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by

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2015

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Foregrounding Accessibility

for User Experience Design

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Foregrounding Accessibility
for User Experience Design

by

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Report

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Fine Arts

The University of Texas at Austin

May 2015

Dedication

This report is dedicated to my loving husband, Gagandeep Singh Bachhal, who has been a continuous source of inspiration and who believed in me during all the ups and downs. I am very proud to have you in my life.

Acknowledgements

I would like to express my deep gratitude to Gloria Lee and Dr. Randolph Bias for their invaluable guidance and support throughout my research and during writing of this report. I also would like to thank specially Terri Vaughn at ESL - UT Austin and Gary Schrempp at Dell Inc.

I would also like to extend my gratitude to my entire design faculty- Dr. Carma Gorman, Jiwon Park, Kate Catterall, Colin Frazer, Joohee Huh and Riley Triggs for all their feedback during critiques and helping me streamline my research at UT Austin.

My grateful thanks are also extended to the Marshall F. Wells Scholarship and Fellowship Endowment for assisting me financially.

I would like to thank my design cohort - Robin McDowell, Becky Nasadowski, Brent Dixon and Jose Perez for tolerating me. I would also like to thank Kt Shorb and my senior and junior batches.

I take this opportunity to also thank my parents, in-laws, brothers - Mandeep and Tirbhavan and my loving sister - Prabhjot, for always being there on my side no matter what during this long journey.

Abstract

Foregrounding Accessibility
for User Experience Design

Amanjot Kaur Sandhu, M.F.A

The University of Texas at Austin, 2015

Supervisor: Gloria Lee

I am interested in creating generative tools and techniques for designing accessible user experiences for end users. As a user experience designer, I am working on embracing the web accessibility standards and guidelines and including them from the beginning of the User Experience (UX) design process.

My projects are directed at facilitating design students and professionals to understand two things: that the broad concept of web accessibility is important, and how they can embed web accessibility into the UX design process at a very early stage. To do this, I used different media (website, posters and videos etc.) to create awareness and educate designers in an interesting, simple and engaging way. In this report, I will discuss the definition and role of accessible design, identify limitations in existing tools and methods, and demonstrate how future designers might research, prototype, analyze, and implement their designs for all users.

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Chapter 1: Introduction

We are living in a digital world where majority of us are interacting with digital devices and using the internet to perform almost all types of tasks. These tasks can be very simple as well as complex. For instance, tasks can involve talking to a friend, setting up a doctor's appointment, checking the available rental car or taxi nearby, paying an electricity bill, looking for a specific location, checking account statements, completing an online course, buying a shirt online or filing an immigration form etc. These tasks can be performed on various digital devices such as desktops, mobile phones, tablets, phablets, gadgets, appliances and wearable devices. However, the internet has also become a critical global tool for individuals to practice their freedom of expression and participate in any collaborative online action. It has been said that internet access is a basic human right.[1] But for the end user the internet access can entail multiple challenges. Web based applications if not accessible can pose an accessibility challenge for people with visual, hearing, mobility and cognitive impairments.

My research focuses on how user experience designers can fully integrate web accessibility into their design and development lifecycles. This will help them to enhance their products and hence address the challenge for people with disabilities to perceive, understand, navigate and participate on the web using various applications. I am interested in creating generative tools and techniques for designing accessible user experiences. These will embrace the web accessibility standards and guidelines from the beginning of the design process of screen-based interfaces. I have created an online platform called Accessibleuxd.com, which demonstrates a step-by-step methodology to design accessible interfaces. In this report, I will discuss the definition and role of an

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[1]Kravets, David (2011).

accessible design, identify limitations in existing tools and methods, and demonstrate how future designers might research, prototype, analyze, and implement their designs for all users.

Chapter 2: Context and Research

"Web Accessibility means that people with disabilities can perceive, understand, navigate and interact with the Web, and they can contribute to the web. Web accessibility also benefits others, including older people with changing abilities due to aging."[2] The term web accessibility addresses the issues of web access and it helps to provide equal access and opportunity for the people with impairments using web based applications. The term web accessibility is also known as E-accessibility, digital accessibility and also online accessibility. Disabilities or impairments do not refer only to a person with a wheelchair. Web accessibility refers to available access to the web applications for people with all sorts of disabilities. Following are the major categories of the recognized impairments and their symptoms:[3]

Visual: Blindness, low vision, color blindness

Hearing: Deafness and hard of hearing

Motor: Inability to use a mouse, slow response time, limited fine motor control

Cognitive: Learning disabilities, distractibility, inability to remember or focus on large amounts of information

Each of these categories requires some kind of modifications in designing of web content for various digital products. These modifications in design benefit everyone, not just those with disabilities. Everyone benefits from easy navigations, helpful visual images, clearly organized content and simple website design.

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[2]Introduction to Web Accessibility (2005).
[3]Introduction to Web Accessibility (2014).

WHY WEB ACCESSIBILITY MATTERS

According to the World Health Organization, "Disability is not just a health problem. It is a complex phenomenon which reflects the interaction between features of a person's body and features of the society in which they live."[4] Disabilities are not necessarily from birth or permanent; they could be temporary as well and can also be experienced as a result of old age.

Various reports provide us compelling statistics which justify the need for making these online products accessible. According to World Health Organization, over a billion people worldwide live with some kind of disability[5] and 285 million have visual impairments (39 million are blind and 246 million have low vision).[6] According to the U.S. Census 2012 report, nearly 1 in 5 people in the U.S. have some kind of disability. Around 56.7 million people (19 percent of the population) in U.S. have disabilities of some sort,[7] these disabilities mainly are low vision, blind, deafness, hard of hearing, mobility, cognitive and learning. Also, according to the Census Bureau, 7 million to 8 million people will be over age 85 and 214,000 will be over age 100 by 2020.[8] Web accessibility matters because there is a need to design interactions for the digital interfaces in such a way that should not restrict any sort of participation.

LAWS AND STANDARDS

There are legal laws and standards in U.S. which prohibit the discrimination against the disabled people using various digital technologies. These laws are a result of a long struggle and a disability rights movement which started in 1960s. "The disability

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[4]WHO | Disabilities (2015).
[5]World report on disability (2011).
[6]Sightsavers (2015).
[7]Census Bureau Report (2012).
[8]Universal Design History (2008).

movement adopted many of the strategies of the civil rights movement before it. Like the African-Americans who sat in at segregated lunch counters and refused to move to the back of the bus, people with disabilities sat in federal buildings, obstructed the movement of inaccessible buses and marched through the streets to protest injustice. And like the civil rights movements before it, the disability rights movement sought justice in the courts and in the halls of Congress." [9]

Section 508

Section 508 was added in 1998 as an amendment in the Rehabilitation Act of 1973. According to Rehabilitation Act, "Cultural organizations, private or public, that receive direct or indirect federal funds or federal financial support must make programs, services and activities accessible, including employment opportunities." [10]

Section 508 requires that all electronic and information technologies used, procured, purchased or maintained by U.S. federal agencies are accessible to people with disabilities. Section 508 covers various technologies which can be used for communication, computing, storage, presentation and many more.

Web Content Accessibility Guidelines (WCAG) 2.0

As a non-binding standard, Web Content Accessibility Guidelines (WCAG) 2.0 demonstrates a number of recommendations to make web content accessible to the users. World Wide Web consortium published revised version of these guidelines as a recommendation in December 2008. These guidelines help designers and developers to create content accessible and usable to people with various disabilities and impairments which includes blindness and vision impairment, deafness and hearing loss, learning and

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[9]Patterson, William V., and White, Alex, (2003), p 15.
[10]Patterson, William V., and White, Alex, (2003), p 17-18.

cognitive limitations, limited movement, speech disabilities and many more. These guidelines, which should be implemented when designing for web content for screen based interfaces, are based on four principles: Perceivability, Operability, Understandability and Robustness.[11]

Perceivability

Users must be easily able to perceive the information being presented. Non-text content should be presented in other ways as well so that it can be easily understood by the user using screen readers or other assistive technologies. There should be other options for time based media. Also make the content easier for user to see and hear.

Operability

Operability means the ability to operate web based applications and perform various tasks. Navigation and components of the user interface should be operable. Users should get sufficient time to read and use the content of the webpage and all functionalities should be available from a keyboard. Users should have easy ways to navigate and find information. Design content should avoid flashing effects.

Understandability

Web content and the user interface should be clear and easily understandable. Web content should not create confusion for the users while navigating any web application. Content should be presented in an easy to read to understandable manner. There should be input assistance to help users avoid and correct errors.

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[11] Web Content Accessibility Guidelines (WCAG) 2.0 (2008).

Robustness

Web content should be interpreted with various assistive technologies. Web content should recognize and interact with assistive technologies. Assistive technologies along with future and current user agents should have maximum compatibility with the web technologies.

WEB ACCESSIBILITY TOOLS AND TECHNIQUES

There are other people and organizations who are working to make the information available on web accessibility in the form of books, blogs, principles, guidelines, instructions, best practices and information visualizations.

John Slatin, a former UT Austin professor, did a lot of research work in the field of web accessibility and inclusive design. He was a blind individual who had a firsthand experience with the web applications and challenges he faced. John Slatin and Sharron Rush in their book *Maximum Accessibility* refers to accessibility as an aspect of User Experience.[12] Accessibility addresses the overall experience of website by people with disabilities not just the property of any specific document or web page of the website. It is important to understand the needs and wants of the users and the problems and limitations faced by them while searching for information and accessing different websites. The designers and developers should follow the guidelines of best practices to analyze and showcase the overall web experience by the individuals rather than just follow the guidelines to design or develop some web pages. It is an approach so that people with disabilities can experience the rich, intuitive, interactive and engaging environment of the web while looking for information, participating in e commerce, navigating and exploring the website.

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[12]Slatin, John M. and Rush, Sharron (2002).

The more recent book on web accessibility is *A Web for Everyone: Designing Accessible User Experiences* by Sarah Horton and Whitney Quesenbery where they describe nine principles for designing accessible experiences. These principles are relevant, detailed and helpful to learn and incorporate web accessibility in any web solution. These principles are the combination of the principles of the Universal Design and WCAG 2.0 principles and design thinking. "Principles are: 1) People First: Designing for differences, 2) Clear Purpose: Well Defined Goals, 3) Solid Structure: Built to standards, 4) Easy Interactions: Everything works, 5) Helpful Wayfinding: Guides Users, 6) Clean Presentation: Support meaning, 7) Plain Language: Creates a conversation, 8) Accessible Media: Supports all senses, 9) Universal Usability: Creates Delight."[13] I felt the need of using these principles as a foundation of my design interventions.

Another example is WebAIM, [14] an online resource which has various trainings, certifications and articles on web accessibility. Inside this resource, I found an infographic explaining web accessibility for designers. This is in the form of a checklist which shows the basic points which designers need to incorporate in their designs in terms of web accessibility. This is a simple example of explaining fourteen points to designers. For example: "Plan Heading Structure Early, Consider Reading Order, Provide Good Contrast, Make Sure Links are Recognizable, Ensure Link Texts make sense of its own" etc.[15] There is too much information on this website which is useful. However, the challenge is to find the specific information for designers.

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[13]Sarah, Horton, Quesenbery, Whitney, and Gustafson, Aaron (2014).
[14]WebAIM: Web Accessibility in Mind (2015)
[15]Web accessibility for designers (2015)

Alongside these guidelines, laws and standards, there are also research papers which state that accessible design is impactful if it is being thought of from the beginning of the design process rather than just an afterthought conforming to the laws or meeting standards. In a research paper (Newell et al. 2011), "User-Sensitive Inclusive Design", it is mentioned that "A major plank of the User-Sensitive Inclusive Design message is thus to encourage designers to develop an empathy with older and disabled users, through meeting with them both in a social situation as well as an experimental one."[16]

The book *Design Meets Disability* by Graham Pullin also emphasizes blurring the boundaries between the design for disabilities and mainstream design. "A dual approach of blurring and sharpening could redefine design for disability and its relationship to mainstream design. Transcending disability could cut both ways, by not necessarily broadening toward universal design, but acknowledging the diversity among people who happen to share the same impairment. Design has a part to play in this complex issue that is both influenced by and yet can also influence social attitudes towards disability. Seeking a resonance between the needs of some people with a particular disability and some people without could blur the boundary between design for special needs and mainstream design." [17]

ASSESSMENT AND NEXT STEPS

My overall research has determined that following are the limitations of the existing tools and techniques for designing accessible experiences for screen based interfaces and incorporating web accessibility:

1) Accessibility is mostly driven by the standards, federal laws and regulations for e.g., WCAG 2.0 (Web Content Accessibility Guidelines); and

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[16]Newell et al (2010).
[17]Pullin, Graham (2011), p 65-109.

2) The language and style of the standards and guidelines are complex and technical, thus discouraging designers from incorporating accessibility at initial stages of design unless it is a part of the requirements;

3) When in particular, for design students and professionals who have encounter the concept of web accessibility for the first time, they don't know where to look, which is the most relevant resource and the information available is overwhelming.

4) Generally the issue of accessibility is introduced at the last stages of most design solution development cycles, typically during usability studies;

5) We don't have any comprehensive or well defined list or online tools or methodology specific for UX designers and students that help them to understand web accessibility in an easy and convenient way and that encourages them to include audience with wide range of impairments in their design solutions;

My research and design projects are directed at facilitating design students and professionals to understand two things. One is the broad concept of web accessibility and its importance. Second is how it can be embedded in the UX design process at a very early stage. The goal is to use different media (website, posters and videos) to create awareness and educate designers about accessible design in an interesting and simple way.

Chapter 3: General Influences

There are various examples that helped me to understand the accessible design in a broader context and influenced my design projects.

ACCESSIBLE ICON PROJECT

Accessible Icon Project[18] aimed to transform the original international symbol of access into an active and engaged image. It is an example of the subtle power of visual representation. "Describing the new image with words such as: active, abled, engaged, ready-for-action, determined, and motivated helps provoke discussion on how we view disabilities and people with disabilities in our culture. The symbol does not 'represent' people with disabilities, but symbolizes the idea that all people with disabilities can be active and engaged in their lived environment. Our active accessibility symbol helps re-imagine how society and individuals view people with disabilities."[16]

Head Position

1. Head is forward to indicate the forward motion of the person through space. Here the person is the "driver" or decision maker about her mobility.

Arm Angle

2. Arm is pointing backward to suggest the dynamic mobility of a chair user, regardless of whether or not she uses her arms. Depicting the body in motion represents the symbolically active status of navigating the world.

Wheel Cutouts

3. By including white angled knockouts the symbol presents the wheel as being in motion. These knockouts also work for creating stencils used in spray paint application of the icon. Having just one version of the logo keeps things more consistent and allows viewers to more clearly understand intended message.

Limb Rendition

4. The human depiction in this icon is consistent with other body representations found in the ISO 7001 - DOT Pictograms. Using a different portrayal of the human body would clash with these established and widely used icons and could lead to confusion.

Leg Position

5. The leg has been moved forward to allow for more space between it and the wheel which allows for better readability and cleaner application of icon as a stencil.

Figure 1: The Accessible Icon, created by Sara Hendren and Brian Glenney, from Icon-Accessible Icon Project, http://www.accessibleicon.org/icon.html. Accessed on May 1, 2015. (Image in the public domain)

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[18] The Accessibility Icon Project (2015).

I am using similar approach in my posters series in order to provoke the discussion about different misconceptions towards web accessibility.

MARIO GAME

Mario Game[19] developed by the Super Mario Bros. in 1985 was one of the most simple, interactive and engaging game ever. The interactions of this game were easy to understand and user can move only in one direction. There were no complex navigations. Design was adaptive to the level of experience and engagement of the player with game. It became more and more intuitive and difficult for users at the same time as they moved up in levels but navigation remained easy and unidirectional. This is one of the good examples of accessible design because most of people can pick up that game and play.

In a similar way, I have attempted to design the AccessibleUXD website using accessibility as a key parameter. It is designed in a way that any novice UX and visual designer can easily follow the instructions and can design accessible interfaces. There are clear and consistent navigations and layout throughout the website. I have tried to avoid the overwhelming feeling faced by designers to understand web accessibility.

OXO GRIPS

Oxo grips[20] is another good example of the inclusive and accessible product design. These products are usable by range of people including people with various impairments. These products initially designed for the people with mobility impairments, however later accepted by wide range of users because of the usability and accessibility of the products. This is the example of a product which was designed for a disability first

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[19]Ates, Faruk (2012).
[20]OXO (2015).

and then used as a mainstream product. It proves Pullin's point of blurring the boundaries between the design for disabilities and mainstream design benefits everyone.

However, I have used the mainstream design approach in my AccessibleUXD project. The website itself is designed in a way that showcases the example of an accessible interface. Various impairments specifications and web accessibility best practices were considered from the beginning of the website design process. This mainstream design thought from the beginning also gives opportunity to avoid various web accessibility complexities at the later stages.

Figure 2: Photo of OXO grips products, from OXO, http://www.oxo.com/s-24-cooking-baking.aspx, Accessed on May 4, 2015

THE BRADLEY TIMEPIECE

Another example of The Bradley Timepiece[21] is designed in a way that a person can see, touch and feel the time. As a watch can be used by everyone including people

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[21] Eone Time, Design for Everyone (2015).

with impairments, this is an example of mainstream design which also addresses the requirements for visually impaired people. When designers start thinking of a product with impaired people in mind from the beginning of design process (in this case product/industrial design) then we will have these kinds of products and negates the notion that same product cannot be designed for both mainstream and people with disabilities. My own work will advocate that designers incorporate requirements for impaired people at an early stage of an UX design process.

Figure 3:   Photo of Bradley Timepiece, from Eone Time – Designed for Everyone, https://www.eone-time.com/design/, Accessed on May 4, 2015.

INCLUSIVE DESIGN TOOLKIT

Inclusive Design Toolkit[22] was developed by the University of Cambridge, Engineering Design Center and sponsored by the British Telecom. This is the second version of the research and reflects twelve years of inclusive design research. This toolkit consists of following sections:

Design process checklist: This is a downloadable excel sheet which explains the fundamental questions, principles and key activities for inclusive concept generation.

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[22]Inclusive Design Toolkit (2015).

Integrated design log: This is a downloadable excel sheet which provides a map of various key activities for inclusive design. The key activities are Manage, Explore, Create and Evaluate.

Materials for business case of inclusive design: A worksheet that helps to develop a business case for the inclusive design project.

Exclusion calculator: One can enter various parameters like Sex, Minimum and Maximum age, various set of capability like vision, hearing, thinking and its level using a scale. Then exclusion calculator calculates the overall population of those with those parameters.

Figure 4:   Screenshots of Exclusion Calculator, from Inclusive Design Toolkit.
              On left is the Enter Data page to select the various set of capabilities related
              to any product. On right is the result of the Exclusion which shows the
              number of people based on various capabilities such as vision, hearing,
              thinking, dexterity, reach & strech and locomotion,
              http://www.inclusivedesigntoolkit.com/betterdesign2/exclusioncalc/exclusio
              ncalc.html, Accessed on May 4, 2015.(© Copyright University of
              Cambridge 2013)

Set of personas: The website also explained various personas using a scenario of a family. Each persona depicts various disabilities and scenarios possible for various members of a family.

Simulation glasses and gloves: These glasses and gloves help to understand the challenges of those with eyesight and arthritis problems. These glasses and gloves are helpful for product designing and testing purposes.

The difference is that this toolkit generally talks about the inclusive product design and my research is focusing on the accessible digital interfaces. This toolkit provides various key parameters which I should include in my AccessibleUXD website such as clear definitions, facts supporting the need and case studies. Including a business aspect for web accessibility would also be helpful for designers. Business case will help designers to pitch for web accessibility and will be helpful to explain to clients what value it will bring. From this resource, I am also inspired to make a framework (visual format) of all the key activities of accessible design process. The introductory videos would also be helpful for setting up the context. Principles of inclusive concept generation of this website are also helpful for the basis of my research.

TOUCHABLE MEMORIES

Touchable Memories[23] was an experiment to help blind people experience the visual memories/ photographs using the 3D printer.

This is an example that showcases how the technology can help the people with impairments to re-experience the minute details of the photos, and opens up a new range of applications of technology which might help in making and designing the lives better for all.

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[23] Touchable Memories (2015).

Figure 5:   Photo of Daniela, from Touchable Memories by Buccaneer,
              http://pirate3d.com/touchablememories/#video-5, Accessed on May 5, 2015.
              (© Copyright Pirate3D 2014)

This kind of experiment is not just helpful for blind people; even the sighted people will cherish this kind of physical visual memories, validating the point that if we think about making lives better of impaired people and design accordingly, this will also enhance the experience of people without any impairment. Instead this will improve the overall experience for all, including those who are temporarily impaired. I am using this project as base for my poster series: Change the Perception project. I will highlight various misconception of web accessibility which will eventually change the perception of designers towards web accessibility.

Chapter 4: Design Interventions

During my undergrad studies in Engineering, I learned about the coding languages, information architecture etc. which was very technical and was focused on development side of the applications. I was unaware of the design side of applications. Then I pursued my design school where I started learning the design side of these web applications. Complementing my experience on both side of the fence, I came to the University of Texas at Austin with a goal to find a research topic which can help both designers and society as a whole. During past three semesters and during my summer internship at Dell, I have worked on several projects that helped me understand the gaps in current design processes and as well as the need for web accessibility motivated me to explore this area. In turn, all of these projects helped me understand and develop the methodology for accessible user experience design to help students and design professionals to design solutions that are accessible for masses.

PROJECT 1: CULTURALL

Through a graduate course in Information Architecture at the iSchool, I learned of various methods used in User Experience Design. For a final project, I and two other students designed a web portal where people can search cultural events in Austin and where promoters can promote these events. This was my first semester project, and I learned about various design methods which complemented my experience in industry. We defined two main goals: to provide more in-depth information about cultural events and to create an interactive community that would appeal to users. We used a variety of design research methods, including a heuristic evaluation of existing web applications in similar domain, and both online surveys and informal interviews to get the insights from travelers, cultural enthusiasts and promoters about their needs. In creating this new events

portal, we went through a complete design process cycle, beginning with creating personas of the users and the mapping of user journeys, the construction of the information architecture, making wireframes of the structure of the portal, developing high fidelity prototype using azure software, undertaking user testing with the prototype, all utilizing data recording techniques, such as note taking, questionnaires, refinement of the prototype and documentation.

Unfortunately, this experience didn't include web accessibility. At the same time that I was looking for my research topic, one of my friends shared his personal issue regarding color blindness. This motivated me to think the challenges he faces when he accesses any web based product, and pushed me to look more into the web accessibility concerns for people like him. Starting from available web products and challenges faced by these people, I started wondering about the gap. I have created so many web based UI solutions and I never had these types of users in my initial personas.

I traced back through my and others educational experiences and found a lack of teaching about accessible design to engineers and design students; it was not seen as an essential part of the UX design process. Additionally, designers don't know where to start about web accessibility. Even for my first semester project, we did not make any personas nor interviewed any user who may have any sort of impairments who might have difficulty navigating with the screen readers and other assistive technologies of the existing similar web portals. I did not think of other ways to provide titles for the images. I ended up providing the titles as part of the image as an afterthought, when I realized the images are not accessible for the users with impairments.

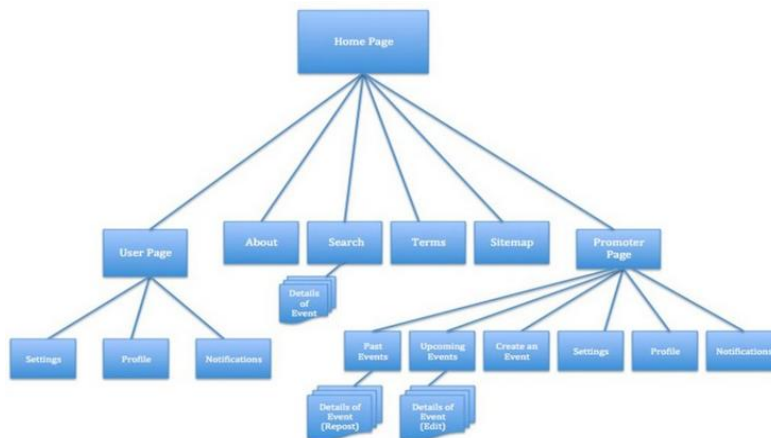Figure 6:   Home page of CulturALL web portal. (Image by Author, © Copyright 2015)

Figure 7:   Information Architecture of CulturALL web portal. (Image by Author, © Copyright 2015)

PROJECT 2: ACCESSIBLE WEB PORTFOLIO

This project was to provide recommendations for a well known portfolio platform Behance to be used by UT Austin students and faculty for creating their accessible portfolios. I performed a web accessibility study of the platform and discovered big gaps when it comes to web accessibility. Eventually I gave to Fine Arts Career Services at UT

Austin a list of recommendations that will help students to make their portfolios accessible on UT Behance Website. Portfolios will be compliant with Section 508 Web Accessibility Requirements. I also created a sample accessible portfolio.

In this project, the challenge was to provide the recommendations for a given platform about its compliance with web accessibility guidelines. I did a heuristic evaluation of the 15 portfolios created by UT students and professors on Behance. Students and professors were from various departments of the College of Fine Arts, and from departments of theatre, design, music and, studio arts. The various parameters for the heuristic evaluation were the presence of title and description of the project, image captions, alternative texts for images, audio, videos, transcript for the audio or video files, choice of font types, size and colors, reader order of the images and the text, usage of Caps and ways of providing links etc.

My analysis revealed that there are so many issues related to accessibility in existing portfolios as per the WCAG 2.0 (web content accessibility guidelines). I created my own portfolio on Behance and included WCAG recommendations for web accessibility. I discovered some limitations on current Behance platform for example "Alt Text" were not possible. So I have created other ways to fulfill this gap by providing the format of the label with every image and video in a certain way. My examples will help students and professors to read the text easily who may use screen readers.

My final recommendations were provide a clear project title and description; the image should have captions or labels so that users using screen readers can know about the image; text and images should be in the same order; contrast ratio for the normal text should be 7:1 and 4.5:1 for the large text; font size should not be less than 10pts, avoid the use of caps; links should have different color in the text; there should be alternative text or transcripts provided for the audio or video projects and last one is to provide the

alternative media options like YouTube and Vimeo links together. This project exposed the web accessibility limitations on Behance which is a well known online platform. I believe lack of accessibility features can hinder their business when institutions need to meet the federal regulation to comply with accessibility guidelines.

PROJECT 3: RESEARCH PAPER - MOBILE WEB ACCESSIBILITY

During my second semester, I took a usability course from the iSchool. During this coursework, I started my research and wrote a research paper which included various standards, best practices and evaluation methods for Mobile Web Accessibility. Mobile phones are increasingly playing a central role in everyday lives of the people around the world. The use of internet through mobile devices is growing at a fast pace. The users with special needs such as learning, hearing, cognitive and visual impairments face problems while locating information on the mobile websites. Some efforts have made by major mobile phone manufacturers and service providers towards accessibility but still there is lack of attention to many usability issues for the disabled community.

People of older generations and also people with various disabilities use web applications on mobile phones for their daily tasks. Most smart phones and tablets devices have a range of built in assistive tools. Some mobile devices have text to speech or screen readers and also these can be used using third party software. However the problems with screen readers are that they do not work with all the mobile applications and websites which hamper the experience of the people with disabilities. According to the American Foundation for the blind, most of the mobile phones provide very limited built in accessibility features.[24]

The conclusion of this research paper was that there are still various limitations in

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[24]Cell Phone Accessibility Overview (2014).

the assistive technologies for the mobile phones. The more research and guidelines are required for the mobile web accessibility evaluation for the disabled people. The designers and developers should follow the WCAG guidelines and mobile best practices for making mobile web sites accessible. These guidelines are very detailed and cover many aspects of the web accessibility. However, I believe that even these guidelines are lacking some areas of mobile web accessibility.

PROJECT 4: SUMMER INTERNSHIP EXPERIENCE AT DELL INC.

Dell Internship gave me an opportunity to closely investigate the accessibility initiatives and awareness at a corporate level. For Regulatory Compliance team at Dell, I examined corporate websites, written policies and executive support for accessibility by various peer companies like Apple, HP, Panasonic, Lenovo, Acer, Oracle, Microsoft, IBM, Intel and Adobe. And I also investigated the investment in Accessibility in various hardware and software products by various companies at a corporate level as well as how their websites worked with various online features like Product accessibility information, Accessibility contact support, resources, online VPATs (Voluntary Product Accessibility Template), Newsroom, Social media presence and many more.

This competitive analysis of the Accessibility standpoint helped me to understand accessibility initiatives, processes and federal guidelines used by many companies. I understood accessibility from software as well as hardware perspective. I met with designers and engineers at Dell to know their pain points of understanding the accessibility processes and guidelines. Designers rarely are interested in accessibility because of the complex and technical language of guidelines and literature. Engineers and developers are implementing accessibility guidelines in the coding by using WCAG and Dell's guidelines.

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From various discussions with regulatory compliance team managers and directors, I gained the knowledge that various other countries like European Union is also coming up with their own CVAA (Communication and Video Accessibility Act) and other guidelines and updated Section 508 report is coming soon in USA. At this point, many U.S. companies are implementing accessibility only because of the federal requirement. But at the same time, some companies like Apple, Microsoft and Adobe are implementing the accessibility because they think it is the right thing to do. Microsoft's Chief Accessibility Officer is also pushing the accessibility into their products. I also observed that accessibility testing of Dell hardware and software products is contracted to a third party company. I understood the process of accessibility testing and experienced various tools like speech software - Dragon, screen reading software- JAWS, screen magnifier – Microsoft's ease of access option which helps people with special needs to access various applications. This internship experience validated my research question that there is a need of accessibility in the design and development process and designers won't take it into consideration till the time it is a mandatory requirement.

PROJECT 5: ENGAGE AND CHALLENGE THE PERCEPTION

During my research, I found that design students lack the understanding of web accessibility. So I used various media to create the awareness about web accessibility and why it is important. I started creating a series of videos that were aimed to engage viewers to learn about web accessibility. These are small videos each for less than 1 min which describes various aspects of web and accessibility.

In a poster and sticker series, I attempted to challenge various misconceptions to provoke audience to think about Web accessibility and Accessible Design. Audience for these projects was design students and iSchool students at UT Austin. Later I have used

these videos, posters and stickers for the promotion of my project AccessibleUXD during my M.F.A thesis exhibition.

Figure 8: Screenshots from the video - Why AccessibleUXD?, from, http://accessibleuxd.com/, (Images by Author, © Copyright 2015)

Figure 9: Poster - Web Accessibility does not kill creativity, from AccessibleUXD, http://accessibleuxd.com/, (Image by Author, © Copyright 2015)

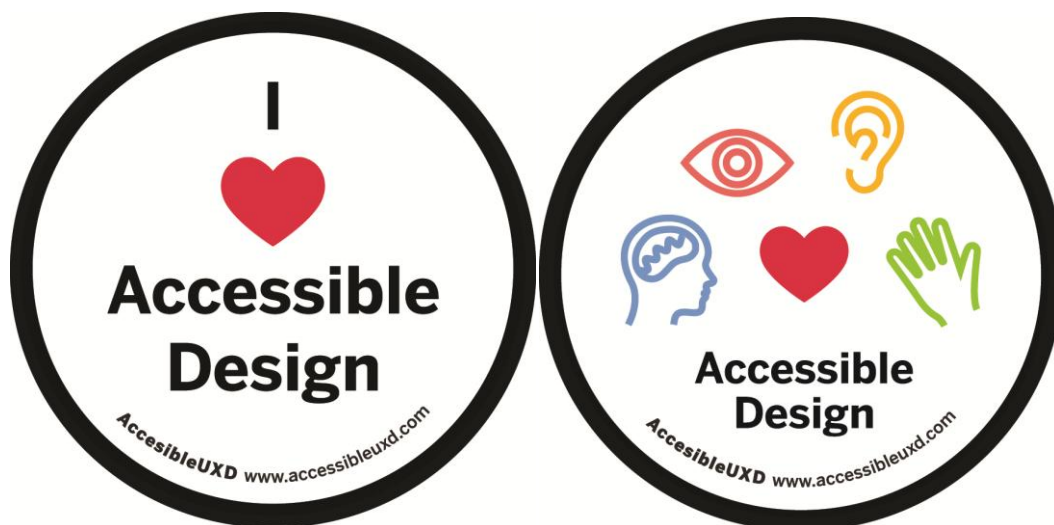Figure 10: Poster -Accessible Design is Good Design, from AccessibleUXD, http://accessibleuxd.com/, (Image by Author, © Copyright 2015)

Figure 11: Stickers - I Love Accessible Design, used for promotion during the MFA Thesis Exhibition, (Images by Author, © Copyright 2015)

PROJECT 6: ACCESSIBLEUXD

This project is a culmination of my research over past three semesters. AccessibleUXD[25] is a web platform which provides a step-by-step methodology for an Accessible User Experience design process incorporating web accessibility from the beginning of the design process. This will guide designers to create digital interfaces accessible for a range of users including people with impairments. This project is in the form of an online website. The audience of this platform is design students and professionals. This methodology starts with a questionnaire which will help designers to set up a context for the accessible web or mobile solutions. The questionnaire consists of options for choosing various groups of people including various impairments like:

-People with visual impairments (blindness, low vision, color blindness) who may need to navigate the site with a screen reader

-People with hearing impairments (deafness, low hearing) who may not be able to hear audio content

-People with cognitive impairments (learning disabilities, poor memory) who may have difficulty understanding the structure of the site or remembering how to complete a task

-People with physical impairments (paralysis, arthritis, and tremor) who may have difficulty using a mouse

-People with physical impairments (paralysis, arthritis, and tremor) who may have difficulty using both mouse and keyboard/stylus

Other questions such as age group, language, level of experience using web applications, kinds of content (text, images, audio and video etc) and types of platform (Desktop, Mobile Phone, Phablets) are also included in the questionnaire. After a

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[25] AccessibleUXD (2015).

designer has decided upon the initial requirements, then website will redirect to a step-by-step methodology. The methodology has four major phases: Define, Research & Analyze, Prototype and Test & Refine. Every phase comprises of various steps. I have incorporated accessibility in various steps of this process. This process consists of the Section 508 requirements, WCAG 2.0 guidelines and best practices of User Experience Design. Every step has explained the activities of that step using explanations and examples.

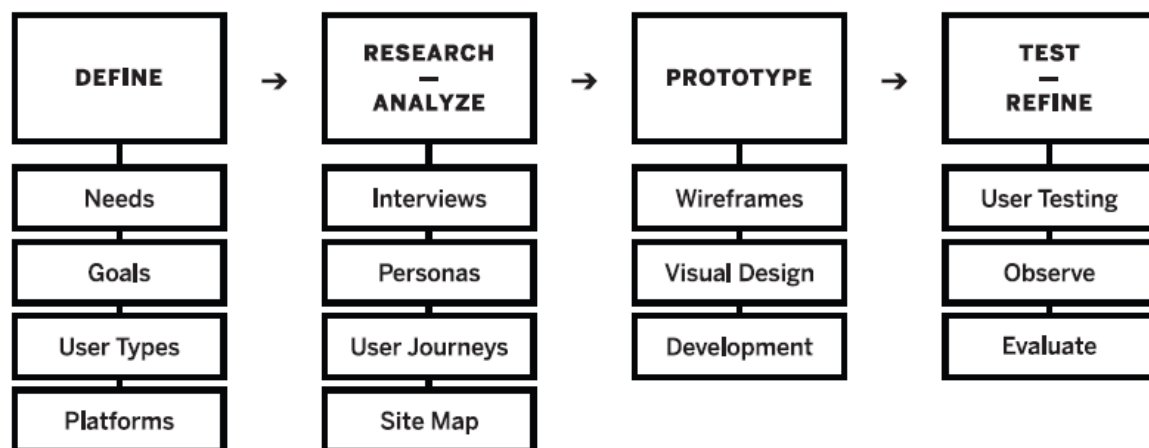| DEFINE		RESEARCH — ANALYZE		PROTOTYPE		TEST — REFINE
Needs	→	Interviews	→	Wireframes	→	User Testing
Goals		Personas		Visual Design		Observe
User Types		User Journeys		Development		Evaluate
Platforms		Site Map				

Figure 12:   AccessibleUXD Methodology, (Image by Author, © Copyright 2015)

This is an online tool which is continuously evolving. A visually appealing look and simple navigations will guide design students and designers to learn about web accessibility and its importance in an engaging and convenient way. Also the end products designed by following this accessible design methodology will generate the accessible products.
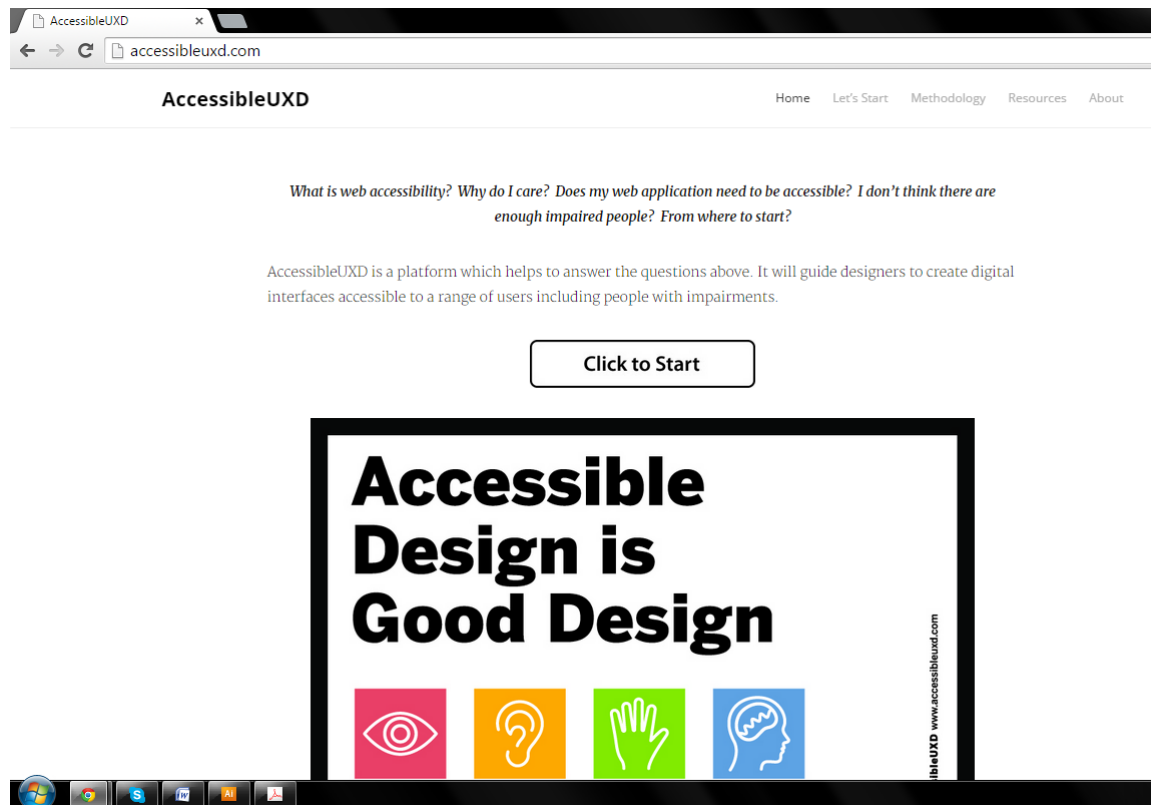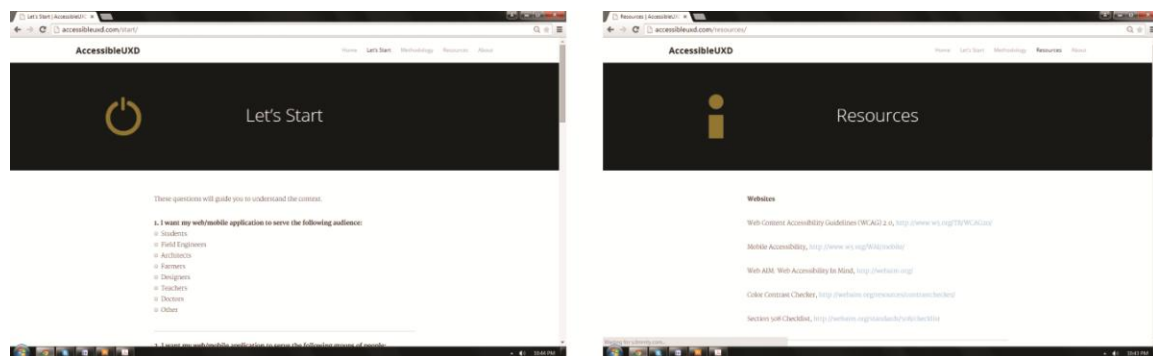
Figure 13: Homepage of AccessibleUXD, from http://accessibleuxd.com/, (Image by Author, © Copyright 2015)

Figure 14: Additional screenshots of AccessibleUXD, from http://accessibleuxd.com/, (Images by Author, © Copyright 2015)

Figure 15:   Visual Design of AccessibleUXD Methodology, from http://accessibleuxd.com/methodology/, (Image by Author, © Copyright 2015)

I have showcased this project in the M.FA. Design Thesis Exhibition- How to Listen. I have exhibited the video Why AccessibleUXD to give the perspective of the project. Also I have shown AccessibleUXD Methodology using projection mapping techniques.
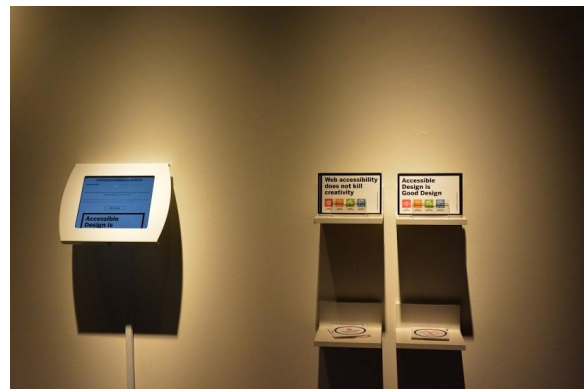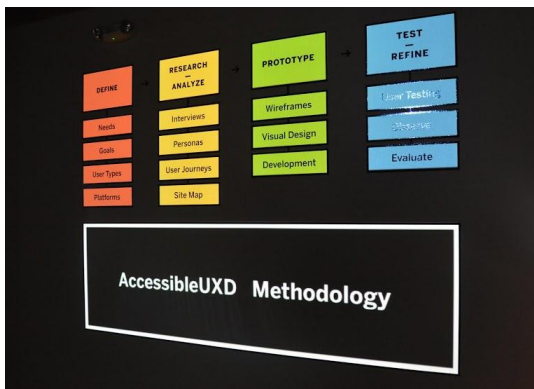
Figure 16:   Images from MFA Thesis Exhibition - How to Listen (Images by Author, ©
Copyright 2015)

Conclusion

The period of two years at UT Austin gave me an opportunity to dig deeper into the area of the accessible design for the digital interfaces. Various coursework both at Design division and iSchool helped me to understand and define my research topic. During this time, faculty at Design division helped me to conduct my research and kept me on track to create a tangible prototype by the final semester. I also had an opportunity to work at Dell during the summer which helped me to explore the industry's present position about accessibility for both hardware and software solutions for digital products. My work at Dell also helped me understand the need and how companies are catering to those needs in their products and web based online services. After deciding on my research area, I performed a thorough analysis for Section 508 regulations and WCAG 2.0 guidelines.

I also talked to design students and professionals to gauge their understanding of the web accessibility. The more I dived into web accessibility world, the more inquisitive I got. Being a designer and an engineer I felt a need to address the gap between the web accessibility guidelines and designers who use them in their accessible design solutions. Industry experience helped me understand the frustrations that designers face when they have to incorporate these requirements after usability testing. When it came to statistics, the number of people around us with disabilities amazed me and I felt more motivated to design a methodology that incorporated web accessibility from first step in design process. I believe doing it right first time is more cost effective and universally accessible.

My online platform AccessibleUXD is an evolving tool and I will continue working to improve it in future. I do plan to conduct the sessions for design students and professionals to educate them to use this methodology. I also plan to conduct interviews with both designers and end users with disabilities and promote web accessibility in design ecosystem. Everyone has a right to information and a right to access that information.

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