

Web Accessibility Evaluation & Recommendations

Making the Inaccessible Accessible for Low Vision Users

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1.0 Abstract

Creating accessible web content is often overlooked by businesses even though it is mandated by a U.S. law. Many HCI practitioners and web content authors, such as designers and developers, are unaware of basic accessibility issues or how to address them. In this project, we performed expert evaluation on a healthcare website using various tools and conducted usability tests with visually-impaired participants. We learned that low vision users took more time to complete the same tasks on a website than those who did not have low vision impairments. We also found that many accessibility issues were “hidden” from visual users, thus making them harder to detect without the proper evaluation tools. Ultimately, we created a list of recommendations on how the healthcare website might improve its web accessibility according to our expert evaluation and user test findings. These recommendations should benefit designers, developers and user experience practitioners alike.

2.0 Project Goals

2.1 Introduction

It is apparent that users with disabilities are often “sidelined” from system usability and user experience considerations. Ironically, addressing accessibility issues improves website usability for users with or without disabilities. Accessible web content will not only improve the lives of those with disabilities, it ensures online businesses will not be targeted in accessibility law suits. Moreover, businesses can reach a wider audience with more accessible websites.

Currently, there are two well-referenced online accessibility publications: Section 508¹ of the Rehabilitation Act and the Web Content Accessibility Guidelines² 2.0 (WCAG2). Section 508 is mandated by U.S. law whereas WCAG2 includes international web accessibility guidelines. There are four major groups of disabilities: visual, hearing, motor and cognitive. Our project focuses on website accessibility for users with low vision³, a particular visual impairment.

2.2 Our Goals

Our project consisted of three main goals: (1) to assess a healthcare-related website for its current accessibility implementation status, (2) to better understand how users with low vision access the Internet, and (3) to make recommendations on how to improve website accessibility based on findings from our first two goals. Most of our suggestions were centered on accessibility best practices that are informative to web designers, developers and HCI practitioners.

¹ "Learn About Section 508 Requirements and Responsibilities." 2015. 9 Aug. 2015
<<http://www.section508.gov/content/learn>>

² "WCAG Overview - World Wide Web Consortium." 2004. 9 Aug. 2015
<<http://www.w3.org/WAI/intro/wcag>>

³ Generally, people with low vision experience difficulties such as driving and reading as their vision cannot be fully corrected by glasses.

2.2.1 Web Accessibility Evaluations

We analyzed ZocDoc (<https://www.zocdoc.com/>) to determine its accessibility and compliance level on desktop computers. ZocDoc is a health-related website which offers free online real-time services such as appointment scheduling and physician reviews. We chose ZocDoc because it has been publicly available since 2007. The site claims it “serves more than 40% of the US population, across 2,000+ cities.” It is likely some of their users have some kind of visual disability. Our evaluation findings answered questions such as:

- How accessible is ZocDoc according to Section 508 and WCAG2?
- What areas of the website are inaccessible especially to those with low vision?

In addition to a desktop website, ZocDoc offers both mobile browser version of their website and iOS and Android native mobile apps as well. However, based on our project scope, our team concentrated our evaluations and recommendations on the desktop site.

2.2.2 Understanding Users with Visual Disabilities

We performed usability tests to find out how low vision users utilized and navigated around ZocDoc on a desktop computer. Low vision users’ primary web accessibility concern is “perceivability” as their vision usually cannot be corrected with glasses alone. They often use screen magnification to aid with reading materials with small fonts or low contrast⁴. We looked for insight in:

- How do participants cope with their disability when using ZocDoc?
- In what areas or tasks do they struggle the most?

2.2.3 Web Accessibility Recommendations

We put together a list of recommendations on how ZocDoc might improve its overall accessibility. The recommendations were based on our discoveries from the ZocDoc evaluations and usability tests. With this study:

- Designers will have access to online tools to verify the accessibility levels of their design choices.
- Developers are provided with techniques on creating accessible HTML/CSS code.

However, due to project scope and copyright concern, we did not produce an improved prototype version of ZocDoc for limited testing.

3.0 Project Methods

Our project methodology was split into two main phases. In phase one we identified the main features of the ZocDoc website and conducted an internal accessibility evaluation on the selected user features using a variety of accessibility validation tools. In phase two we conducted a series of user tests that included both visually impaired and non-visually impaired individuals.

⁴ "WebAIM: Visual Disabilities - Low Vision." 2006. 8 Aug. 2015
<<http://webaim.org/articles/visual/lowvision>>

3.1 Phase One

We first had to ensure ZocDoc was a good candidate for accessibility improvements. We used the Accessibility Management Platform⁵ (AMP) tool to produce a preliminary assessment on several ZocDoc web pages. The evaluation on the home and doctor search results pages showed that their Section 508 compliance and WCAG2 ratings ranged from 52% to 78%. Additional page evaluations revealed similar ratings.

Next, we completed an expert evaluation on ZocDoc to familiarize ourselves with the site as well as make more informed decisions with user test creation. An expert evaluation would help validate user test findings and expose any accessibility issues that were not discovered in user testing.

To assist with our expert evaluation, we researched and collected a list of six free online accessibility tools (see [Appendix A](#)). The tools we selected offer semi- to fully-automated evaluations based on current compliance standards and guidelines. We also performed manual testing when human judgment was required. For example, most of our selected tools complained about some misuses of frame elements (<iframe>) but we determined it was not a critical issue. This is because ZocDoc includes the frame elements for their (invisible) marketing data collection, not user content.

We limited the scope of our expert evaluation by identifying a total of six ZocDoc's key performance indicators (KPIs) (see [Appendix B](#)). We selected KPI's we thought would reflect the goals of a first time ZocDoc user, such as "register for an account." We created an accessibility checklist based on Section 508 and WCAG2 (see [Appendix C](#)) to ensure our evaluation was consistent across the defined KPIs.

Eventually, we also created our usability test matrix in phase two based on these KPIs. By first recognizing issues commonly found in the ZocDoc desktop website, we were able to provide accessibility improvement recommendations tailored to our target site.

3.2 Phase Two

In phase two we conducted both in-person and remote synchronous usability tests to gain a better understanding of how visually impaired individuals navigated around a healthcare website without visual aid. Additionally, we collected task completion times of test questions for baseline comparison from additional asynchronous participants. The latter group performed the tasks normally, i.e. while wearing their glasses or contact lens.

3.2.1 Recruitment

We recruited visually impaired users through a screener questionnaire (see [Appendix D](#)) sent to potential participants via email. Ideally, we would like to get participants who have low vision disabilities. Since we were unable to locate such individuals, we asked our participants to remove their glasses/contact lens during the usability sessions to simulate instances of uncorrectable vision impairment.

⁵ "AMP - SSB BART Group." 2015. 1 Jul. 2015 <<http://www.ssbartgroup.com/amp/>>

3.2.2 Participants

For our standard user testing we recruited six visually impaired individuals. For a baseline group we recruited four individuals who either have no visual issues or whose vision can be corrected with visual aid. Out of the six visually impaired individuals, four participants identified as being nearsighted, one as being farsighted, and one as having red/green color blindness. All visually impaired users relied on glasses or contact lenses to adequately use a computer with the exception of the individual who had red/green color blindness. Although we were most interested in low vision participants, the color-blinded participant provided an opportunity to see how someone with color blindness would interact with the site. This participant's results were, however, included in the baseline group since his visual conditions did not match those in the standard group.

All of our participants were at least 18 years old and have used one or more healthcare websites to find a doctor or schedule an appointment. For the standard test group, there were three males and three females. Five of them identified themselves as "advanced" Internet users while one as "proficient." All possessed at least one mobile device (smart phone and/or tablet) and a traditional laptop or desktop computer. Two participants regularly use browser zoom to enlarge the web content and one of them changes screen contrast levels, in addition to zoom, to better view web content. No detailed demographic or background information was collected from the baseline group.

3.2.3 Procedure

Synchronous user tests were conducted over a period of seven days. Sessions lasted approximately 30 to 45 minutes. Each of our team members conducted the tests individually. In-person testing took place in either Chicago, Illinois or Maui, Hawaii in quiet office spaces. We also had a remote synchronous participant who lives in San Francisco, California. A researcher was present for each of the in-person and the remote testing to act as a moderator. As moderators, we were responsible to set up the user test equipment, collect pre-test documents such as completed background questionnaire (see [Appendix E](#)) and signed informed consent form (see [Appendix F](#)), ask participants to perform test tasks, and answer any questions participants might have. The remote synchronous participant shared her computer screen during the test session so that the researcher could see the participant's progress in performing the required tasks. User tasks were directly related to the ZocDoc website features defined in phase one. For example, one of our tasks had the user cancel an appointment that they had scheduled. There was a total of six tasks for the visually impaired group (see [Appendix G](#)).

We captured both audio and screen recordings of all standard user test sessions. Once a session was complete, the moderator provided the participant with a wrap-up questionnaire and survey.

Baseline Test

Though not originally planned, we added baseline tests that were given asynchronously to those who did not have visual impairments or were using visual aids such as lenses to improve their impaired vision. We decided to include the baseline tests asynchronously and with fewer tasks in hopes of reaching more willing individuals. Ultimately, we received results from four participants. Baseline participants completed a total of three

tasks (see [Appendix H](#)) that were also used on the main user test group. The participants reported their allotted time on each task. Because the baseline participants performed these tasks on their own time and equipment that might not have the needed software, their sessions were not recorded.

3.3 Data Analysis

Data analysis was separated by methodology type: expert evaluation findings and user test findings. Afterwards, qualitative findings from both methodologies were cross examined to highlight instances of similarity or dissimilarity, as similar results between the two tests would increase the validity of defined accessibility issues.

3.3.1 Analysis of Expert Evaluation Findings

In phase one we created a visual accessibility heuristic based on Section 508 and WCAG2 guidelines as part of our expert evaluation. Each KPI was reviewed by a checklist of accessibility standards, and was given a corresponding grade of pass, average, or fail (see [Appendix C](#)). A passing grade meant there was no accessibility issue present, a grade of average meant an issue was present, but it was not detrimental to the user's experience and a failing grade meant the issue could jeopardize the user's experience. For each average and failing grade, we provided justification for the score based off of expert knowledge as well as results obtained from accessibility tools.

3.3.2 Analysis of Usability Tests

After all scheduled usability tests and baseline tests were complete, we combined our tests notes and data in a spreadsheet for quick references. We also conducted several unpaired t-tests to determine if there was statistical significance of time spent on task completion between different user test groups. Any additional user testing data that could not be analyzed by statistical reasoning alone was analyzed descriptively.

4.0 Results and Findings

Findings from our expert evaluation and user test analyses revealed multiple accessibility and usability issues present on ZocDoc's desktop site. But there are some current site practices that are helpful to visual users as well. Certain accessibility issues were discovered both in user testing and our expert evaluation, but some issues were unique to one of the two evaluation methods. For example, our expert evaluation revealed code related issues for screen reading software--a finding that was not discovered in user testing considering no participant relied on a screen reader to access ZocDoc.

4.1 Combination Findings

Combination findings are those discovered across both user testing and expert evaluation methods.

4.1.1 Text Legibility Issues

Text contrast levels, text size, and text styling failed to pass AAA and AA WCAG 2.0 standards within our expert evaluation analysis. Most text elements on the website, such as body text, sub headers and labels had a contrast ratio level lower than 7:1. Furthermore, the body text size at 15px was considered too small for AA or AAA standards.

User test participants often displayed some degree of difficulty reading text. One participant increased her browser view to 200% but still found it difficult to read. Although several participants answered in a post-test questionnaire that they did not think text was difficult to read, some of their user testing behavior contradicted their statement. For instance, one participant said the text was not hard to see during the test session. Yet, he later mentioned he had to “strain his eyes to see” and he “missed words” that he would have normally seen. This was demonstrated in the first task where he misread the form label “who participates in” as “who is paying.”

4.1.2 Useful Iconography

Within our expert evaluation we determined that the current website iconography would be visually informative to users, especially if they had a difficult time reading or identifying text. This observation was reinforced during user testing when several participants explained they based decisions off of (or were looking for) certain icons that contained a specific meaning. For example, two participants immediately recognized a notification icon appear in their profile dashboard after they had scheduled an appointment. They correctly assumed their newest appointment information would be accessible if they clicked on the icon. Another participant successfully located the “cancel appointment” link because she was specifically looking for an icon that displayed a cross (“X”), which meant “cancel” to her.

4.1.3 Difficult to Cancel an Appointment

We noted during our expert evaluation that it wasn’t entirely clear where to cancel an appointment. During user testing, almost all participants had difficulty locating the “cancel appointment” function. Moreover, users were not given immediate feedback upon canceling their appointment. One participant failed to complete the task because she did not think her appointment was canceled. Although she had discovered and clicked the “cancel” button, she did not get any immediate feedback on the cancellation. She said she would call the doctor’s office to cancel instead. Another participant wrongly assumed he could cancel an appointment under the “reschedule appointment” option.

4.2 Expert Evaluation Findings

Expert evaluation findings were only identified in our expert evaluation analysis.

4.2.1 Improper Code Standards for Screen Readers

None of our recruited user test participants was blind, or relied on a screen reader to access websites. Therefore, no user test was completed with a screen reader. However, within our expert evaluation, several accessibility tools revealed that much of ZocDoc’s

underlying code was unfit for screen reader software. Some notable issues were:

- There was no "skip link" present on the website which provides screen reader users a way to skip over navigation links and direct them to main website content.
- Headers tags were out of numerical order. For example, <H2> headlines were sometimes placed before <H1> headlines, which causes disruption in appropriate screen reading order.
- Many form elements, such as input fields or drop down selection menus lacked corresponding label tags, which help screen readers inform the user to what information the form is asking for.
- Some link elements are not accessible by screen readers because the links have a HTML "tabindex" value of -1. Such elements cannot be discovered by screen readers or tab-based navigation.
- Most website images did not have any "alt" or "desc" tags, which screen reading software uses to describe the image and its underlying functionality to the user.

4.3 User Test Findings

User test findings include findings from user behavior analysis, participant surveys and recorded time on tasks.

4.3.1 Participant Behavior & Feedback

Navigational Issues

Although we gave website navigation a passing grade in our expert evaluation, our user testing results revealed that ZocDoc navigation was insufficient. Two participants used the browser zoom command to enlarge the web page in order to see the page more clearly. Participant zoom settings ranged from 190% zoom to 240%. Both participants who used the zoom feature exhibited difficulty navigating through the website. However, since the site was not optimized to work for zoom settings, these users had to browse the website by scrolling horizontally as well as vertically, which was time-consuming. Both participants cited this issue as their "most frustrating" experience on the ZocDoc website. Notably, both participants were over the age of 37.

Additional participants who did not use the zoom setting also faced frustration with site navigation. Two participants were confused that the website did not have a universal navigation menu at the top of every page as they relied on such menu as their primary and "go to" method of navigation.

Physical Discomfort

It was revealed in several user testing sessions and post-test surveys that users experienced discomfort, such as neck or eye strain, while using the website without their normal visual aid. This made their overall experience more time consuming and irksome. One participant noted that the back pain he developed while hunching over to view the screen more closely was his "most frustrating" experience.

Instances of Poor User Feedback

There were several instances when users became confused because they were not given

immediate feedback or provided direction when completing assigned tasks. The most noted instance of poor user feedback occurred when users canceled an appointment and they were not given any confirmation that their appointment had, indeed, been canceled. One participant had difficulty creating a password that would be accepted by registration standards. He became frustrated because the system did not provide any password creation guidelines.

4.3.2 Survey Findings

A Likert scale survey was administered to the standard participant group at the end of each testing session. Users were asked to say if they “strongly agree,” “agree,” “neither agree nor disagree,” “disagree,” or “strongly disagree” on the proposed statement. There were four statements in total.

“Website was difficult to use.”

Out of the five low vision participants (N=5), only one nearsighted participant and the farsighted participant found the website difficult to use (N=2). Notably, these two participants identified themselves in a higher age bracket than the other three participants who identified themselves in the age group of “18 to 37.” Interestingly, the color blind participant (not included in the standard pool of low vision users) said that he “neither agreed nor disagreed” with the website difficulty. He was also above the age of 37.

“I could clearly see images and read text.”

Out of the five low vision participants, two nearsighted participants agreed that text and images on the website were adequate (N=2), two additional nearsighted participants neither agreed nor disagreed on the statement (N=2), and the farsighted participant disagreed, saying that text was “difficult to see.” The color blind participant additionally agreed that text and images on the website were adequate enough.

“I am comfortable using this site without my glasses.”

Two participants disagreed (N=2) and two strongly disagreed (N=2) with this statement. One participant who had selected “strongly disagreed” did so because she had to strain her neck and move her computer monitor closer to her face to use the website. Only one nearsighted participant said she would be comfortable with using the website without her contact lenses if she was able to sit closer to the computer screen.

“I could easily find my way around the site.”

Two participants disagreed with this statement (N=2), one participant agreed, one strongly agreed, and one participant neither agreed nor disagreed. One participant said that she had difficulty navigating the website because there was not a traditional navigation menu at the top which she preferred over the “fat footer” navigation at the bottom of the website.

4.3.3 Time on task

For the following three tasks, we conducted unpaired t-tests by comparing the standard test participants’ time on task (N=5) to the baseline groups’ time on task (N=5). The latter included the color blind participant.

Task: Registration

When it came to time on ZocDoc account registration, there was a significant difference between time on task for low vision users ($\mu = 3:40$, $\sigma = 1:25$) and users without low vision ($\mu = 1:21$, $\sigma = 0:25$) at $t(8) = 3.49$, $p = .0081$. The results show users without their normal visual aid took longer to complete registration than users who had visual assistance.

Task: Book an appointment

For booking an appointment, there was a significant difference between time on task for low vision users ($\mu = 4:00$, $\sigma = 0:52$) and users without low vision ($\mu = 1:25$, $\sigma = 0:34$) at $t(8) = 4.10$, $p = .0034$. The results demonstrate that users without their normal visual aid took longer to book an appointment than those with visual assistance.

Task: Cancel an appointment

For canceling an appointment, there was no significant difference between time on task for low vision users ($\mu = 1:57$, $\sigma = 2:00$) and users without low vision ($\mu = 0:54$, $\sigma = 0:20$) at $t(8) = 1.158$, $p = .28$. The results suggest users in both test groups performed about the same.

Difference in time on task for farsighted vs. nearsighted users

An unpaired t-test with unequal variance was done to see if there was any statistical significance between users who were nearsighted ($N = 4$) and those who were farsighted ($N = 1$) on average time on task. There was no significant difference between time on task for nearsighted users ($\mu = 2:06$, $\sigma = 1:25$) and farsighted users ($\mu = 2:43$, $\sigma = 2:22$) at $t(8) = -0.24$, $p = .803$. The results demonstrate that users with nearsighted vision and farsighted vision performed about the same.

5.0 Discussion and Conclusion

We discovered in our reviews that ZocDoc was not fully compliant with web accessibility standards for desktop. Most identified accessibility issues adversely impacted users who relied on screen readers or keyboard navigation methods. Our findings also revealed that low vision users took more time on average to complete a task in comparison to non-impaired users. Nonetheless, ZocDoc provides a few instances of good design practices. Particularly, ZocDoc's consistent visual design patterns in iconography offers good affordance in locating important site functionality, such as new appointment notification, doctors' popularity, social media links, and so on. Low color contrast aside, most users can quickly learn the site's functionalities as ZocDoc adopts consistent styling in common user interface elements such as buttons and links. Furthermore, users with motor control disabilities should be able to interact with the large buttons and link areas without precision. Finally, ZocDoc also uses appropriate color choices as error feedback in form fields.

Unsurprisingly, ZocDoc falls short in providing good content accessibility to screen reader and keyboard users. This is a common issue for most websites as (sighted) developers are not always aware of issues unique to disabled users. One example is the

lack of text zoom functionality. This forced some test participants to use the browser zoom which substantially increased the need to scroll horizontally. ZocDoc's inadequate accessibility coding practice has also decreased the effectiveness of screen reader software. We believe our compiled list of recommendations will help to elevate ZocDoc's web accessibility level. Our recommendations are grouped by (1) Visual Design, (2) HTML Coding, and (3) Functionality.

5.1 Recommendations

Based on our expert evaluation and usability test findings, we suggest the following high-priority web accessibility improvements in ZocDoc. We believe these recommendations will not only help users with low vision have a more accessible experience, but also help ZocDoc's overall usability and performance.

5.1.1 Visual Design

Suggestions in this section are most helpful to web designers who are often responsible for the styling and branding of a website.

Increase Contrast

A lot of ZocDoc text elements do not pass visual accessibility standards due to low contrast levels. For example, white texts against green or orange background and light blue links on light grey background all score a low (unsatisfactory) contrast ratio.



Recommendation

Use WebAIM's Color Contrast Checker at <http://webaim.org/resources/contrastchecker/> to find out foreground and background contrast ratio. The WCAG2 guidelines require that normal text should have a minimum contrast ratio of 4.5:1.

Increase Text Size

Body text and smaller link labels are too small for low vision users.

Recommendation

Body text and smaller links should be enlarged to 16px.

Design Unambiguous “Hover” State

Some link elements have less noticeable “hover” state when the mouse cursor passes over them. These elements only change in cursor type from the default (arrow) to pointer (hand) icon which can be easily overlooked.

Recommendation

Apply consistent and visually unambiguous hover state using Cascading Stylesheet (CSS), such as changing text color or font style in addition to the mouse cursor change.

5.1.2 HTML Coding

This section is geared for web developers who are responsible for creating and updating

the site HTML codes. Most of the issues here were found using WAVE, Web Image Analyzer, NVDA and manual testing. See [Appendix A](#) for tool details.

Add a “Skip Link”

None of the KPI’s we evaluated includes a “skip to main content” link. A “skip link” is essential to keyboard and screen reader users to bypass all the repetitive navigational links by “jumping” directly to the main content of a web page.

Recommendation

A “skip link” should be the first “focusable” element in a web page so that keyboard and screen reader users can orient themselves from this starting point.

```
<body>
  <a href="#main-content">Skip to main content</a>
  ...
  <main id="main-content">
  ...
  </main>
</body>
```

Use Consistent Header Tags

ZocDoc does not always use appropriate numerical order in their HTML page headings. Proper headings are particularly important for screen readers which allow non-sighted users to navigate and “scan” the main ideas of a web page.

Recommendation

The simplest way to assure proper HTML heading structure is to start the primary document heading with <h1> and followed by <h2>, <h3> and so on.

```
<body>
  ...
  <main id="main-content">
    <h1>...</h1>
    <p>...</p>

    <h2>...</h2>
    ...
  </main>
</body>
```

Use Proper Form Labels

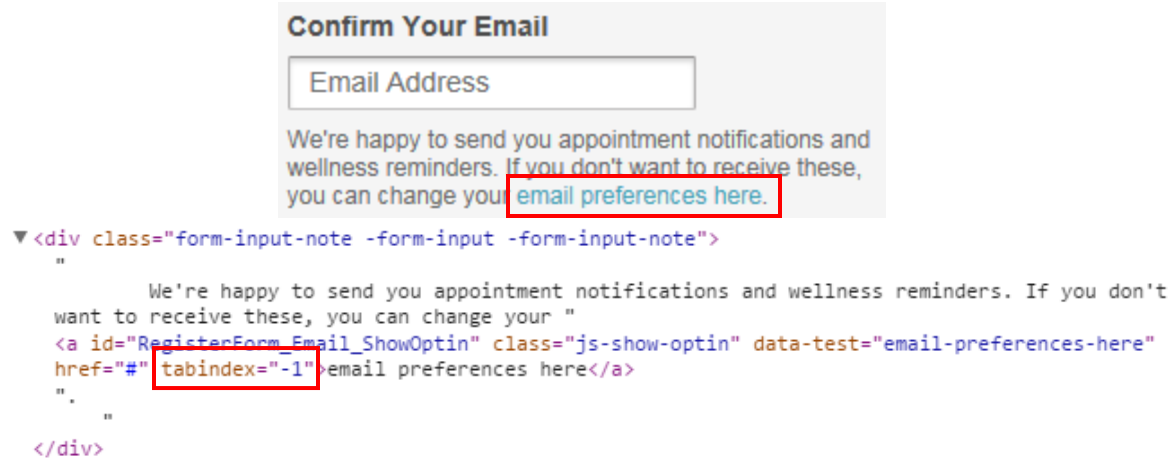
Most of the ZocDoc online forms lack proper labels for input fields, drop down menus, radio buttons, etc. A form control without an associated label text cannot be read by a screen reader software so this becomes an issue for non-sighted/screen reader users.

Recommendation

```
<label for="fname">First Name:</label>
<input type="text" name="firstname" id="fname" value="">
```

Use Proper “tabindex” Value

An element with tabindex="-1" is removed from the default navigation flow and cannot be reached by keyboard or screen reader users. For instance, the “email preferences here” link in ZocDoc’s registration form is inaccessible for non-sighted and keyboard users.



Recommendation

ZocDoc should remove the `tabindex="-1"` attribute from the “email preferences here” link for it to be accessible. The `-1` `tabindex` value may be assigned to an HTML element so that scripting can be used to manipulate the element, e.g. to hide or display additional content programmatically when users interact with the site.

Include “alt” and “desc” Tags

All images should include proper “alt” (alternative) tags to provide textual representation and functionality and the “desc” (description) tags for more in-depth explanation of the visual item, when necessary.

Recommendation

Images that convey content or contain function such as a link should always have a proper “alt” tag and succinct text information. For example:



```

```

Decorative images do not add value for non-sighted users and they should include an empty “alt” tag.



```

```

Consider Zoom Compliance

Several low vision participants used the browser zoom feature in order to see and read text more easily. Although browser zoom improved text legibility, it caused navigational issues since users had to scroll through the site horizontally.

Recommendation

Add text enlargement buttons that can increase text size without jeopardizing the structure of the website. This button should be placed within the main content area of the website in a visible location. This can be achieved with JavaScript.

Text size **AAA**

```
$("plustext").addEvent("click", function() {resizeText(1)});  
$("minustext").addEvent("click", function() {resizeText(-1)});
```

5.1.3 Functionality

This section provides recommendations on how to improve overall functionality and information hierarchy of the ZocDoc website.

Provide System Feedback & Requirements

Users were confused when they had canceled an appointment but did not receive any immediate confirmation on the cancellation. Additionally, participants were not given any password criteria or guidelines when a password they had created was rejected.

Recommendation

We recommend that the site provides immediate feedback that is easy for users to understand. For example, upon appointment cancellation a user should receive a confirmation message, on the same page or redirected to that their appointment has been canceled.

Add Accessible Primary Navigation

Several participants were frustrated that a primary navigation menu was not available to them at the top of the page. Instead, some participants used the footer navigation as a means to get around.

Recommendation

ZocDoc should consider including a main navigation at the top of the page so users can

have immediate access to site content.

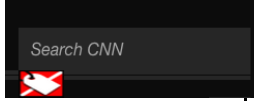
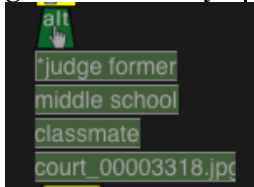
5.2 Conclusion

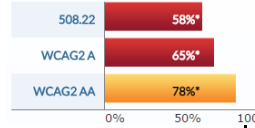
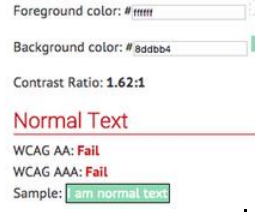
As the web community works towards making content accessible to a wide variety of users, it is imperative we continue to help raise awareness of the accessibility law and guidelines. Accessibility software tools can be used to introduce web designers, developers and user experience practitioners to web content accessibility. However, a website can be compliant yet *inaccessible*. At times, human judgment is needed to ensure accessible content by manual verification, as we did in our expert evaluation. Together with our usability tests, we were able to assess ZocDoc effectively and made appropriate accessibility recommendations based on best practices. Moreover, we came to have a better understanding of what barriers visually impaired users face when using an inaccessible website. Going forward, we hope to become better HCI practitioners armed with useful evaluation tools and knowledge in building accessible web content.

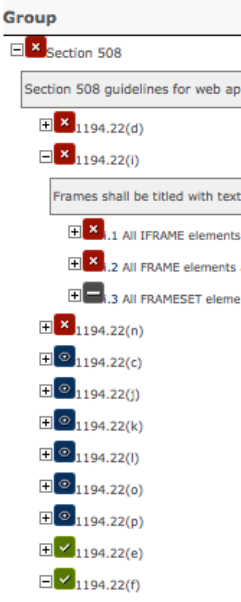
Appendix: Supporting Material

A. Web Accessibility Tool List

We researched and listed some of the free tools appropriate in identifying web accessibility issues. The following is a list of tools we used to evaluate the target website.

#	Tool name & URL location	Explanation/ Description of tool.	Example	How it will benefit our research
1	WAVE URL: http://wave.webaim.org/	Tool allows the user to enter in URL page of their choice to be analyzed. The tool analyzes the page and it's underlying HTML code, and highlights areas that are following proper accessibility standards. Additionally, it calls out non accessible areas as errors and/or warnings. These warning areas are not up to visual accessibility standards.	CNN.com example: error showing that search field does not include a label  In addition, it shows items that properly follow accessible standards. Image below from CNN shows an existing alt image tag. This is an example of good accessibility. 	WAVE highlights specific code components that are important for users who are using a screen reader to view the site. For example, WAVE checks for the following visual accessibility standards (and more): • Image alt tags • Input field/textarea and button labels • ARIA friendly code. • Proper sequence of h1 tags. WAVE used on ZocDoc will reveal any underlying code issues that may hinder a screen reader from properly reading the website.
2	Accessibility	An on-demand web-	Overall	Using the same

	Management Platform (AMP) URL: http://www.ssbbarthgroup.com/amp/	based tool to audit, test and report web page HTML codes according to compliance rules. Also includes suggestions and best practices on accessibility standards. Used by U.S. government agencies for enterprise-level software compliance testing, e.g. Veterans Affairs and Department of Defense.	“Compliance Health” for www.zocdoc.com home page on Jun 26, 2015. 	tool other U.S. Federal Government agencies are adopting ensures a higher chance of compliance as required by those agencies.
3	WebAIM Color Contrast Checker URL: http://webaim.org/resources/contrastchecker/	A simple web tool to manually but quickly verify the color and font size contrast for specific web page elements based on AA and AAA ratings.	White text on light green background: 	This is a handy tool to get the pass/fail rating on a small amount of UI elements (colors and font sizes) especially when we do not need to run a full website analysis.
4	Website Image analyzer http://juicystudio.com/services/image.php	A web tool that analyzes all images present on a page, and checks to see if they include height, width, alt and long desc tags which are all helpful for screen reader software.	N/A	This tool is helpful in analyzing images present on a website, and whether or not the website has screen reader friendly images.

5	508 website compliance checker http://www.cyntiasays.com/	A tool that analyzes the 508 compliance of a page, and highlights areas of the page that are not compliant. The tool directly connects an error to a specific 508 compliance number and sub category letter. 508 compliance standards can be found here: http://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-section-508-standards/section-508-standards		This tool directly references the 508 standards for accessibility, which follows government mandated guidelines. Therefore, this tool is helpful in ensuring that a website meets or does not meet 508 standards.
6	NVDA screen reader URL: http://www.nvaccess.org/	An open source (free) screen reader which makes it possible for the blind and visually-impaired people to use computers.		Allows anyone to test and experience how web pages are “read” without having to pay for expensive licensing fee. This is especially helpful for web designers and developers to understand some of the difficulties users with vision disability encounter when using the web.

B. ZocDoc Website KPI's

We selected six Key Performance Identifiers (primary features) for patient users from

the ZocDoc website for our evaluation.

#	Feature/KPI Name	URL/Page Location	Description/Reasoning
1	“Find a Doctor” Tool (Non Registered/Logged in User)	Home: https://www.zocdoc.com/ Results: https://www.zocdoc.com/search/	First task prior to registering as a new ZocDoc user. Most likely a new user's first impression of the site.
2	“New User Registration” Note: provide test email account to participants	Pathway: “Sign in” link → “Join Now” under “I’m a new patient” → “Join Now” form	Some of the services, e.g. make an appointment, are only available for registered users.
3	“See Doctor Profile”	Pathway: Search for doctor(s) → “View Profile” button of doctor of choice	Get more information about the selected doctor, such as certifications, specialties and accepted insurances
4	“Book an Appointment”	Pathway: “Find a doctor” → “Search Results” → “Book Online” → “I’m new to ZocDoc” or “I’ve used ZocDoc before”	A quick way to locate a doctor. User does not need to be logged in to search for doctors. This is part of the new user onboarding process. They can find and locate an appointment time prior to registering.
5	“FAQS”	ZocDoc Site Footer	Access site FAQs for more information on the site and its services.
6	“Cancel Appointment” Note: related to Book an Appointment (#2); the cancelling an appointment feature is quite cumbersome and may not be a good task for usability test	Pathway: Access appointment confirmation email sent by ZocDoc → “Manage Appointment” button in email → “Cancel” button in right menu (bottom) → confirm cancellation	How to cancel a scheduled doctor’s appointment.

C. ZocDoc Website Evaluation Checklist

We evaluated each of the identified KPIs for its web accessibility using the tools we chose.

KPIs/Primary Features

1. "Find a Doctor" Tool (<https://www.zocdoc.com/>)
2. "New User Registration" (<https://www.zocdoc.com/createuser/details>)
3. "See Doctor Profile" (https://www.zocdoc.com/doctor/shanicka-williams-md-105262?LocIdent=59878&reason_visit=75&insuranceCarrier=-1&insurancePlan=-1)
4. "Book an Appointment" (<https://www.zocdoc.com/booking/>)
5. "FAQS" (<https://www.zocdoc.com/faq>)
6. "Cancel Appointment" (<https://www.zocdoc.com/patient/medicalteam>)

Legend: Passed = :) Failed = :(Average = :|

#	Evaluation Questions	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6
<i>Visual Contrast</i>							
1	Does the KPI follow AA & AAA visual contrast standards for text?	:(	:(	:	:	:(	:(
<i>Content Grouping</i>							
2	Are header elements in appropriate numerical order (h1, h2) for screen reader?	:(	:)	:(	:)	:	:
3	Headers and subheaders are easy to define, and do not look like body text.	:)	:)	:)	:)	:)	:)
4	Is there an adequate amount of white space so there is not too much visual clutter?	:(	:)	:)	:)	:)	:)
5	Is it clear what page elements belong together? (Proximity, similarity)	:	:)	:)	:)	:)	:)
6	Are clickable elements easily distinguishable from non-clickable elements? (similarity)	:	:	:)	:)	:)	:

Labels and “alt” Tags							
7	Does the KPI properly label form elements, images, and links for screen readers?	:	:	:(	:(	N/A	:(
8	Do image elements include the “alt” tag?	:	:)	:(	:)	:(	:(
9	Do the “alt” text describe what the element <i>does</i> instead of what it <i>is</i> ?	:(	:(	:(	:(	:(	:(
10	Do colored elements have proper labels?	:(	:)	:(	:(	N/A	:(
Styling (color, size, white space...)							
11	Are the font choices used legible? (i.e font style and size)	:(	:(	:(	:(	:(	:(
12	Is the screen design kept consistent (style, color, size)?	:)	:)	:)	:)	:)	:)
13	Is color variance kept minimal (not too many colors or different colors)?	:)	:)	:)	:)	:)	:)
14	For link elements, is there a noticeable hover state? (only useful for desktop browsers)	:	:)	:)	:)	:)	:)
15	Does supplemental imagery and iconography help define underlying functionality or page purpose? (i.e. head icon means profile)	:)	:)	:)	:)	:)	:)
16	Does the page follows an underlying grid structure?	:	:	:	:	:	:
17	When an event if triggered, are users given good visual feedback? (i.e error states on a form, appropriate placement)	:	:)	:)	:)	:)	:)
18	Are color choices appropriately used? (i.e. red means error, green means correct)	:)	:)	:)	:)	:)	:)
19	Are buttons and field elements large enough to click on/click into?	:)	:)	:)	:)	:)	:

20	The site does not heavily rely on symbols, i.e. asterisks, parenthesis, quotations marks.	:)	:)	:)	:)	:)	:)
<i>Navigation</i>							
21	Does a user know where to go just looking at the website? Are navigational cues obvious?	:)	:)	:)	:)	:)	:
<i>Keyboard Access</i>							
22	Is there a “skip to main content” link?	:(	:(	:(	:(	:(	:(
23	Do page elements follow a natural “tab order” for keyboard users?	:)	:	:	:(	:)	:
24	Are proper ARIA attributes included?	:	:	:(	:(	:(	:(
25	Do frames have proper title attributes?	:(	N/A	:(	:(	:(	:(

General Findings across each Key Website Feature

Visual Contrast

- **Text contrast issues:** Most text elements do not pass AA or AAA visual accessibility standards due to low contrast levels. For example, the website uses a lot of white text on top of a colorful background, such as blue, green or orange, which scores a low contrast ratio. This color combination is used heavily in button styles. Additionally, a lot of sub-headers use an orange color, which is hard to discriminate from a light/white background.

Examples of contrast issues:



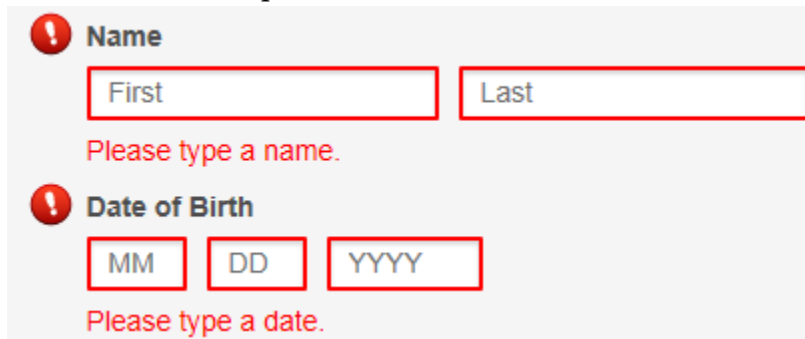
Content Grouping

- **Inconsistency with header tags :** Content header tags were rarely used in appropriate numerical order. For example, <h2> tags would be inappropriately be placed before <h1> tags. Headers tags are supposed to go in numerical order

according to text location on a page so that screen readers can appropriately read text in chronological order.

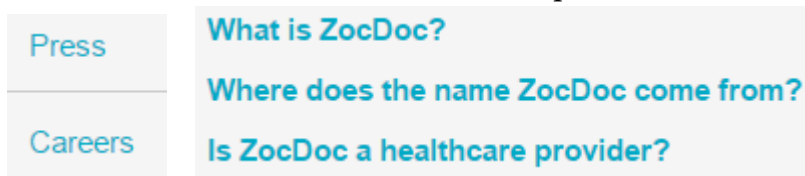
Styling

- **Consistent styling:** Overall, the design of the web pages are relatively consistent with the same color theme and font types. The site typically includes ample white space and UI elements, such as buttons and links, are usually large enough to click without precision required of users. The number of colors used is not overwhelming and the color choices are typically appropriate for standard elements. For example, the color red is used to denote form fields with errors.



The screenshot shows a web form with two sections. The first section is titled 'Name' with a red exclamation mark icon. It contains two input fields labeled 'First' and 'Last', both outlined in red. Below the fields is a red error message: 'Please type a name.' The second section is titled 'Date of Birth' with a red exclamation mark icon. It contains three input fields labeled 'MM', 'DD', and 'YYYY', all outlined in red. Below the fields is a red error message: 'Please type a date.'

- **Low color contrast and small font size:** The major issue we found in the key features is the low (failed) color contrast ratio between the font and background colors. In the FAQ page--which contains a list of clickable questions--the contrast ratio is only 2.55:1 (blue links on light grey background). The 15 pixel font size is less than the recommended minimum (16 pixel).



- **Incorrect use of grid layout:** Although the website appears to have adopted a responsive grid layout, the implementation is done in such a way that the screen does not respond to different form factors as expected. It is mostly appropriate for screen resolutions of at least 1024-pixel wide. Users using a device with less than 1024 pixels in width will have to scroll horizontally. However, ZocDoc has its own mobile native app implementation which does not rely on the responsive design of its desktop counterpart.
- **Clear “hover state:** In most instances the website includes link elements that have a distinguishable hover state when a mouse cursor passes over it. However, some elements have more noticeable states than others. Link elements that were more noticeable would change color or text color. Link elements that had a less

noticeable hover over state would only change in cursor type, which is easily overlooked.

- **Useful Supplemental iconography and visuals:** Iconography and images used throughout the site proved to be helpful visual aids to content. In other words, iconography/images appropriately represents corresponding text.



Labels and “alt” Tags

- **Inconsistent Form labels:** Although ZocDoc did not have lengthy forms for users to fill out, the forms it did have often lacked form labels for input fields, drop down menus, radio buttons and more. Form labels are important to include for screen readers, because labels provide a way for screen readers to match label text to a specific form field. For example, the following HTML code displays how to attach a label to an input text field:

```
<label for="fname">First Name:</label>
<input type="text" name="firstname" id="fname" size="20">
```

- **Little use of “alt” & “desc” tags:** Another important screen reader feature is the “alt” and “desc” tags that are placed on non-textual objects such as images or video players. Although ZocDoc features had many image elements, only a few images contained “alt” tags. No images contained “desc” tags. Alt tags is supposed to be a textual representation of the image and whatever functionality it conveys. The images that contained alt tags was the name of the doctor is was a picture of. Description, or “desc” tags offer the user a more in-depth explanation of the visual item. However, there were no desc tags preset. Many images on the website could of benefitted from the addition of an alt and a desc tag, as some images contained links to other pages, but this functionality would not be made evident to someone with a screen reader.

Navigation

- Navigation and content element affordance is generally intuitive in the key features. However, it was noted that it was difficult to locate on the site where to cancel an existing appointment (in other words, navigation to this feature was not clearly defined).

Keyboard Access

- **Missing “skip link”:** None of the key features we evaluated contains a “skip to main content” link. This link is important to those who rely on keyboard access or the use of a screen reader to navigate a web page. A “skip link” allows users to bypass repetitive content, such as banner and navigation menu items, by skipping over to the main content.
- **Inconsistent tab order:** Some of the pages have inconsistent or missing tabindex attribute values. As such, some of the content element will “appear” in random orders or some content may even become inaccessible for those who cannot visually discern the intended content order. For instance, a user using keyboard to navigate the registration form will not be able to access the “email preferences here” link because an erroneous tabindex value (-1) has been assigned. This means a keyboard user will never be able to tab to and access the content of the “email preferences here” link.

Confirm Your Email

Email Address

We're happy to send you appointment notifications and wellness reminders. If you don't want to receive these, you can change your [email preferences here](#).

```
▼ <div class="form-input-note -form-input -form-input-note">
  "
    We're happy to send you appointment notifications and wellness reminders. If you don't
    want to receive these, you can change your "
    <a id="RegisterForm_Email_ShowOptin" class="js-show-optin" data-test="email-preferences-here"
    href="#" tabindex="-1">email preferences here</a>
  "
  "
</div>
```

- **Insufficient ARIA attributes:** ARIA attributes make a web page more accessible to users using assistive technology. Almost all of the evaluated key features have no ARIA attributes at all. The only ARIA attribute we found is the landmark role="button" in the “Find a Doctor” tool and the “New User Registration” form.

```
▼ <div class="search_button_container">
  <input type="submit" id="refine_search" name="refine_search" value="Find a Doctor"
  role="button" class="-button-secondary btn btn-search" data-test="search-
  criteria-submit-button">
</div>
```

- **Missing title attribute in frames:** The <iframe> elements can be found in all of the evaluated key features mostly for non-visible content, such as site statistics and for the check of JavaScript state (disabled/enabled). Although it is generally recommended that developers should include a title attribute in each <iframe>,

its value is highly debatable⁶ among the community because of the inconsistent and diverse implementations in how browsers (Safari, Chrome, IE, Firefox, etc.) and assistive technology (JAWS, NVDA, Apple VoiceOver, etc.) handle frame elements.

Notes

The following is a list of our notes and explanations on the KPIs ratings.

KPI 1:

- 1.** It does not follow AA or AAA standards because the white text on top of the teal background has a contrast ratio of 2.52:1, and the form button has a contrast ratio of 2.95:1. Level AA requires a contrast ratio of 4.5:1 for normal text (14 point and bold or larger) and 3:1 for large text (18 point or larger). Level AAA requires a contrast ratio of 7:1 for normal text and 4.5:1 for large text.
- 2.** There are several instances where header tags are out of logical order. For example, h2 headers come before h1 header tags, which will disrupt the logical reading flow a screen reader will go in.
- 4.** The doctor search results page displays a lot of information, and a lot of visual clutter (especially with the addition of the google map on the fixed side bar). A lot of visual stimuli will be especially overwhelming for someone with low vision.
- 6.** There are some elements that are not clear they are clickable link elements, however links and buttons are pretty clear. Sometimes the only indication is a change in cursor icon upon hover over, which can be too small for visually impaired users. For example, there is an image on the page that links to a section where doctors can list their practice, but it is not obvious the image is a link. In addition, there is not alt text description that describes the link function either, so a screen reader will not be able to tell the image has an underlying link.
- 7.** Some form fields are labeled, but not all. Specifically the text field that says "In" (which is where the user is supposed to enter a location, address or ZIP). It is not clear this supposed to be a location-based entry either.
- 8.** Images within this section are not HTML elements on the page. They come from the CSS stylesheets. None of them appear to have a desc or alt tag. The only exception are the images of the doctors within the search results (just says doctors names).

⁶ "Is it a failure of WCAG to not have a title on an iframe?." 2015. 21 Jul. 2015
<<http://davidmacd.com/blog/is-title-attribute-on-iframe-required-by-wcag.html>>

11. Body text should be at least 16px. The body text on this website is 15px or smaller, it does not adhere to the best legibility standards. Text within the search results page is even smaller.

14. Only some links have a noticeable state change upon hover, such as text link elements and buttons. However, some links do not have a hover state besides a cursor change, such as the image links to the app store.

17. The form does not give any feedback, not even error state (you can type anything into the text field and it accepts it)

22. Keyboard users must always tab through all available links in the banner before they can get to the page main content.

23. Follows logical tab order but tab selection is not always obvious (visual feedback is not strong).

KPI 2:

24. The single form button in page has an ARIA role but the rest of the page does not have any other ARIA landmarks/attributes.

KPI 3:

1. Most of the text has a color contrast ratio of 7.88:1 (dark grey text on light grey background) but some (blue) links have a ratio of only 2.55:1 and (green) buttons have a ratio of 2.67:1.

2. There is a h1 tag and several h3 tags but no h2 tag.

23. At least one control element cannot be focused by tab order in the page. But the rest of the tab index ordering is correct.

KPI 4:

2. Only one header tag (h1) so no other header tags are present.

23. Tabbing skips over some sections of a form (radio buttons).

24. ARIA elements are not present on the page.

KPI 5:

1. The main text (in the form of linkable questions) have a color contrast ratio of 2.55:1 against the background. While the h1 text has a ratio of 7.88:1, one of the h2 texts is in 2.61:1.

- 2. The header tags are in order but there are two different sets of h2 texts--one of which is used in the capacity of a subtitle.
- 7. The FAQ page does not contain any form controls.
- 8. There are a lot of “utility” images which are not visually presented to users. Nonetheless, an empty alt tag (alt=”) should have been included.
- 16. Although the page has a grid layout visually and it is supposedly using a responsive grid, the underlying code implementation is inaccurate. Hence the grid is not responsive.
- 24. There are no ARIA landmarks or attributes found to identify page banner, navigation, footer, JavaScript state change, etc.
- 25. None of the <iframes> has any title attribute.

KPI 6:

- 19. Some button elements are not large enough to be noticeable to click into, such as the help icon.
- 21. Not entirely clear where to go to cancel an appointment, unless a user decides to scroll down. “Cancel” link is located on the sidebar of the page, which might be easy to miss.
- 19. Not entirely clear where the tab is on the screen (poor visual feedback).
- 25. None of the <iframes> has any title attribute.

D. Usability Test Screener (Blank)**Information Sheet for Research Screener Questions**

[WEBSITE ACCESSIBILITY EVALUATION & RECOMMENDATIONS]

Institution: DePaul University, USA

Faculty Advisor: Harold Streeter

Research Team: Ginger Glendinning, Debye Leong, Nick Aleck

Note: Screener questions will be provided to those during recruitment. Individual must pass all three questions in order to qualify for the study.

1. Do you use the Internet on your computer at least 3 times a week?
To Moderator: (If YES continue to question 2. If NO, end screener)
2. Do you legally need to wear glasses or contacts in order to drive or operate machinery?
To Moderator: (If YES continue to question 3. If NO, end screener)
3. Do you have to wear glasses, contacts or use a screen reader (software that reads website content out loud) while using your computer?
To Moderator: (If YES end screener. This individual matches the criteria to be a part of the study. If NO, end screener)

E. Usability Test Background Questionnaire (Blank)

Background Questionnaire

Name: _____ **Gender:** Male / Female

Occupation: _____ **Age:** 18-27 / 28-37 / 38-47 / 48-57 / 58+

How would you rate your ability using websites on the Internet? Select one.

☐ Learner ☐ Basic ☐ Proficient ☐ Advanced

How often do you visit websites on the Internet each week? Select one.

☐ 7 times or more ☐ 5-6 times ☐ 3-4 times ☐ 2 times or less

Have you ever used any online healthcare services, e.g. find a doctor, make doctor's appointment, etc.?

☐ Yes ☐ No

Do you have any vision issues, e.g. near- or far-sightedness, astigmatism, color-blindness, low vision, etc.?

☐ Yes ☐ No

If the above answer is "Yes," do you need to wear glasses/contact lens when visiting a website?

☐ Yes ☐ No

Do you use any other assistive tool(s) when accessing a website, e.g. screen reader, web browser zoom function, computer screen contrast setting, etc.?

☐ Yes - **Please list the tool(s) you use:**

☐ No

What devices do you use to access websites? Select one or more.

☐ Smartphone ☐ Tablet ☐ Laptop computer ☐ Desktop computer

.....

For researcher use only

Additional Comments:

F. Usability Test Informed Consent (Blank)

Information Sheet for Participation in Research Study

[WEBSITE ACCESSIBILITY EVALUATION & RECOMMENDATIONS]

Institution: DePaul University, USA

Faculty Advisor: Harold Streeter

Research Team: Ginger Glendinning, Debye Leong

We are asking you to participate in a research study because we are trying to learn more about how people with vision impairment access an online website. This study is being conducted by a team of graduate students, as listed above, at DePaul University as a requirement to obtain our Masters degree. We hope to include at least three people in the research. We are asking you to be in the research because you are 18 years or older, are proficient at reading English, have some form of vision disability and use the Internet at least three times a week. If you agree to be in this study, you will be asked questions about how you access and navigate around a specific website. The study will include a usability testing session comprised of questions about how you utilize a website related to healthcare. We will also collect some personal information about you such as your age, gender, and country of origin. With your permission, this usability test will be recorded so that the researcher can have a clear record of the conversation. All of your information will be kept confidential. If there is a question you do not want to answer, you may skip it.

This study will take about 35 minutes of your time with approximately five minutes devoted to collecting demographic information, twenty minutes devoted to the usability testing session, and ten minutes devoted to the post-test questionnaire. Your information will be anonymous.

Date: Aug 19, 2015

Your participation is voluntary, which means you can choose not to participate. There will be no negative consequences if you decide not to participate or change your mind later after you begin the study.

You must be age 18 or older to be in this study. This study is not approved for the enrollment of people under the age of 18.

If you have questions, concerns, or complaints about this study or you want to get additional information or provide input about this research, please contact [Researcher Name] at [Researcher Email].

If you have questions about your rights as a research subject you may contact Susan Loess-Perez, DePaul University's Director of Research Compliance, Office of Research Protections in the Office of Research Services at 312-362-7593 or by email at sloesspe@depaul.edu. You may also contact DePaul's Office of Research Protections if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.

You may keep [or print] this information for your records.

SIGNATURE: _____

PRINTED NAME: _____

DATE: _____

G. Usability Test Session Script

All team members worked from the same test session script to ensure that our instructions to all participants in the usability tests were the same. The script includes the task matrix and post-task wrap-up questions for the participants.

Usability Testing Website

ZocDoc at <https://www.zocdoc.com/>

Preparing for the sessions

To get ready for the sessions, I will

- Distribute copies of the Informed Consent and Background Questionnaire to participants

Date: Aug 19, 2015

- Notify participants they will perform the tasks with their glasses or contact lens removed during the testing session
- Rehearse with the team and adjust the script
- Set up bookmarks, links and Gmail accounts for participants to use
- Set up Google Hangout or other software to record test sessions

Participant	Testing User Name	Email	Password
1	One ZocDoc	1.zocdoc@gmail.com	zocdoc123
2	Two ZocDoc	two.zocdoc@gmail.com	zocdoc123
3	Three ZocDoc	3.zocdoc@gmail.com	zocdoc123
4	Four ZocDoc	4.zocdoc@gmail.com	zocdoc123
5	Five ZocDoc	5.zocdoc@gmail.com	zocdoc123
6	Six ZocDoc	6.zocdoc@gmail.com	zocdoc123

Before each session

- Make copies of Task Matrix (without Acceptance Criteria) for each participant
- Make sure the browser is set up properly
- Gather forms for the participant
- Make sure screen recording software is set up
- If using cameras, set them up to face the participant
- Set up the starting point

After each session

- Close browser sessions
- Clear the history and cache in the browser
- Stop recording devices.
- Note particular issues and surprises

Research Goals

As a ZocDoc user with visual impairment...

- How many tasks are participants able to complete successfully?
- Which tasks are most difficult to complete? Why?
- Which tasks are the easiest to complete? Why?
- Where are users struggling the most on the site?
- What is their time on each task?

- Which tasks take the most time to complete, why?
- How are users navigating the site?

Session Introduction

Time: 5 min

Thank you for agreeing to take part in my research study. My name is [Researcher Name]. May I have your signed consent form and background questionnaire, please? Thanks. *[If they don't have a signed consent form and/or a completed background questionnaire, give them a copy now and have them review, sign and/or fill out the questionnaire.]*

During the rest of the session, I'll be working from a script to ensure that my instructions to everyone who participates in the study are the same.

I'm here to learn about how internet users with vision impairment use a healthcare website. During the session, I will ask you to do a variety of things on the website with your glasses or contact lens removed. I will observe you while you do the tasks. As you do these tasks, please try to do whatever you would normally do.

Please try to think out loud while you're working. Just tell me whatever is going through your mind. We're not testing you, and there is no such thing as a wrong answer. Your doing this helps us understand what works or doesn't work about the site for our target users.

By the way, I'm an independent researcher who had nothing to do with the design of the site you're about to try out. So please be honest in your feedback—I need to know exactly what you think, not what you think I want to hear.

Additionally, we will be recording this session *[on a video camera - point to camera placement or using a screen recording software]*. Only my research colleague and I will see the footage which will be destroyed afterwards. If you are uncomfortable at any point being recorded, please let me know.

The testing session will take about 35 minutes. Please be sure to have your glasses or contact lens removed during the session.

Do you have any questions before we begin? *[Answer any questions.]*

Task Matrix

Time: 20 min

Great. Let's get started.

For the session today, I'd like you to visit the ZocDoc website and perform some pre-defined tasks on this website. Remember to say out loud what you see and how you accomplish the tasks step-by-step. When you are done with each task, say "done" so that I can check off the task from my list.

1. "Find a Doctor": Search for available doctors in a specific area

- *Scenario:* You want to visit a *eye doctor* in Chicago. You want to look for doctors who are available in the area using the ZocDoc website.
- *Link:* <https://www.zocdoc.com/>
- *Zip code:* 60613

Acceptance Criteria:

- User is able to fill out the "find a doctor" form and return a search result list of Chicago-based eye doctors.
- *Pass / Fail? Time spent on task:* _____ min / sec
- *Prompts or assistance provided:*

2. "See Doctor Profile": Review a doctor's information

- *Scenario:* You found a female eye doctor you like at ZocDoc but you want to see more information about her before your visit.
- *Link:* Continue from your last task (you should see a list of doctors).
- *Doctor:* Select a female eye doctor from the screen.

Acceptance Criteria:

- User is able to see the selected doctor's profile by either clicking the "View Profile" button or the doctor's name (link).
- *Pass / Fail? Time spent on task:* _____ min / sec
- *Prompts or assistance provided:*

3. "See FAQs": Look at the frequently asked questions

- *Scenario:* You are new to the ZocDoc website so you want to find out more about the site, and how its name came to be "ZocDoc" by looking at the frequently asked questions and answers.

Acceptance Criteria:

- User is able to locate the site's FAQs page and find the correct question/answer to how "ZocDoc" got its name.
- *Pass / Fail? Time spent on task:* _____ min / sec

- *Prompts or assistance provided:*

4. “New User Registration”: Sign up for a new user account

- *Scenario:* You want to get a ZocDoc user account so that you can start using their services.
- *Email:* [moderator - select one untaken email from prep list]
- *Password:* zocdoc123
- *Insurance:* Please choose “HMO Illinois” as your insurance plan.

Acceptance Criteria:

- User successfully creates an account with ZocDoc by completing all the appropriate user registration criteria.
- *Pass / Fail? Time spent on task:* _____ min / sec
- *Prompts or assistance provided:*

5. “Book an Appointment”: Make a doctor’s appointment online

- *Scenario:* You want to book an appointment with an eye doctor located in Chicago for some time in the near future. The doctor should have at least a 4-star rating.
- *Appointment date/time:* Avoid an appointment date/time within today, if possible.

Acceptance Criteria:

- User books an eye doctor appointment that has at least a 4-star user rating.
- *Pass / Fail? Time spent on task:* _____ min / sec
- *Prompts or assistance provided:*

6. “Cancel an Appointment”: Cancel a doctor’s appointment you previously made online

- *Scenario:* You realized that you made a prior commitment on the day you scheduled your eye doctor appointment. You need to cancel your appointment.

Acceptance Criteria:

- User successfully cancels their scheduled appointment.
- *Pass / Fail? Time spent on task:* _____ min / sec
- *Prompts or assistance provided:*

Close the session

Time: 10 min

Date: Aug 19, 2015

Great. We are done with the tasks. You can put your glasses or contact lens back on now if you'd like. [*Wait for participant to be ready.*] I just have a few wrap-up questions for you.

Having used the site now...

How was your experience viewing the site without your regular visual aid (lenses or glasses)?	
Did you use any particular technique while trying to navigate the site? For example, did you look for certain images or keywords?	
What did you find most frustrating about your experience?	
Could you see yourself having difficulty using this site in the future, even while using a visual aid, such as your glasses? (note: if participant is below the age of 60)	

I have one more thing for you to do. [*Hand the participant the closing questionnaire.*] Please read each statement aloud and then circle the choice that most closely matches your answer and tell me what it is.

Closing Questions

Please rate these statements from 1, strongly disagree to 5, strongly agree by circling your choice.

1. The website was difficult to use.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
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Why or why not?

2. I could clearly see images and read text.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
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What was difficult to see?

3. I am comfortable using this website without glasses or contact lenses

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
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Why or why not?

4. I could easily find my way around the site.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
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Why or why not?

H. Baseline Usability Test Script

Record the time needed to complete **each** of the following tasks. Please access the ZocDoc website at <https://www.zocdoc.com/> using a desktop or laptop computer (not tablet or smartphone).

1. “New User Registration”: Sign up for a new user account

- *Scenario*: You want to get a ZocDoc user account so that you can start using their services.
- *Link*: <https://www.zocdoc.com/>
- *Insurance*: Please choose “HMO Illinois” as your insurance option.

Date: Aug 19, 2015

- *Acceptance Criteria:* Task is complete when you see a registration confirmation from the website.

Time Taken: _____

2. “Book an Appointment”: Make a doctor’s appointment online

- *Scenario:* You want to book an appointment with an *eye doctor* located in Chicago for some time in the near future. The doctor should have at least a 4-star rating.
- *Appointment date/time:* Avoid an appointment date/time within today, if possible.
- *Acceptance Criteria:* Task is complete when you see an appointment confirmation from the website.

Time Taken: _____

3. “Cancel an Appointment”: Cancel a doctor’s appointment you previously made online

- *Scenario:* You realized that you made a prior commitment on the day you scheduled your eye doctor appointment. You need to cancel your appointment.
- *Acceptance Criteria:* Task is complete when you see a cancellation confirmation from the website.

Time Taken: _____

I. Usability Test Result Summary

		P1 (IP) NEARSIGHT ED	P2 (RS) NEARSIGHT ED	P3 (IP) NEARSIGHT ED	P4 (IP) FARSIGHT ED	P5 (IP) COLOR BLIND	P6 (IP) NEARSIGHT ED
Usability Test Results				Legend: IP = In-Person; RS = Remote Synchronous			
1 Search Doctors	Pass/Fail	Pass	Partially failed	Pass	Pass	Pass	Pass
	Time Taken	1 minute 10 seconds	39 seconds	1 minute	18 Seconds	27 seconds	1 minute, 2 seconds
	Prompts/Notes	- P1 zoomed in on web page to 190% using browser tool - Said interface was simple but could not easily read results (the list of doctors returned from search) with	- P2 was able to quickly search for doctors but she didn't input the "eye doctor" criterion.	Thought the word "participates in" actually said "who is paying" said it was hard to see what the label said on the "Find a doctor" form	Participant enlarged browser size to 200% because she enlarges the browser in order to see better	No difficulty locating the tool, because he could see everything clearly	

		bad eyes					
2 Doctor Profile	Pass/Fail	Pass	Pass	Pass	Pass	Pass	Pass
	Time Taken	1 minute 59 seconds	1 minute 05 seconds	45 seconds	14 Seconds	10 seconds	26 seconds
	Prompts/Notes	- P1 spent most of his time looking through the selected doctor's info (specialty, history, education, ratings and reviews by other patients, etc.)	- P2 looked around the page top portion for an option to filter the search for eye doctors. - P2 said she could either click the doctor's name or the [View Profile] button to see the profile.				
3 FAQ	Pass/Fail	Pass	Pass	Pass	Pass	Pass	Fail
	Time Taken	1 minute 28 seconds	50 seconds	20 Seconds	4 minutes, 13 seconds	35 seconds	2 minutes 25 seconds
	Prompts/Notes	- P1 skimmed through the whole web page by scrolling from top to bottom	- P2 scrolled to page footer to look for FAQ-- said "FAQ is normally at the footer." - P2 found the becoming of the name "ZocDoc" funny.	Said he thought that the FAQs would be at the bottom because that is "usually where it is on other sites"	Had difficulty locating the FAQ section when the screen was zoomed in. Cannot see the entire screen.	User said he would probably look for the FAQs at the bottom of the site. He scrolled down, hit "about" and then located the FAQs within the sidebar on the about page.	Found the answer but did not think it was the answer. She first looked for information under the "about section." she scrolled down to the bottom to the footer navigation because she said she noticed the website did not have a main navigation menu at the top.
4 User Registration	Pass/Fail	Partially failed	Partially failed	Pass	Pass	Pass	Fail
	Time Taken	4 minutes 18 seconds	5 minutes 48 seconds	2 minutes, 45 seconds	3 minutes, 26 seconds	1 minute 35 seconds	2 minutes, 9 seconds
	Prompts/Notes	- P1 did not input insurance info as stated in task - P1 further zoomed in web	- P2 didn't enter insurance info at first. Later she attempted to find "HMO	went through the "log in" button at the top because a lot of sites use "log	When filling out email within the form, participant but in a	Entered in password in confirm email	Could not locate where to sign up. Did not realize that "sign up" would be under the

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		page to 240% - P1 clicked "Sign In" but was unsure if that was really the correct place to register - P1 was frustrated at the lack of clue on how to generate a password because the website did not provide any indication on what the level of password complexity should be - P1 felt the password requirement of a minimum of 6 characters was conflicting to the error message	Illinois" and was unable to find that option. - P2 skimmed part of the Terms of Use and HIPAA info. - P2 said the small grey font was too small to read in the registration confirmation message box. - P2 was unsure if DOB was required so she skipped it at first. - P2 became frustrated when trying to create a password that met site requirement.	in" as register as well	comma instead of a period in the email input field. She did not realize she had done the mistake, but the system corrected the mistake for her by saying "did you mean this"	address instead. Said he didn't read the field labels and assumed it would be the area to input a password, said he usually scans over web pages.	"log in" link. Said that it was confusing because she was looking for a "sign up" or "register" link.
5 Book Appointment	Pass/Fail	Pass	Pass	Pass	Pass	Pass	Pass
	Time Taken	3 minutes 55 seconds	3 minutes 18 seconds	3 minutes, 30 seconds	5 minutes, 30 seconds	2 minutes, 22 seconds	3 minutes, 47 seconds
	Prompts/Notes	- P1 first checked that he was signed in - P1 was unsure what to do next to book an appointment after registration - P1 had to scroll a lot horizontally because of the zoomed-in web page	- P2 "instinctively" searched for doctors who met the requirements in the task before she selected an appropriate one.		User had difficulty reading drop down labels		
6 Cancel Appointment	Pass/Fail	Pass	Pass	Pass	Pass	Pass	Fail
	Time Taken	57 seconds	43 seconds	40 seconds	5 minutes, 24 seconds	1 minute, 18 seconds	2 minutes, 2 seconds
	Prompts/Notes	- P1 scrolled up and down web page for clue on how to cancel appointment - P1 looked at	- P2 found the "notification" (the red badge on the list icon) helpful.	Canceled the appointment through a module window. Clicked on an	User did not see the cancel button within the "past appointment" area, and		She did not think the appointment was canceled and assumed she would have

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		this profile (under signed in name, upper right corner) but didn't see anything useful - P1 then clicked on the "list menu" with a red notification number on, clicked "Upcoming Appointment", scrolled down web page and found the "Cancel" icon and link		appointment "number" next to the doctor's profile to view the upcoming appointment.	instead clicked on the "reschedule" button instead. After locating the cancel button, and choosing "cancel appointment," the appointment was canceled but the user was confused because she did not get confirmation, so she checked her email to see if her appointment was canceled.		had to call the DR office in order to confirm that her appointment was canceled because there was no user feedback saying her appointment was canceled.
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