:00pm

1. Data Analysis

- a. Did people know about web accessibility, and if so how much did they know?
 - i. Were they familiar with any guidelines?
- b. Where did people learn about it; in class, or through some other project/way?
 - i. If they did not know about web accessibility, had they taken any of the listed classes?
- c. Did they do any web or app development?
- d. Did people think implementing web accessibility would be easy or difficult?
 - i. Would they consider implementing web accessible features in their designs, and why?
- e. Did they know of anyone who needed to use accessibility features?
 - i. What features did these people use and why?
 - ii. Were they aware of web accessibility if they people with a large variety of disabilities?
- f. Look at demographics to see how different groups responded
 - i. What year were people?
 - ii. What were their Major(s)?