

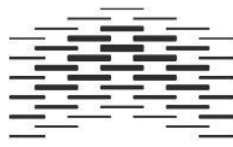
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**The Accessibility of Chinese Social Media
for People with Visual Impairments
– the case of Weibo**

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Preface and Acknowledgement

China is just beginning to pay attention to accessibility. There are 83 million people with disabilities in China, including 13 million people with visual impairments. Weibo is one of the most popular social media. There are 100 million daily active users. Almost every Chinese has his own Weibo account, which showed that Weibo has inevitable influence. It would be meaningful if Weibo is fully accessible, especially for people with visual impairments. Thus, through this project I would like to contribute to the research and practice concerning accessibility in China.

Firstly, I would like to thank my supervisor Weiqin Chen for providing important instruction in the project and writing-up process. Secondly, I acknowledge the contribution of Information Accessibility Research Association (IARA) in China and the participants involving in survey and user testing for their support in this project.

A research paper “How accessible is Weibo for people with visual impairments” based on this project has been accepted as a full paper by the AAATE 2017 (The Association for the Advancement of Assistive Technology in Europe).

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Abstract

Weibo is one of the most widely used social media in China. It is the Chinese Twitter, which allow users to post 140 Chinese characters. Weibo has 100 million daily active users. People usually use it to get news and share their opinions since Weibo serves as micro-blogging. There are at least 13 million people with visual impairments. If the information on Internet are accessible, they can surf online as people without disabilities. Our survey showed that also people with visual impairments use Weibo to get news and share their minds. Weibo consists of multimedia, such as text, images, videos and audios. As a website with mobile applications, Weibo also has common elements, such as navigation, robustness etc. If these are not fully accessible, they can create barriers for the visually impaired. For instance, no alterative text for non-text content and low colour contrast. There exists research focusing on the accessibility of social media services such as Facebook, twitter etc. These services are not available in China. To our knowledge, there is no previous research concerning the accessibility of Weibo.

This project aims to identify the accessibility issues of Weibo for people with visual impairments and provide recommendations for improving accessibility. Three evaluation methods were used in this project, including automatic testing, heuristic testing and user testing. *AChecker*, *AccessLint.com* and the *WAVE* evaluation tool were chosen for automatic testing. People with visual impairments were involved in user testing.

Based on the evaluations, we found that the most frequent accessibility issues for the visually impaired included lacking alternative text for non-text content, ambiguous description of buttons and labels, no Hotkey setting, illogical layout and inaccessible web widgets used, disabled resize options and low contrast. Based on the findings, we consider Weibo as not fully accessible for people with visual impairments and made recommendations for improvements, including providing alternative text for non-text content, providing Hotkeys and ARIA tags for easier and efficient keyboard navigation, improving colour contrast and logic page design, providing resize options and context-sensitive support.

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1 Introduction

1.1 Background

As we all know, blog is the earliest product of social media. Blog allows users to publish everything they want, such as some details from daily lives and even some information about specific knowledge on personal web pages (Kaplan & Haenlein, 2010). However, blogs usually have long-text content. So after blog, some services are conducted for short information, such as Facebook, Twitter, Instagram, and LinkedIn. Obviously, although they all concern social media, they have different purpose in different ways. For instance, people can post text without limitation and attach multimedia with their posts on Facebook. Twitter allows users to post no more than 140 characters in one post. On Instagram, users can only post one picture or video with text. Moreover, LinkedIn is an application for helping people in their careers, which focuses on social networking.

These social media applications are always based on the new Web 2.0 technique. New Web 2.0 is a basic technical framework which is used for sharing information among large numbers of users. Therefore, the applications based upon new Web 2.0 allow everyone to be a public broadcaster. In social media, everyone can express himself / herself through text, audio, and video, which are available to almost everyone. These media tools are often cheap and even free, which also very easy to operate with little training (Cook & Hopkins, 2008).

From user's perspective, they would like to use social media to build and to maintain their relationships. Brands and companies even sell goods on their social media webpage. Students get knowledge from some collaborative websites, such as Wikipedia. Moreover, they could even modify webpage to update the knowledge people have never known before. On social media, people could build their own teams by searching specific tags of users so that they can directly generate new ideas without physically meeting each other. Thus, it is no doubt that social media could generate some potential value when people communicate with each other (Cook & Hopkins, 2008).

However, worldwide social media, such as Google, Facebook, Twitter and several services are not available in China. Therefore, there are a lot of similar but novel applications created for Chinese people to make their social networking online. Recently, there is much academic research conducted for these applications which are also called “new media”. Among these new media, the most popular instant-message application is Wechat, especially for elderly, who can communicate with others by sending voice message. It is a novel way to free people’s hands and make communication easier.

Another new media is Sina Weibo, which is Twitter-like service in China. Sina Weibo is one of the most popular web 2.0 applications in China, which was launched in 2009. Weibo provides a platform for Chinese users to post something with free style to record their daily activities. One feature of Weibo is that the information on it spreads quickly. For example if you have 200 followers on Weibo, your message will spread to 200 people immediately after delivering it to the Weibo platform. This is the reason why Weibo developed so fast and gained millions of users in a short period. It provides a chance for every user to be a broadcaster. All the content of Weibo is opened to the public.

1.2 Demographics

Since 2011, the World Report on Disability (WHO, 2011) showed us that about 18% of the American population is disabled, while over 84 million people in EU/EEA countries have different kinds of disabilities. Moreover, around 650 million people globally in total have severe disabilities.

Therefore, not only general users benefit a lot from social media, but also people with disabilities. According to the article written by (Lee, Hong, An, & Lee, 2013), by using social media, although people with disability still have some kind of barriers, they could gain self-realization as well as preventing the sense of social isolation.

In addition, the elderly form a significant part of the population, since United Nations in 2006 predicted that the population of elderly would exceed 839 million in 2025 on a global basis. Therefore, to raise the awareness of aging is quite important. Everything

should be accessible to older adults as soon as possible since they need accessible technologies, especially Information and Communication Technology (ICT) in their daily life and they need quality living just as youth do.

According to (Leist, 2013), the elderly are willing to use social media because they can give and receive support to and from others. This is also a way to increase their self-awareness. However, some factors such as ICT skills, knowledge about social media, and their own functional limitation will influence their performance when using social media.

The social media has same function in China. The report (CNNIC, 2015) conducted by China Internet Network Information Center showed that in December of 2015, 688 million people are using Internet every day. At the same time, more than 90% of these have access to the Internet by mobile devices. Seventy five percent of Internet users are between 10 and 39 years old, while over 10% of them are older than 50 years.

Moreover, about 130 million people in China are older than 65 years. There are very large populations indeed.

On the other hand, the majority of Internet users have secondary education background or above, comprising nearly 85% of the total users. However, in 2015, more and more people with lower education, which means they only have primary school education or below, have participated in Internet. This phenomenon shows that the Internet is accepted by increasing numbers of people, even some of them with low-literacy.

In 2008, China had about 83 million people suffering from some kinds of disabilities, i.e. 6.34% of the total population ("About 6.34% people with disability. The growth of disabled is still increasing.," 2008). It means that nearly 260 million families are influenced by disability. What is more, the data also showed us that every fourth family has one person with a disability. It also reported that 14.86% of disabled have visual impairments, which are about 12 million people. According to Tecent Research Institute ("Report on Chinese Internet users with visual impairments," 2016), this number have raised to 13 million in 2016. Twenty million people have hearing impairments while 24 million having motor impairment. There are about 1.5% (1.2 million people) with

communication disabilities and 6.68% (over 5.5 million people) have intellectual disabilities. Besides, over 13 million people have multiple disabilities, which is about 16.3% of the total disabled population ("How many disabled in China?," 2008).

According to a report about the livelihood situation of people with disabilities in China (Chen, Lin, Zhang, Song, & Zheng), in 2008 over 58% children with disabilities (between 6 to 17 years old) are literate with a basic education. However, only 25% of them will go to high schools or colleges to continue their education ("Special education in China,"). The investigation by (Fox, 2011) described that only 54% of people with disabilities use Internet while more than 81% adults without disabilities are using Internet frequently. The reason leading to this problem is that the Internet is not accessible enough for disables. Sometimes the websites do not provide valid information via assistive technologies, for example, the screen reader and switch controller.

Not only young people are interested in Internet, but also the elderly are fascinated by Internet and mobile technology. As shown in (Gan, 2014) that in 2014, about 40% elderly in Shaoxing City have smartphones and they use them daily. Meanwhile, nearly 30% of them installed applications on their smartphones, such as Wechat, Weibo and video players.

1.3 Accessibility issues

"The dream behind the Web is of a common information space in which we communicate by sharing information. The power of the Web is its universality. Access by everyone regardless of disability is an essential aspect." (Berners-Lee, 1997) As it said, if all these useful social networking websites are accessible, their functionalities will bring several benefits to all people. Otherwise, the inaccessible issues would confuse them and even make them frustrated.

(Baker, Bricout, Moon, Coughlan, & Pater, 2013) thought that if the developers of social media or Social Networking Sites (SNS) lack of the accessibility awareness when they design interfaces, the digital divide of disabled will be exacerbated which leads to the unfairness. However, when more people as much as possible take "accessibility" into

their design scenarios, social media would present more engaging opportunities and useful information in multiple ways for people with disabilities.

Social networking sites (SNSs) could provide many opportunities for people with disabilities; however, they might encounter challenges, for example, their skill deficiency. People with intellectual or learning disabilities may have difficulties in understanding the text-based content in SNSs. When they misunderstand something important or private, it would lead to their information disclosure. Another barrier, like the uniform templates on Facebook webpage, people using screen readers might have challenges with operating with them, which make them confused a lot (Shpigelman & Gill, 2014a).

In the former research, researcher (Davies et al., 2015; Gomes, Duarte, Coelho, & Matos, 2014) designed a new prototype of Facebook to customize the need of elderly and people with intellectual disabilities. After developing, they also compared their new prototype with the native Facebook by doing questionnaire or interview to rate the user satisfaction. These are the cases about developing their own applications for special target group person through identifying accessibility issues.

Other researches also concerning Facebook from (Shpigelman & Gill, 2014a, 2014b) used survey to evaluate the accessibility of Facebook. In the first research (Shpigelman & Gill, 2014a) they conducted a survey about the usability of Facebook. People with disabilities gave a response that some technical changes from Facebook often confuse them a lot. Then researchers narrowed their target group in their second research (Shpigelman & Gill, 2014b). They chose people with intellectual disabilities involved in the survey and found some accessible problems of Facebook.

Except Facebook as a typical social media among different kind of people, Twitter is popular among young adults. However, researchers (Lee et al., 2013) figured out that the online form on Twitter is illogical for people with disabilities, which is a kind of navigation problem. Besides, Twitter is regarded as a good platform for supporting information exchange in the study of (Hemsley, Palmer, & Balandin, 2014). In this study, they thought Twitter have an accessible design about tolerance of poor grammar, which

is a solution for people with intellectual disabilities to communicate online. Therefore they created a training program for people with intellectual disabilities to learn how to use Twitter.

When concerning about the web content, there is a paper (Rello, Pielot, Marcos, & Carlini, 2013) for making Wikipedia accessible for people with dyslexia. They did an experiment and found that font size with 18 points have a significant and valid effect for helping people with dyslexia to read and comprehend the content on webpage.

In 2007, China became the 133th party of UN Convention on the Rights of Persons with Disabilities (Yu, 2007). In the same year, the institution published an international convention about protecting and improving the right of people with disabilities. The indication ("International Conventions for People with Disabilities in China," 2006) from the convention shows that all kind of things, from the toilets in commercial centers to ATM machines and even the mobile information, should be universal and accessible enough for all people, to the greatest extent possible.

1.4 Purpose and research question

The book wrote by (Rogers, Sharp, & Preece, 2011) indicated that the evaluation of a technical product is quite important since the product owner could receive important feedback that if it is good or not to add, delete, modify and develop some features into prototype. Likewise, the earlier feedback you get, the more time and money you save during designing progress.

In our study, we are going to evaluate Weibo, the Chinese social media according to Web Content Accessibility Guidelines (WCAG) 2.0.

On December, 2008, the World Wide Web Consortium's (W3C) and WCAG 2.0 launched for offering a series of guidelines and principles for accessibility of web content, which aims to help people with disabilities and aging people remove online barriers (W3C, 2008). Thus if all websites follow the W3C and WCAG 2.0, and before releasing the product, they have already tested accessible issues, the "digital divide" would be much smaller, or even disappear.

Many researches about social media focus on its value or how to utilize social media to bring value to others. The accessibility of social media has received little attention. I have tried my best to search and collect the paper concerning accessibility. The worldwide representative social media are Facebook, Twitter and etc. At the same time, the Chinese representative social media are Weibo and Wechat. I would like to learn something from former researches and aim to make a progress on Chinese social media. However, most of previous study papers focus on how to use social media properly or discuss the specific aspect of them instead of exploring how to include people with disabilities into their potential users. Moreover, few researches are conducted for evaluating Chinese social media, but there is a need from large amount of Chinese people. It is obvious gap between Chinese social media and information accessibility.

The **research question** for this project is:

What are the accessibility issues in Weibo?

As a step addressing this need, automatic testing and heuristic testing were conducted for evaluating Weibo webpages and mobile applications in this study. From the result, a part of the existing accessibility issues of Weibo were identified. Then to get a better understanding of what people with disabilities need and what the barriers are when using Weibo, the target group was narrowed down to people with visual impairments. With the help from Information Accessibility Research Association (IARA) in China, a demographic survey for people with visual impairments and user testing with specific tasks were conducted to collect user experience and insight.

2 Literature Review

2.1 Social Media

As highlighted, the concept of social media first came up with is about 20 years ago. “Open Diary” is the initial idea of blog, which means customers publish their “diaries” on a publicly websites or on a social networking website when people in specific group can receive these “diaries”. From technical perspective, social media consists of two related techniques: Web 2.0 and User Generated Content (UGC). We can regard UGC as the prototype of social media when Web 2.0 as a technical foundation. According to the Organization for Economic Cooperation and Development (OECD, 2007), there are three basic requirements to be UGC. Firstly, it is an accessible website to specific group people, which excludes emails and some instant-message tools. Secondly, it is creative, which means it is not reposted from others or existing content. And it is created without practices, which shows it is not for commercials.

It is believed that everyone is familiar with some famous social media. For instance, Facebook is opened for people social networks, while LinkedIn showing personal career networks. Some social media, such as MySpace, Youtube and Flickr, focus on sharing multimedia content, such as videos and pictures. Weblogs (blogs) is still very popular because of its simplexes to create and maintain. Recently, a new type of blog, which is micro-blogging for revealing users’ real-time status in a short message, named Twitter is booming among young users.

(Jensen et al., 2003) have argued that a personal webpage often contains personal information, for instance, personal thoughts, personal feelings, what they like and what they dislike. People who created a webpage for himself usually want to shows and present his daily life to the public. In this case, people would like to choose a social media website to create his personal homepage since there are various types of social media they are able to choose.

2.1.1 Classification of worldwide Social Media

Social media can be divided into several types according to different purpose. Generally speaking, the most popular type of social media is for social and maintains the

relationship among people, for example, Facebook and LinkedIn. Besides, in order to give their users more options to attach different multimedia content with their post, such as images, audios and videos. Therefore, another typical type of social media for sharing was produced, such as Youtube for video sharing and Instagram for photo sharing.

A study from (Kaplan & Haenlein, 2010) gave a definition to social media; they think social media is an ideological and technological generation based on Web 2.0 and UGC. Therefore, researchers classified existing social media by two elements, which are the richness of media or social presence, and the degree of user's self-disclosure. Then social media is divided into six types according to definitions. They are 1) blogs with low Media Richness (MR) and high Self-disclosure (Sd), 2) collaborative projects (e.g., Wikipedia) with low MR and low Sd, 3) social networking sites (e.g., Facebook) with medium MR and low Sd, 4) Content Communities (e.g., Youtube) with medium MR and high Sd, 5) Virtual social worlds (e.g., Second Life) with high MR and high Sd, and 6) Virtual game worlds (e.g., World of Warcraft) with high MR and low Sd.

Based on the features of each social media and their functionalities, researchers (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011) divided social medias into seven types. Unlike (Kaplan & Haenlein, 2010), they are concerned about identity, conversations, sharing, presence, relationships, reputation and groups. The term "Identity" means users are willing to show their identities publicly in this website, including name, age, location, and some private information. Obviously, Facebook and LinkedIn belong to "Identity". The term "Conversation" represents the extent of users communicating with others in this communicated site. It seems almost all the social media have included a function for users to communicate, so "Conversation" is the common feature of most social media. The term "Sharing" shows that users could create, modify, and delete their own content and receive the content from other users. Although Twitter fits into both "Conversation" and "Sharing", however, it focuses on sharing something much more than communicating. The term "Presence" lets users know if other users are accessible to their post. The term "Relationships" reveals a map for users' relationship that how they relate to other users. The "Reputation" gives users a sense of how attractive they are

and how many users have read your messages, photos and finally follow you and become your follower. The last term “Groups” stands for users can make their own groups and post something private but publicly for these specific groups.

2.1.2 Users of Social Media

In organization study (Curtis et al., 2010), the authors showed findings of the adopted factors of social media and the organization usage on each social media based on the Unified Theory of Acceptance and Use of Technology (UTAUT). From the result of online survey, 54% of the participants used social network frequently. Among them, 51.1% chose video sharing services while 48.4% using blogs and 27.1% using photo sharing applications.

An online reported by (Burson-Marsteller, 2012) showed the social media platform usage of the companies in Fortune Global 100 increased by average rate 10% since 2010. Until 2012, the Twitter is the most popular social media among these companies since 82% of them using it. At the same time, 79% of them opened their Youtube channels and 74% have public exclusive Page on Facebook.

A survey by researchers (Duggan & Brenner, 2013) evinced that there was almost 73% adults frequently use social media, such as Facebook, Twitter, Pinterest, Instagram and so on. Among social networking site users, near 32% were older than 65 years old while elderly taking 35% of Facebook users.

(Baker et al., 2013) did a survey and found that in LinkedIn, near 32% users were over 50s and 25% users were without college education, some of them even did not have any education before. Besides, among the people using Facebook, 12% of them were more than 50 years old and almost 47% Facebook users were illiteracy. Some studies, such as (CRESCI, YARANDI, & MORRELL, 2010) figured out most aging people are willing to use computers and new ICT products to communicate with others, and (Ryu, Kim, & Lee, 2009) indicated that the User-Created Content (UCC), for example, the videos are one of the most appealing content for aging people when they use Internet.

2.1.3 Influence of Social Media

Most social media have both webpage version and mobile application, which provided a good platform for people to interact with each other. To utilize this feature, a lot of famous institutes, even the government, began to use social media to improve their influence. For example, Arnold Schwarzenegger, one of the governors of California, has over 1.8 million followers on Twitter. Some famous institutes, like Northwest Organic Valley showed the slogans “Find, friend, and follow us” on its milk cartons in order to spread its brand (Kietzmann et al., 2011).

Not only the public institutes benefit from social, each single person also gains a lot from their personal account on social media. A research associated with Americans and social media (Hampton, Goulet, Rainie, & Purcell, 2011) figured out that social media could strengthen the relationship between users and their close friends in their real life, while also providing social power as well as some political issues.

People generally use social media to strengthen relationship with close friends and families in real-world environment. Social media often provide users with psychological well-being. As shown in (Burke, Kraut, & Marlow, 2011), Social Networks Services (SNS) is a kind of social media platform, which aims to provide some available ways for users to connect their friends, families and even some potential relationships that might exist. SNS could influence users’ psychological issues, for example, their well-being.

There are over one billion active users per month worldwide on Facebook. Researchers (Wilson, Gosling, & Graham, 2012) thought that Facebook makes people help themselves close to their real-world friends by giving comments and sending messages. Meanwhile, they also use Facebook to bridge their social bonding through “like” functionality to make a better connection with people they do not so familiar with.

2.2 Chinese Social Media

According to the report conducted by Kantar Group Limited in 2016 (Guo, 2016), there are over 51% people in China using social media in their daily life which increased about 7% users compared with last year. The 55% participants who were investigated in this report mentioned that they usually use social media to relax themselves and release the

pressure from work and relationship. Besides, over 38% people think using social media to retrieve information is efficient and convenient. However, social media also brought some negative influence to Chinese. Near 30% people think the privacy is an inevitable issue when they use social media. On the other hand, 67% users considered that social media made their lives better. Among various social media in China, the most popular one is WeChat, which own 75.9% Internet users, while QQ having 50% and Weibo having 35% separately.

2.2.1 Wechat

In China, people are not allowed to use Facebook, Twitter, Google etc. because of access restriction. Then IT companies created a lot of similar but novel applications for Chinese to experience the social life through Internet. For instance, Baidu is a search engine like Google since people in mainland China cannot access to Google. Wechat (Weixin in Chinese) is something like Facebook Messenger, which is used to send instant messages and share personal life in “Moments”. The post feature in initial “Moments” in 2011 is like the post in Instagram, which means users could only share their moments with pictures (“WeChat,”). According to the Facebook post by WeChat group on 18 March, 2016, there are more than 697 million monthly active WeChat users in the world. The slogan of WeChat is “Connect a half billion people, just go more personal” (WeChat). The word “personal” here means only the mutual friends among users are visible to the post in “Moments”, which is the novel feature in WeChat application. It is something similar to the timeline on Facebook. Besides, this kind of feature also present a good privacy of personal information compared with other type of social media. People who could see the moments you post, is only able to make a comment or make a “like” on your post, which means the moments on Wechat are not available to repost.

2.2.2 Weibo

Weibo (Microblogging), which is a kind of micro-blog, only allow its users to post no more than 140 Chinese characters on one post. Actually, Weibo is Twitter-like service, released in August, 2009. The representative Weibo services in China are Sina Weibo, Tencent Weibo, Netease Weibo and Sohu Weibo (Hu, Yan, & Hu, 2015). Weibo users

could post their micro-blog with less than 9 pictures and linked video or audio through webpage, WAP page, mobile applications and Short Message Service (SMS) ("Sina Weibo, "). The Sina Weibo is the most popular Weibo application in China, which takes over 57% micro-blogging Chinese users. In 2015, there are 222 million Sina Weibo users and 100 million users are active daily which leads to a large number of messages will be posted on Sina Weibo. People could post message through webpage and mobile application. In 2010, the official Sina ("Sina Weibo, ") showed that 38% messages were posted from mobile application. On the other hand, other developers could use API of Weibo to generate more than 28 million new applications (Hu et al., 2015).

To post and repost multimedia messages are the basic functionalities of Weibo. Users could follow and comment other users which also build a personal social network at the same time. Nowadays, people use Weibo not only for sharing daily life, but also for getting information about current events. Weibo has search functionality which allows user put keyword inside and it would present the relevant posts on Weibo. It is a kind of information exchange also. Weibo provide a message library for users to retrieve user-generated information of current events (Fan, Zhao, & Xu, 2015). Due to the lower threshold and its easiness for using, Chinese users could express what they think, sharing information they known, retrieve news and discuss it in a very ease style(Svensson, 2014).

There is a specific syntax of posting a message on Weibo, which is similar to the syntax in Twitter. On Twitter, among different users, who even are not friends, they use “#” to share information on the same topic, while people using double “#” as their hashtag (e.g. #music on Twitter; #music# on Weibo). Both of Twitter and Weibo use “@” to tag other users on posts (Hemsley et al., 2014).

On 12 April of 2016, Stephen William Hawking created his personal account on Sina Weibo and posted a message to the public, which showed his greetings to Chinese people. Until 6 May of 2016, there are 411 thousand comments on this post and it gained 967 thousand “like” from other Weibo users. All of his post content on Weibo is in English but they were translated into Chinese after the statement in English. Stephen also posted his messages with pictures. To some extent, he could use some basic

functionalities of Weibo as a people without disability. As a people with amyotrophic lateral sclerosis (ALS) ("Stephen Hawking,"), Stephen lost his abilities of movement and speaking which result in he could only use one finger to communicate with others whether in real life or surf on Internet. Besides, Stephen is 74 years old now, which means he is one of the elderly who use Internet frequently.

The report (Guo, 2016) stated that people who using social media belongs to different age group. Over 70% are youth while 30%people older than 50s and nearly 10% users are over 60 years old. This phenomenon means that when the global population is aging, the Internet users are aging, too.

2.2.3 Mobile social media

Some researchers from China (Mou, Atkin, Fu, Lin, & Lau, 2013) thought that social media have different features from other media, because social media could be presented in two ways, which are web-based and mobile technologies.

Compared to Twitter, Weibo has larger amount of users. In the study by (Svensson, 2014), only 18% American used Twitter in 2013 since Twitter was founded in 2006. However, it is said that in 2013, Weibo own 56% of Internet users in China. It is a bigger usage percentage than that of Twitter. There was a report also revealed that nearly 60% people in China use their mobile phone to access online applications while 30% of them use Sina Weibo by mobile application.

Mobile social media application is popular among Chinese since Weibo was launched in 2009. Weibo provides a mobile platform that allows users could get the updated news no matter when or no matter where you are. It is a kind of instant valid information from society. That is why Weibo is also called "new media" in China, which shows its difference from traditional media, such as newspaper and Television. When Wechat was launched in 2011, it provides an always-online mode for users to exchange their information through mobile devices (Xu, Kang, Song, & Clarke, 2015). Therefore, Weibo and Wechat are typical mobile social media applications in China.

2.3 Accessibility of non-Chinese Social Media

The accessibility of a website is quite important for its potential users, such as older users and users with different kinds of disabilities. However, according to a report conducted by (Watkins & Xie, 2011), researchers tested 140 health-related social media websites with Total Validator which is an automatic tool for testing the compliance of web accessibility. The report indicated that only 3 websites fulfilled the lowest level of Web Content Accessibility Guidelines (WCAG) 2.0. It means that almost 98% social media websites were inaccessible for old adults.

The authors (Rogers et al., 2011) mentioned on their book “Interaction Design beyond human-computer interaction” that, to evaluate is to make the design process more integral. Researchers, who try to evaluate a prototype, a system or one component of a computer system, should collect users’ experiences when they interact with these products. The usability and accessibility of the products are important for wider user population. Is it easy to use? Is it truly fulfilling user's exact needs? Does the user use without fuss or barriers? These questions are the basic requirements of evaluations.

Therefore, in this section, we collected some experiential relevant researches so that to have a better understanding of evaluating a social media website. First of all, to decide a target group is something important in evaluation projects. According to (INCOM, 2008), there are a lot of impairments, which means different people with different kind of disabilities have different needs and at the same time, e-products should provide a wide range of solutions to remove a great variety of barriers. As we all know, there are several kind of impairments, for instance, visual, motor, hearing, cognitive and speaking disabilities.

The basic requirement for making accessibility is making every single social media accessible enough step by step. Some mash-up phenomenon happen among several kinds of social media, for instance, the videos from Youtube are posted on Facebook while this Facebook account embedding with blogs. If one of them is lack of accessibility, all those operations would be influenced (Kent & Ellis, 2015).

Based on the classification from (Kaplan & Haenlein, 2010), about blog we only found some guidelines for making blog accessible and no relevant valid researches come out so far. Furthermore, there is no former research evaluating the virtual social worlds (e.g. Second Life) and virtual game worlds (e.g. World of Warcraft). To making all the video to have captions with accessible standards is not possible in China so we will not include the researches about Youtube also in this section. Thus, the accessibility of worldwide social media we discussing are divided into three different sections: Facebook, Twitter and Wikipedia, which represent social networking, microblog and text-based service separately.

2.3.1 Facebook

On Facebook ("Accessibility for People with Disabilities,"), it provides guidelines for people with disabilities when they first use Facebook. Facebook allows them to use keyboard shortcuts to navigate Facebook. People with visual impairment also could use keyboard shortcuts with screen reader. Meanwhile, the CAPTCHA can be interpreted into letters and numbers for people using screen reader to understand. On 4 April of 2016, breaking news about blind people came out with Facebook. It is reported that blind people could receive the information from photos through automatic alternative text (Wu & Wieland, 2016). The new technology will generate a description of photo automatically so that blind people can hear some keywords about this photo and image what the photo looks like. Facebook also provides a platform for people with disabilities to report their Facebook experience and what kind of functionalities and services they need.

Some design projects about making Facebook friendly are found but they have different target group.

The research article from (Davies et al., 2015; Gomes et al., 2014) has designed a tablet-based prototype for senior users to use Facebook. The first two problems they met are: (1) it is difficult to let all the users to accept the special designed interface of Facebook, especially the young users. And (2) how to make the masses notice this new product is another issue should be considered. That is why they chose to design an

adaptive prototype to help older adult to communicate online instead of making some changes on Facebook native application.

The researchers adopted a mix method component by focus group, including interviews and user observation. From the result, they got one of the most important issues is that the senior users care about are privacy of what they post and they also concern about who could view the post content. What is different from the native Facebook mobile application is that the prototype they created has extra functionality of choosing who is visible to their post. Besides, the prototype provides family graph presentation as well.

Based on what they found in qualitative result, a new prototype was produced and they conducted comparison with Facebook's native Android application through task performance and observation. They got the result that the native Facebook application is not usable enough for the elderly since for instance, they found it not easy to post, very difficult to find out their family members from list, hard to find the media filter and such a kind of functionality does not useful for them. At the same time, their new prototype looks better.

Another design project is for helping people with intellectual disabilities, researcher (Davies et al., 2015) developed a new prototype called Endeavor Connect for people with intellectual disabilities to use Facebook independently. Before designing Endeavor Connect, researchers conducted a pre-interview with people with intellectual disabilities, their families, their assistance and administrators in order to have a better understanding of what their special need when using Facebook. Based on previous research, the interface of Endeavor Connect was designed with combination of pictures and familiar-voice audio, such as a parent-voice audio prompt and a bigger picture button, which help people with intellectual disabilities to understand the web content in a better way. People with intellectual disabilities could use Endeavor Connect directly instead of using Facebook. It has the same basic functionalities as Facebook and the training tutorial of how to use Endeavor Connect is available for beginners.

Then they used a pilot testing to test if the interface of Endeavor Connect is accessible or not for people with intellectual disabilities. 12 young adults with certain intellectual

disabilities took part in this pilot testing. The IQ score of them is ranging from 38 to 66. They were not Facebook users before using Endeavor Connect. They asked to perform five typical tasks on both Endeavor Connect and Facebook with the same 21.5-inch screen.

The five typical tasks included 1) reading and comprehending a new post, 2) creating a new post, 3) posting a message with pictures, 4) navigating a friend's Facebook page, 5) after doing 4), navigating back to their own homepage.

Researchers recorded down the successful task-performed times, the assistance times they need and the error times. From the result, it was obvious that the participants have lower error times and few assistant times when using Endeavor Connect.

A brief interview aimed to identify their preference and how much they perceive when they use Endeavor Connect and Facebook happened after completing five tasks on each prototype. The response from them is that they would like to hear the familiar voice from people they known before and the bigger-sized menus made them easier to focus and operate.

Using survey to get information from specific users is also a popular method to do an evaluation about accessibility.

(Shpigelman & Gill, 2014a) conducted an online survey, which used SurveyGizmo to guarantee the usability and accessibility of its survey. They put the survey on Facebook Ads to obtain more participants randomly. The survey included some Likert scale questions for the frequency of using Facebook, two open-ended questions about their personal advice and several demographic questions about personal information. The quantitative data, which is achieved from Likert scale questions, used paired samples *t*-test to show that Facebook users with disabilities behaved similarly compared to the non-disabled users. The qualitative results from open-ended questions, mentioned three aspects from people with disabilities. The technical accessibility is one of those issues. They thought when the Facebook version updated; some basic operations changed and made them confused, which is a kind of navigation barrier. Besides, it is also mentioned

the text-based instant message is a good way for them to communicate easily and relaxed than face-to-face communication with non-disabled friends.

Social networking sites, like Facebook, have potential social function to help people with intellectual disabilities (Shpigelman & Gill, 2014b). People with intellectual disabilities could rebuild their relationship and self-determination by using Facebook. However, they meet literacy challenges when they use these social media as people without disabilities do. In this research, authors conducted online survey which was written by accessible and plain language to explore their online experience, preferences and challenges they met before. The survey included Likert scale choices and open-ended questions.

Combined the survey results and previous researches, they found people with intellectual disabilities faced three challenges when they use Facebook. Firstly, they may find it difficult to sign in their personal account with username and password. After signing in, it is the second challenge that some specific terminologies and concepts in Facebook may make them confused. Finally, the privacy issue is another thing to understanding since people with intellectual disabilities have difficulties in literacy.

From the open-ended questions in qualitative analysis, the participants mentioned that one of the biggest accessible challenges is the Facebook timeline change frequently too much. They suggested that there should be an alternative setting or adjustable version of Facebook, something like “easy-Facebook” by using Elgg (<https://elgg.org/>), for people with intellectual disabilities to accommodate the complexity. Besides, to improve the accessibility of Facebook, the voice recognition with more icons and less text would be a good method for them to keep up with all the context and concepts in Facebook. The researchers also indicated that it is important to hear some real-experience from people with intellectual disabilities. That is why they chose survey with open-ended questions to retrieve information they really need.

2.3.2 Twitter

The pioneers of SNS evaluation study might be (Lee et al., 2013). Four researchers chose Facebook, Twitter, Me2day and Yozm as their target SNSs. Eight people with different kinds of disabilities participated in this research. Among them, two are total

blindness while two with low vision. And two participants have brain lesions while the other two have extremely disable with their upper. All of them have Information and Communication Technology (ICT) experience more than 3 years.

The participants were asked to perform navigation-related tasks and general tasks on each social media platform. The researchers would record their success rate at the same time. According to the National Information Society Agency, people with disabilities using a website have average 3 times as much time more than people with non-disability do. Besides, they also generated a satisfaction questionnaire with a five-point Likert scale for the participants.

From the statistical results, they found that Facebook was inaccessible in text and skip navigation according to the low success rate and significantly low satisfaction score with 2.3. As for Twitter, they found more accessible issues. The online form in Twitter is illogical which leads to people with visual impairments cannot identify these forms. Moreover, the participants also thought that they could not access the webpage by using keyboard only.

Besides, there is a research about people with communication disabilities. As discussed by (Hemsley et al., 2014), Twitter is the most suitable social media for people with limited literacy since it has short (140-character) messages on website. It is obvious that people with communication disabilities often have limited literacy. However, due to the totally different syntax from Facebook, people with communication disabilities did not choose Twitter as their social tool because of cognitive pressure. One of the reasons, why people with communication disabilities should choose Twitter as their social tools, is that the mobile applications of Twitter have better tolerance of word spelling and poor grammar. People with physical disabilities would like to have less keystroke.

The researchers thought that they only need an effective training of how to using those syntax (e.g. MT, RT, # hashtags, @) so that people with physical and communication disabilities could benefit from this micro-blogging. Thus, in the research (Hemsley et al., 2014), they conducted three studies for their training module, including creating and evaluating it. In study one, they made a face-to-face survey designed for people with

physical and communication disabilities. A pilot survey of 10 adults was also conducted before the real survey for 400 adults with different physical or communication disabilities degree happened. The survey answers include Yes/No responses, Likert scale responses and opened comment responses. The survey is to have a better understanding of what people with physical and communication disabilities needs are and what kind of preference they like. The qualitative and quantitative result of this survey will be taken into consideration on designing a training module of study two.

In study two, they did a training experiment for evaluating the efficiency of training module for Twitter. The participants signed a consent form before doing the experiment. All of 36 participants are novice of Twitter. The Tweet data collection tool NCapture combined with data analysis software NVivo was used as add-on on participant's browsers. The experiment was last for three months. The efficiency of training module was evaluated by the usage comparison between before and after training and how much information exchanged.

In study three, all the 36 participants in study two were recruited as well. This study aimed to get some post-comments from the participants and get the data analysis from NVivo to evaluate the training module.

2.3.3 Wikipedia

Wikipedia is one of six websites that people visit most frequently in 2012. It is the website that people retrieve knowledge they unknown. Especially for students, Wikipedia have big influence on their study lives. Researchers (Rello et al., 2013) found that around 10% students have dyslexia, which have limited reading ability. If the content on Wikipedia is not accessible enough, it would lose a big part of potential users. Thus they conducted an experiment about font size and line spacing. They chose the font size 10, 12, 14, 18, 22 and 26 points while choosing line spacing with 0.8, 1.0, 1.4 and 1.8.

Here, 28 people with dyslexia took part in experiment. They were asked to read six Wikipedia articles which have the similar topic. Besides, eye-tracking is used to determine the most readable text on screen. The comprehension tests and feedback

from participants were also adopted after reading. From the analysis of eye-tracking machine, researchers found that 18 points font size was more readable for people with dyslexia according to the fewer repeat times to read the same line. However, they thought line spacing have no impact on text readability, because they could not find any big differences among 4 different line spacing. This is due to the limitation of their experiment design. Obviously, line spacing has inevitable impact on reading performance of people with dyslexia. The smaller line spacing they get, the more readability of text content they lose.

2.4 Accessibility of Chinese Social Media

There is a study (Hu et al., 2015) used the tetra-class model to evaluate user satisfaction of Sina Weibo. The tetra-class model is to divide the service elements into four categories, including Basic, Plus, Key and secondary. They represent basic functionalities, extra functionalities, critical functionalities and irrelevant functionalities respectively. The Basic functionalities include post, repost, comment, “@” and private chat. The Plus functionalities are identification policy, Weibo desktop, advertisement eliminator, and follower filter. The Key functionalities concern post navigation and account privacy. The Secondary functionalities are Vdisk using for sharing documents on Weibo, news topics for discussing and Weibo Games.

This research analyzed the user satisfaction and dissatisfaction of each element on Sina Weibo. Researchers chose random interview, online questionnaire with Likert Scale. They select balanced percentage of male and female participant. However, almost all the participants are young adults with higher education background. This study aimed to reveal the satisfaction representing as much Weibo users as possible since 51% users are from 26 to 35 years old (Svensson, 2014). From the result, they found that Weibo users paid most attention to three aspects which are efficiency, security and empathy sense. If these three aspects are fulfilled, the user satisfaction will become higher relatively.

Researchers believed that user experience plays an important role in the product development. They provided some recommendations to increase the satisfaction

through evaluation analysis and user experience, which helps Sina Weibo to reveal critical problems. Besides, according to different characters from different user group, they tried to help Weibo become more efficient. For instance, they found that common users paid more attention to the Key functionality, the post navigation than that for certificated users, who have more followers on Weibo. Meanwhile, the certificated users focus on advertisement eliminator while common users doing not. Therefore, Weibo developer could customize the user preference according to how much followers they have and then adjust the default settings.

Findings from the study by (Sun, Ding, Lindtner, Lu, & Gu, 2014) show that although only 5.9% seniors (from 50s to 70s) in China use Internet frequently, the ICT become an inevitable component of their daily lives. Even some of them said that they would spend 7 hours on Internet with their friends or communicate with families after retiring.

According to 17 elderly interviewers, researchers found a barrier which the majority of seniors may encounter is that they could not use PinYin (the most popular Chinese character input method) to type Chinese characters since their absence from education during the Cultural Revolution from 1960 to 1970. Besides, some interviewers thought some features, such as “shake” functionality (when user is shaking his mobile phone, a friend from Internet will come up) on Wechat, are not necessary for them when using Wechat. Meanwhile, they thought that this kind of functionalities is risky because they use Wechat only for contacting their families. Some of them said they never thought of making new friends on virtual world. Thus, researchers suggested that the social media should extend some family-like features and settings only for old adults.

The table below is showing the keywords that I put in two different engines. Although there are many so called relevant papers come out from Google Scholar, almost all of them are not relevant. For Weibo, the searching results presented on Google Scholar are something related to disabled or impairment when these papers could be shared as a link on Weibo platform. Some papers even are written by a people named Weibo. Therefore, I limited the publish time after 2009, which is the year that Weibo released. Besides, some articles which only mention Weibo one time are also included in the searching result. Meanwhile, Wechat (or Weixin) has the same situation as Weibo.

Table 1 Search result with specific keywords in two scholar search engines

		Search Result in different search engines		
Keywords		Google Scholar	Web of Science via HiOA	Valid Article
Weibo	Disabled Disability Impairment	353	0	0
	Accessible Accessibility	815	11	0
	Barrier	1470	0	0
	WCAG	287	0	0
	Evaluation	1550	7	1
	Inclusion Inclusive design	1440	0	0
Weixin Wechat	Disabled Disability Impairment	8	0	0
	Accessible Accessibility	95	3	1
	Barrier	62	0	0
	WCAG	2	0	0
	Evaluation	359	0	0
	Inclusion Inclusive design	40	0	0

The result showed us that there is an obvious gap between information accessibility and Chinese social media. That is why we choose Weibo as our case study to evaluate the accessibility of Chinese social media, which is a meaningful and achievable project for Chinese people.

3 Methodology

As said by four Korean researchers (Lee et al., 2013), there are three main methods to evaluate the web accessibility, including automatic testing, heuristic testing and user testing. The Bobby, LIFT, WAET belong to automatic tools, which are used to test the web accessibility automatically. According to previous studies, the methodology of this study has consisted of 4 main methods to cover the whole evaluation process. This evaluation research firstly included automatic testing in order to get a technical testing result from automatic tools. Then a survey is conducted. Using survey is a well-established method to collect demographic data with specific questions and options. Thirdly, heuristic testing is used to follow guidelines and check accessible issues manually by researcher who can analyze accessibility issues professionally. Lastly, user testing, which is used for involving people with disabilities or elderly people in evaluation, help researcher directly get experience of human-computer interaction on website and mobile applications we evaluating. It is also the most important and valuable part in evaluation research. In the following sessions, we depicted an overall print of what these methods are and why they are appropriate for this project.

3.1 General on Survey

Survey is a method for gathering data that could involve a group of people. Doing a survey is the process of collecting and analyzing data. If you want to collect a big amount of response, survey is time consuming. However, survey is used for a targeted audience so that the response can fulfill the requirements from the aim of survey. Both of open and closed ended questions are included in survey. The respondent can choose the options given and respond by their subjective opinions.

In a general survey, question designer need to identify how to select and contact with sample members. The question before delivering should be evaluated and tested. The order of these questions should be considered carefully at the same time. Moreover, the options belonging to the same questions should relate to each other or have a meaningful sequence (WIKIPEDIA).

According to (merriam-webster), we know that survey has three definition:

1. Asking people questions so that more information about what most people think of something or how they do something.
2. Testing all aspects of (object).
3. Measuring a specific area.

Before doing a demographic survey, we had no idea about how many people with visual impairments pay attention to Weibo. If they use Weibo as frequent as people without visual impairments do, what kind of barrier they meet while using Weibo. Since it is not possible to include all kind of people with disabilities in this project, doing a survey is a method that helps researcher narrow down the range of target users. Meanwhile, from the result of survey, researcher could know more about what they do on Weibo and what they think of Weibo.

3.2 Automatic Testing

Automatic testing means using web accessibility automatic evaluation tools to assist researcher in evaluation. It is a good method to reduce time and effort but get more insights of webpage content. The automatic evaluation tools can determine what web content misses accessibility considerations and what the problems are (W3C, 2005). Then researcher can improve the accessibility quality of testing pages in terms of the report given by automatic evaluation tools. Since there is still no available evaluation tool for mobile application, we focus on web accessibility in this section.

3.2.1 Automatic Tools

With the help of evaluation tools, we can find some accessible issues which cannot be detected by eyes. Automatic testing is to use automatic tools, such as Automated Accessibility Testing Tool (AATT), Accessibility Checker, and AccessLint.com, to check the accessibility issues automatically. Then giving a result in a report is the sequence after each testing.

Until 2016, there are 88 professional automatic tools available. People can choose anyone of them in terms of what kind of guidelines they want to fulfill, language, types, technology and so on. We have 10 accessibility guidelines in total, for instance, WCAG 2.0, WCAG 1.0 and BITV for Germany websites. The automatic tools can be divided into six types, including browser plugin, online tools and etc.

If you select the automatic tools, which following by WCAG 2.0, it will always follow the WCAG 2.0 strictly and check every single elements of webpage content step by step. Then the testing report, which is generated automatically from the tools, allows researcher identify accessible issues more easily with less time debt. As for automatic testing of Weibo, researcher chose three web accessibility testing tools which are all based on WCAG 2.0, including two online tools and one browser plugin. They are AChecker, AccessLint.com and WAVE Evaluation Tool.

3.2.1.1 AChecker

AChecker ("AChecker,") is used for checking the accessibility issues of single HTML webpage online in order to make sure the content of these webpages are available for everyone to the greatest extent. This tool strictly follows the International accessibility guidelines, such as the WCAG 1.0 and the WCAG 2.0, which are the International accessibility guidelines. It also support the guidelines from Germany, United Stations and Italy, which are called BITV 1.0 (Germany), Section 508 (U.S.) and Stanca Act (Italy).

The screenshot shows the AChecker web accessibility testing tool interface. At the top, there is a section titled "Check Accessibility By:" with three tabs: "Web Page URL" (selected), "HTML File Upload", and "Paste HTML Markup". Below the tabs is a text input field labeled "Address:" containing the URL "http://www.weibo.com". A "Check It" button is positioned below the input field. Underneath, there is a section titled "Options" with three checkboxes: "Enable HTML Validator", "Enable CSS Validator", and "Show Source". Below the options is a section titled "Guidelines to Check Against" with nine radio button options: "BITV 1.0 (Level 2)", "Section 508", "Stanca Act", "WCAG 1.0 (Level A)", "WCAG 1.0 (Level AA)", "WCAG 1.0 (Level AAA)", "WCAG 2.0 (Level A)", "WCAG 2.0 (Level AA)", and "WCAG 2.0 (Level AAA)". The "WCAG 2.0 (Level AAA)" option is selected. At the bottom, there is a section titled "Report Format" with two radio button options: "View by Guideline" (selected) and "View by Line Number".

Figure 1 the layout of AChecker

The figure 3.1 shows the layout of *AChecker*. The smart and brief features of *AChecker* are the reasons why researcher chose *AChecker* to evaluate Weibo webpages. People who want to test his webpage can easily put the URL into the input field and click the button with description “Check It”. Then the user will get the feedback in a few seconds and even can get the PDF report from *AChecker* very easily. It is not only a very good User Interface design, but also an accessible website so that everyone can operate it very easily.

About the feedback, *AChecker* generates a report with clear statement for all the existing accessibility problems, the partial problems and the potential problems with possible solutions. What’s more, users can select the guidelines based on what the type of webpages and what they need.

3.2.1.2 AccessLint.com

AccessLint.com is released on 2014. This online testing tool is a quite new, which is for accessibility developer. That means to use AccessLint.com needs code-based accessibility knowledge in order to fix the accessibility issues directly and efficiently. Unlike the *AChecker*, the WCAG 2.0 is the only guideline it follows.

The basic operations to check accessibility issues are similar to *AChecker*, which need to input the URL of single webpage and click the button below to process. The difference between two online testing tools is shown in the feedback they gave. The AccessLint.com will list out the source codes which need to be adjusted by the developers for fulfill the specific accessibility guidelines. The figure 3.2 shown below is an example about the visible problems of focusable elements.

to determine where the problems are and what kind of problems it is. The figure 3.3 below is a feedback sample after clicking on the WAVE icon on chrome browser.



Figure 3 a feedback sample after clicking on the WAVE icon

3.3 General on Heuristic

Although there are 58 automatic tools based on WCAG 2.0 strictly, there are still many accessible problems could not be identified automatically. Thus, an evaluation project needs to do heuristic testing along with automatic testing. The heuristic testing is a method for testing interaction products manually based on the checking list from WCAG 2.0. The heuristic testing is not only for Webpages, but also for mobile applications which indeed need to check manually, since there is no automatic tool for testing mobile applications until now. Here we did heuristic testing both Weibo webpages and mobile applications on iOS and Android platform.

Web Content Accessibility Guidelines (WCAG) 2.0 is the fundamental theory of this heuristic evaluation. WCAG 2.0 includes a wide range of guidelines about how to make Web content accessible for elderly and people with disabilities. Each guideline has a series of testable success criteria that are generally at three levels: A, AA and AAA ("What is in WCAG 2.0," 2012). By following these guidelines and success criteria, the Web content, which is all information in webpages and its code and makeup for website structure, will be more usable and accessible. However, if the Web content could not

fulfill the requirements on WCAG 2.0, it means it needs to fix some problems that are not accessible enough.

For checking accessibility of mobile application, we have World Wide Web Consortium (W3C) mobile accessibility considerations (W3C, 2015), which are not the additional guidelines for mobile but consider some special factors of mobile, such as small screen and gestures. They are the branch of existing W3C Web Accessibility Initiative (WAI) accessibility standard.

3.4 User Testing

In evaluation study, it is very important to include user's opinion into iteration design. It is said that the user experience is the most value core of evaluation. Therefore, for Weibo, we aimed to include as much users involved into this research. Qualitative methods are used to collect user experience. We decided to use observation and semi-structured interview as our main qualitative methods in user testing.

3.4.1 Observation

Observation is going to see what people do during the research. Researcher can get the nonverbal expression of feelings in observation. It is a general method in case studies. There are three main types of observation, including controlled observations, naturalistic observations and participant observations (McLeod, 2015). Based on the definition of each type, we decided to use natural observations since we aimed to get more insight experience about how people with visual impairments feeling when using Weibo. In naturalistic observation, researcher is asked to simply record down what they see when observation happened.

3.4.2 Interview

Interview is a method of conversation with purpose. In order to get more details and understanding of what users' opinions are, doing an interview is a good method to achieve that. Interview is a conversation between two people with specific purpose and topic. It help researcher to get more personal ideas than survey. Generally, there are four different types of interviews: open-ended structure, structured, semi-structured and group interview.

In interview, interviewer needs to specify the interview purpose based on the questions to be addressed and the lifecycle stage of software. Meanwhile, to get the agreement from respondent is also important. Followed by the introduction of interview, demographic section is conducted for warming up, which is a way to make respondent relaxed. The main session of interview will be guided by the interviewer based on the respond. Lastly, the closing session is included to show the thanks from researcher.

Before the interview happened, the consent form should be designed tailored for the research purpose. Since the interview is recorded by audio, the consent form is an agreement from participants, which is also a way to concerned about ethic. Then participants are asked to sign the consent form before interview.

4 Testing

Here we chose Weibo website and mobile application as our target. The researcher tests Weibo webpages with three automatic tools. With the help of Information Accessibility Research Association (IARA), the survey was conducted at the same time. From the result of survey, researcher would focus on what the most important elements are for specific group of users on Weibo. The accessibility issues of mobile applications were checked by researcher according to the WCAG strictly since there is no automatic tool suitable for mobile devices. The webpages on Weibo were checked manually as well. Furthermore, to specify user's need, the user testing is included in this study to understand the user's need deeply.

4.1 Survey

From the result of automatic testing on Weibo, it is easy to know that the main accessibility issues on web Weibo are alternative text for images, proper structure for presenting, and contrast between text and background. However, it is just the result from automatic tools, which cannot represent the opinions from users with visual impairments. Thus, we decided to conduct a pre-survey to know more about people with visual impairments. Through web-based survey, the results are from people with visual impairments, who have IT background as well. Their opinions were well-collected by structure questions.

4.1.1 Questions designed

Several staff with visual impairments from Information Accessibility Research Association (IARA) provided some advice for designing the questions on survey in order to make sure every question and option makes sense. The questions on survey are designed as follows:

1. Which is your favorite way to surf on Weibo?
 - A. Web Weibo
 - B. Mobile applications of Weibo.
2. How often do you use Weibo?
 - A. Almost every day
 - B. Three to four times for a week

- C. At least once a week
 - D. Sometimes
 - E. Never
3. Choose three options that you use them often on Weibo.
- A. Repost
 - B. Comment
 - C. Write a post
 - D. Like
 - E. Hot Weibo
 - F. Search
 - G. @
4. Do you think the following Weibo versions need to improve its accessibility?
- A. Mobile Weibo on iOS needs
 - B. Mobile Weibo on iOS does not need
 - C. Mobile Weibo on Android needs
 - D. Mobile Weibo On Android does not need
 - E. Web Weibo needs
 - F. Web Weibo does not need
5. Choose the options that you think it need to improve its accessibility on Weibo.
- A. Logical sequence for screen readers
 - B. Contrast between text and background
 - C. Alternative text for images
 - D. The proper explanations for labels and buttons
 - E. Others, and please specify_____.

The purpose of this survey is to collect as many opinions as possible, about which Weibo versions that people with visual impairments prefer mostly, what kind of barriers they encounter when using Weibo and etc.

The survey result helped researcher to design user testing better. Moreover, the demographic data from survey also support that the opinions are from a group people, but not individual.

4.1.2 Platform

IARA provided researcher a good platform to publish the survey. It is called PC-Secretary. PC-Secretary is a kind of assistive software for users with visual impairments. It is popular software in China since more than 40 thousands users using it daily. Based on screen reader, PC-Secretary is assistive software which uses special Application Programming Interface (API) to filter redundant information appeared on websites. Besides, it provides a simple but logical sequence for websites. The administrator of PC-Secretary is a software manager in IARA. He helped researcher to publish the survey on PC Secretary.

The survey would appear when users open PC Secretary in a new day. Certainly, users have right to skip or finish the survey. In order to include 500 and more opinions, researcher and the administrator of PC-Secretary decided to publish the survey for three days on the first page of PC-Secretary. Besides, the responding would be collect automatically by the server. The survey is presented in Chinese.

4.2 Automatic Testing

In this part, researcher uses three kinds of automatic tools to test five main webpages of Weibo. The automatic tools are *AChecker*, *AccessLint.com* and *WAVE Evaluation Tool* as the reference testing tools. WCAG 2.0 Guidelines is the following standard during the test. The five main Webpages of Weibo are selected by researcher according to the basic requirement and using frequency from Weibo users, which include Login and Register Pages, Personal Home Page, Setting Page, Message Page and Hot Topic Page. Researcher used three tools to test every single Page separately and presented the result report separately. Then the results would be compared and analyzed.

4.2.1 Weibo Webpages for Testing

Since there are a lot of Webpages contained in a social media website, and a big part of them are used for extending the extra functionalities so that users would like to stay and continue use it as much as longer. In this project, researcher test five basic pages of Weibo, which include several basic functionalities of Weibo. The chosen Webpages of Weibo are as follows:

- Login and register Pages

- Personal Home Page with default settings
- Setting Page
- Message Page
- Hot Topic Page

Login and Register Pages

The Login and Register Pages are the first parts when people start to use Weibo. It need users to fill in their information when register Weibo. Then users get access to their personal account by input their account information, such as user name and password correctly, sometimes users also need to identify the CAPCHA below at the same time. Besides, Weibo users also can login Weibo by scanning the QR code appeared on the screen which need to install Weibo mobile application as well. Therefore, it is very important to make every single element in these two pages accessible so that people can register and login Weibo successfully and continue to use it. That is why researcher chose them to test firstly.



Figure 4 the login pages on Weibo (general login)



Figure 5 the login pages on Weibo (login with QR code)

个人注册 | 官方注册

* 邮箱:

或使用 [手机注册](#)

* 设置密码:

* 验证码:  [换一换](#)

[立即注册](#)

[微博服务协议](#)
[微博个人信息保护政策](#)
[全国人大常委会关于加强网络信息保护的決定](#)

Figure 6 Figure 3.5 the register pages on Weibo (register with email)

个人注册 | 官方注册

* 手机:

或使用 [邮箱注册](#)

* 设置密码:

* 激活码:

[立即注册](#)

[微博服务协议](#)
[微博个人信息保护政策](#)
[全国人大常委会关于加强网络信息保护的決定](#)

Figure 7 the register pages on Weibo (register with mobile)

Personal Home Page with default settings

The personal home page of Weibo users is a page for showing what you have posted in the past. It is a something like the Facebook Timeline. The home page is also a place

where users can edit their personal information and their posts. As a social media website, the personal home page is the first thing when other users who does not know you before. It is no doubt that makes it accessible is quite necessary so that all people can edit information fluently without barriers. Here research chose the personal home page with default setting which is provided by Weibo originally.



Figure 8 a sample personal home page with default settings on Weibo

Setting Page

The Setting Page is the webpage for Weibo users to modify details as their preference, such as private settings about personal location, blacklist and etc. It concerns personal information setting, updating the profile photo, privacy setting, message setting, preference setting and etc. The message setting, which allows users to define which group of followers can comment or repost my posts, and who can send me private message through Weibo instant message. The preference setting is included into Setting Page. However, users just can modify some settings about reminding and language. There is no setting about changing the font size, the color and the contrast. Due to such a problem happened on Weibo, it may cause a part of desktop-users stop using web Weibo since they cannot use Weibo in an easy and relaxing way.



Figure 9 Setting Page on Weibo

Message Page

The message page on Weibo is a container for all the messages, including @ (in a post & in a comment), comments on my posts, likes on my posts, private messages through Weibo instant message, group chat and etc. Weibo users can communicate with other users on message page. Moreover, when a new message comes, a yellow tag appeared for reminding on the left-top corner of Weibo. Users click the tag and get into the message page to reply or edit the message. Thus, the message page is the core page of Weibo, which is a place providing a direct way for users to communicate. It is also a page for manage the messages. If the message page is not accessible, Weibo will lost a lot of funs absolutely.



Figure 10 the message page on Weibo

Hot Topic Page

The hot topic page on Weibo is showing the hottest Weibo post within 24 hours and the hot topic that people discussing on Weibo. In China, Weibo is also a platform for people to discover and discuss the current news. It is believed that Weibo will be the new media which have the same and even bigger influence than traditional media, such as newspaper and television. The reason of that is everyone can be a broadcaster and comment on the current event no matter who you are. Therefore researcher believed that the hot top page is also an important part of Weibo, which means its accessibility also should be considered in the first place.



Figure 11 the hot topic page on Weibo

4.2.2 Automatic Tools used

In automatic testing, we put every single webpage link into two selective automatic tools, *AChecker* and *AccessLint.com* generated a single report for each page. Besides, we chose one browser plugin tool called *WAVE*, so we can directly know the accessibility problem list through the internal window generated by *WAVE*. Researcher will record them down in separate tables. Thus, after testing, we had 10 accessibility checking reports in total from *AChecker* and *AccessLint.com*, 5 problem lists from *WAVE*. Each page of Weibo has three results from three automatic tools.

4.3 Heuristic Testing

The heuristic testing for Weibo is conducted from September to October, 2016. Researcher took the latest current versions of Weibo into testing. The details about different platforms and devices are shown in below table.

Table 2 Operation Systems, Devices and Weibo Version Evaluated

Operation System	Device	Weibo Version
Windows 7	DELL	Online Weibo
iOS 8.4.1	IPhone 6	6.10.0
Android 4.4.2	MEIZU MX4	6.8.0

4.3.1 Web Weibo

Besides, there is no relevant Chinese Web content standard for checking accessibility, thus researchers still chose WCAG 2.0 as the reference although WCAG 2.0 is mainly for English content.

The five webpages tested in automatic testing, including Login and Register Pages, Personal Home Page, Setting Page, Message Page and Hot topic Page, are chosen for heuristic testing again for consistency.

Based on WCAG 2.0, researcher made a list of guidelines and success criteria for checking the online Weibo by heuristic testing. In addition, our research aims to find out Weibo accessibility issues for people with visual impairments. Therefore, researcher selected some relevant criteria from WCAG 2.0 instead of checking all of them. For example, as we all know, there is no caption transcript in all videos and audios in China. Therefore, we will not include the success criteria about caption into checking list, such as success criteria 1.2.2 Captions (Prerecorded) (Level A).

The following table is made for checking:

Table 3 Accessibility Checking List for Webpages

Principles	Guidelines	Success Criteria
Perceivable	1.1 Text Alternatives	1.1.1 Non-text Content (Level A)
	1.2 Time-based Media	1.2.1 Audio-only and Video-only (Level A)
	1.3 Adaptable	1.3.1 Info and relationships (Level A)
		1.3.2 Meaningful Sequence (Level A)
	1.4 Distinguishable	1.4.1 Use of color (Level A)
		1.4.3 Contrast (Level AA)
		1.4.4 Resize text (Level AA)

Principles	Guidelines	Success Criteria
		1.4.5 Images of Text (Level AA)
		1.4.8 Visual Presentation (Level AAA)
Operable	2.1 Keyboard Accessible	2.1.1 Keyboard (Level A)
		2.2 Enough Time
	2.3 Seizures	2.3.1 Three flashes or below threshold (Level A)
	2.4 Navigable	2.4.1 Bypass Blocks (Level A)
		2.4.2 Page Title (Level A)
		2.4.3 Focus Order (Level A)
		2.4.4 Link Purpose (Level A)
		2.4.5 Multiple Ways (Level AA)
		2.4.6 Headings and labels (Level AA)
		2.4.7 Focus Visible (Level AA)
Understandable	3.1 Readable	3.1.1 Language of Page (Level A)
	3.2 Predictable	3.2.1 On focus (Level A)
		3.2.2 On Input (Level A)
		3.2.3 Consistent Navigation (Level AA)
		3.2.4 Consistent Identification (Level AA)
		3.2.5 Change on Request (Level AAA)

Principles	Guidelines	Success Criteria
	3.3 Input Assistant	3.3.1 Error Identification (Level A)
		3.3.2 Labels or Instructions (Level A)
		3.3.3 Error suggestion (Level AA)
		3.3.4 Error Prevention (Level AA)
		3.3.5 Help (Level AAA)
		3.3.6 Error Prevention (ALL) (Level AAA)
Robust	Compatible	4.1.1 Parsing (Level A)
		4.1.2 Name, Role, Value (Level A)

Four evaluated result are defined as “Yes”, “No”, “Partial” and “N/A”, to represent separately. “Yes” means it fulfill the criteria successfully while “No” representing fail. “Partial” means some elements on this webpage pass the conformance testing but some are not. At this situation we cannot define it as “No” so “Partial” is suitable. And “N/A” represents the criteria is not related or applicable at this situation.

4.3.2 Mobile Weibo

As shown in table below, the mobile Weibo have five pages generally, including Home Page, Message Page, Post Page, Discover Page and Me Page. Basically, Home page is used for viewing following users’ posts and does some interactive operations with it. Weibo Users view their response from other users through Message Page. Post Page is a page for users to choose what kind of post he wants to post, such as post with pictures, videos and etc. Users can know more about current events and how people discuss in Discover Page. Me Page is used for managing user’s own account, which is a similar page combined Setting Page and Personal Home Page on Web Weibo. We

summarized the main functionalities which were evaluated by researchers on below table.

Table 4 Page and Functionalities on mobile Weibo

Page	Functionalities
Home	Repost
	Comments
	Likes
	Choose Groups
	Manage Group
	Favorite
	Friends Follows
	Radar
	Search
Message	(View) Mentions
	(View) Comments
	(View) Likes
	(View) Messages
	Find Group
	Chat
	Private Chat
Post	Text
	Photos/Video
	Top Article
	Check in
	Live
	More
Discover	Search
	Hop topic
	Hottest Weibo

Page	Functionalities
	Add Follow
Me	Personal Page
	Following
	Follower
	Add Friends
	Settings
	Albums
	My Likes
	Favorite
	Draft Box

Based on World Wide Web Consortium (W3C) mobile accessibility considerations (W3C, 2015), we conducted heuristic testing for mobile Weibo by following checking list.

Table 5 Accessibility Checking List for Mobile applications

Principles	Guidelines	Success Criteria
Perceivable	Small Screen Size	-
	Zoom/Magnification	1.4.4 Resize text (Level AA)
	Contrast	1.4.3 Contrast (Minimum) (Level AA)
1.4.6 Contrast (Enhanced) (Level AAA)		
Operable	Keyboard Control for Touch Screen Device	2.1.1 Keyboard (Level A)
		2.1.2 No Keyboard Trap (Level A)
		2.4.3 Focus Order (Level A)
		2.4.7 Focus Visible (Level AA)
	Touch Target Size and Spacing	-
	Touch Screen Gestures	-
	Device Manipulation Gestures	2.1.1 Keyboard (Level A)
	Placing Buttons where they are easy to access	-

Principles	Guidelines	Success Criteria
Understandable	Changing Screen Orientation (Portrait/Landscape)	-
	Consistent Layout	3.2.3 Consistent Navigation (Level AA)
		3.2.4 Consistent Identification (Level AA)
	Positioning important page elements before the page scroll	-
	Grouping Operable Elements that perform the same action	2.4.4 Link Purpose (In Context) (Level A)
		2.4.9 Link Purpose (Link Only) (Level AA)
	Provide Clear Indication that elements are actionable	3.2.3 Consistent Navigation (Level AA)
		3.2.4 Consistent Identification (Level AA)
Provide Instructions for custom touch screen and device manipulation gestures	3.3.2 Labels or Instructions (Level A)	
	3.3.5 Help (Level AAA)	
Robust	Set the Virtual Keyboard to the type of data entry required	-
	Provide Easy Methods for data entry	-
	Support the Characteristic Properties of the platform	-

Both Android Weibo and iOS Weibo were checked separately based on this checking list, and we aimed to present the result to figure out what the exact existing accessibility issues are on iOS platform and Android platform.

4.4 User Testing

Consent form, observation and interview are included in user testing. Researcher got the agreements from people with visual impairments by signing consent form. Then they become the participants of this research. Observation is a procedure for observing how people with visual impairments use Weibo. Researcher wrote down their nonverbal expression and their reactions of meeting barriers on notebook. Individual interview is followed by Observation.

4.4.1 Participants

The participants are staff from Information Accessibility Research Association (IARA) in Shenzhen City, Guangdong Province, China. They are people with different visual impairments. As we mentioned in section 3.2 Survey, our research mainly focus on Weibo users with visual impairments since there are 13 million people living in the dark.

We found 6 participants in IARA and they showed that they were willing to take part in our research. The ages of participants are 26, 27, 20, 27, 28 and 23. All of them are male with different visual impairments. They all use screen readers to access computers and Internet. What they do in IARA is general accessibility checking and collection, which means that they knew what accessibility of Weibo is and what response they should give. Besides, 3 of them are software engineers and all participants have good IT background as well as skilled operation on personal computers.

Table 6 Participants information

Participants	Age	Visual impairment	Experience with Weibo
P1	23	Blind	Web & mobile
P2	26	Can identify day and night, but no vision	Mobile
P3	27	Low vision	Mobile
P4	27	Blind	No
P5	28	Blind	Web
P6	20	Blind	No

In observation, there are two participants involved in testing web Weibo while 4 participants involving in mobile Weibo. Among them, two people using iPhone 6 with same OS version. Thus, we have 5 different testing environments in total. The devices

are chosen by participants themselves. We summarized the testing environments on below table:

Table 7 The testing environments

Participants	Device	Operation System	Screen reader	Weibo Version
P1	Vivo Xplay 5s	Android 6.0	Talkback 5.0.2	Android Weibo 6.7.2
P2	DELL	Windows 7 with IE browser 11	Yongde with version 11.18 *	Current Web Weibo
P3	Samsung S4	Android 5.0.1	Talkback 4.5	Android Weibo 6.7.2
P4	DELL	Windows 7 with IE browser 11	Zhengdu with version 1.5 *	Current Web Weibo
P5	iPhone 6	iOS 9.3.3	VoiceOver	iOS Weibo 6.3.2
P6	iPhone 6	iOS 9.3.3	VoiceOver	iOS Weibo 6.3.2

Screen reader with * are Chinese screen reader on computer.

However, as we mentioned in section 3.1 Survey, they all use PC Secretary to get information from some websites since the accessibility of websites in China is still in a bad situation. Web Weibo is one of these websites. The developer of PC Secretary is one of our participants. He told researcher that his software used special Application Programming Interface (API) to filter and remove the redundant information on websites. Besides, some unstructured elements on webpages are also reordered by PC Secretary Service. Six participants used Web Weibo through PC Secretary which means that they do not familiar with original Web Weibo. Thus, Researcher conducted observation firstly so that they can provide their opinions about both web Weibo and mobile Weibo.

4.4.2 Testing procedure

In this section, researcher selected most common functionalities on Weibo which are the basic requirements for general Weibo users, including: Login (login with QR code, general login), Register, Repost, Comment, Like, View @ (posts mentioned me),

Personal Home Page, Settings, Private chat, Hottest topic and posts, Search, Navigation.

Researcher distributed tasks to participants according to their agreements. Every participant selected at least two functionalities of Weibo by their willing to check if it is fulfill the accessibility requirements on their minds.

The participants were also asked to note down what they think are not accessible enough for them on documents so that there is no misunderstanding between observation recorded by researcher and the participants. The observation happened when the participants doing tasks on different Weibo platforms which participants are familiar with. During the observation, researcher wrote down their nonverbal expression on notebook when participants did the tasks.

Following the observation, the individual interview is conducted. The interview contains four parts: project introduction, warm-up section with demographic questions, main session with questions presented in a logical sequence, and closing section with thanks. The interview was recorded by audio with noting by interviewer. The demographic questions include age, IT background and etc.

The guidance questions of interviews are as follows:

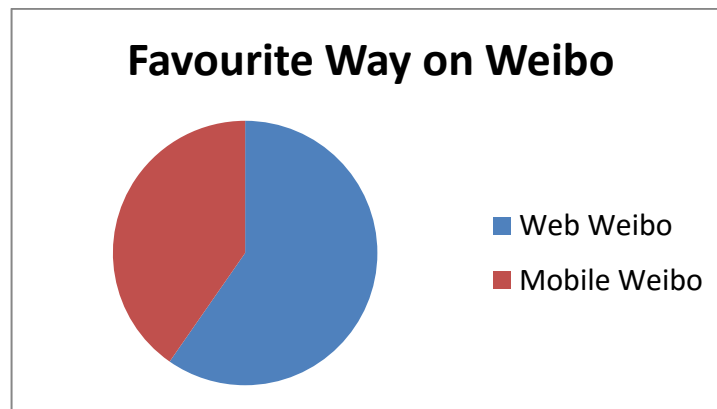
1. How old are you? Could you tell me what kind of visual impairments do you have?
2. How long have you use computer? Internet? What kind of social media are you using?
3. When did you register your Weibo account? What inspired you to use Weibo?
4. How often do you use Weibo? Through web or mobile? Which functionality do you use most frequent?
5. Do you think Weibo is accessible enough? What problems do you encounter when you use it? Can you specify? Why do you think it is not accessible or not reasonable?

Each interview lasted for circa 20 minutes when they had breaks during their working time. When the entire interview done, researcher had a good dinner with all participants in order to present our thanks.

5 Result

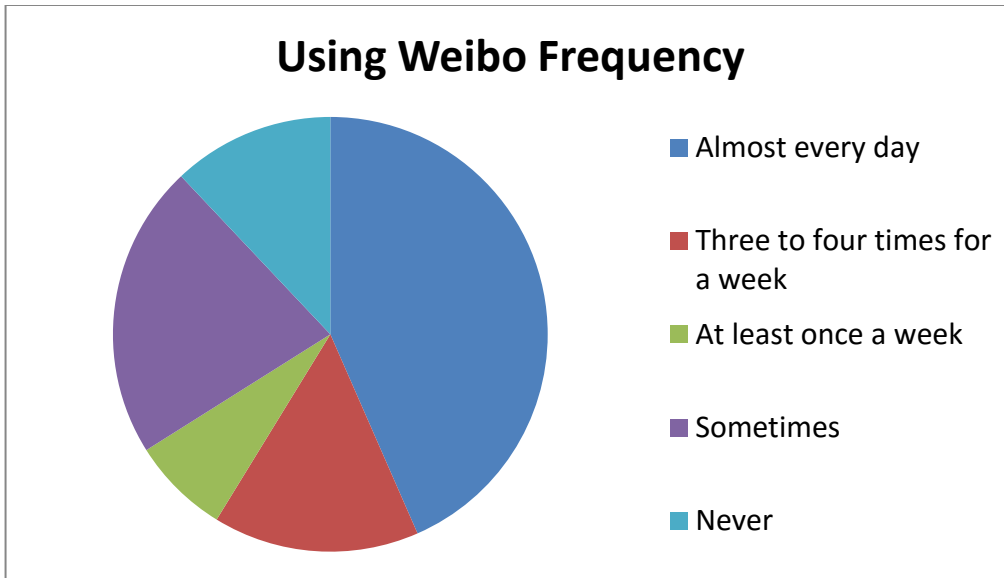
5.1 Survey

- **Time Period:** 15 July, 2016 to 17 July, 2016
- **Platform:** PC-Secretary
- **Total participants:** 548
- **The URL of survey result:**
http://ms.sky808.com/pcsec_admin/index.php/API/Survey/counter/sid/11/enterpwd/fiduosapiug (in Chinese)
- **Statistical Data of Survey:**
 1. Which is your favorite way to surf on Weibo?



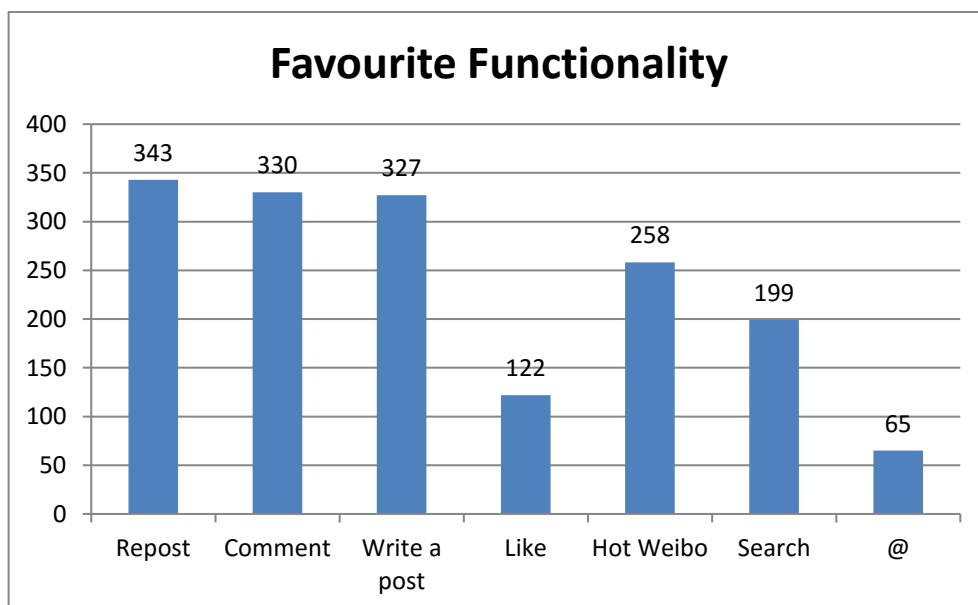
From the pie chart, we can clearly know that both web Weibo and mobile applications of Weibo are popular among people with visual impairments. Meanwhile, it seems using Weibo on computer is the first choice for them to surf on Weibo.

2. How often do you use Weibo?



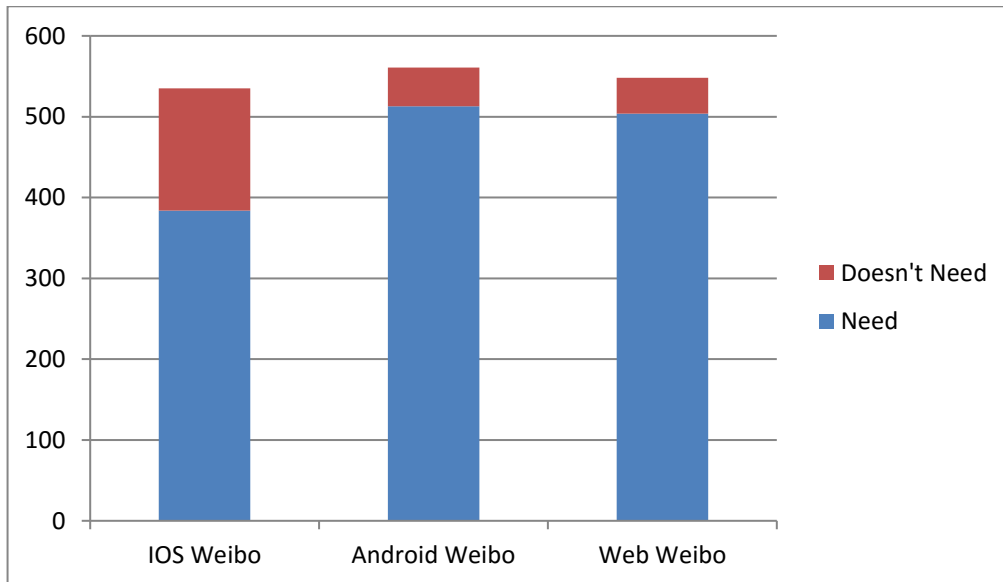
The statistical data told us that almost all the survey participant would use Weibo while only about 10% of them never use Weibo in life time. Although people with visual impairments have visual barriers to access Internet, however, they are willing to use social media with the help of screen readers to know more about society. Almost 50% of them use Weibo every day, which means the accessibility of Weibo is quite important for this part of people. Otherwise, Weibo will lose many existing users, like people with visual impairments.

3. Choose three options that you use them often on Weibo.



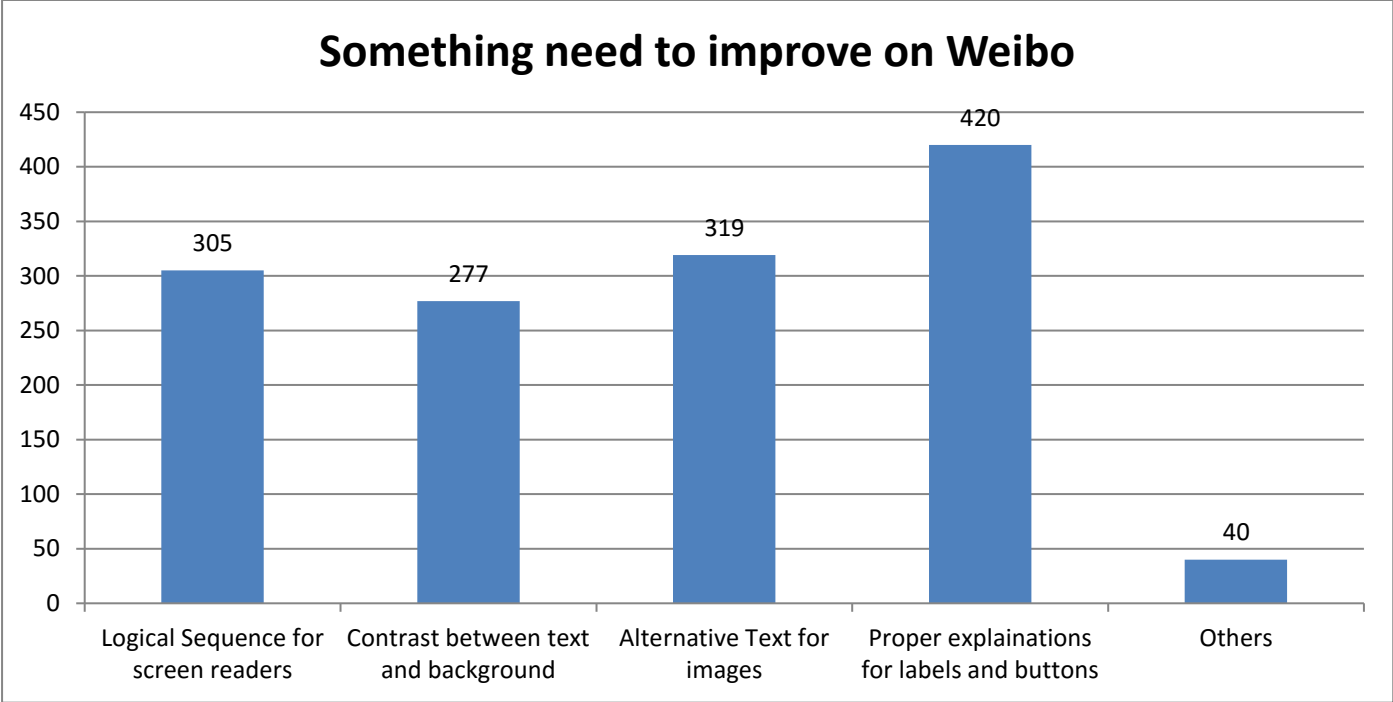
According to the five webpages of Weibo which are tested by automatic tools, researcher selected seven main functionalities from these webpages on Weibo, including Repost, Comment, Write a post, Like, Hot Weibo, Search and “@”. The histogram showed the functionalities that people with visual impairments use frequently. The top three functionalities are Repost, Comment and Write a post, which are the main basic functionalities of Weibo. Two hundred and fifty-eight people also chose hot Weibo as their preference, which means they like using Weibo to get the latest news as people without disability. The “@” is the functionality that get the least choices among these options. The functionality “Like” and “Search” gain 122 and 199 choices separately.

4. Do you think the following Weibo versions need to improve its accessibility?



From the bar chart we can easily know that all the Weibo versions need to improve its accessibility since 70% and more of them thought Weibo need to improve, especially Weibo on Android platform and Weibo webpages. Compared to the other two versions, iOS did a better job but still need to improve anyway.

5. Choose the options that you think it need to improve its accessibility on Weibo.



The histogram reviewed that all the options, including logical sequence, contrast, alternative text and proper explanations need to improve. Meanwhile, it means on Weibo, these issues are inaccessible enough for people with visual impairments. The option “Others” included the respondent that the reaction speed and the compatibility of screen reader also need to improve.

5.2 Automatic Testing

- **Time Period:** 16, June, 2016 to 30 June, 2016
- **Researcher:** Zhifeng Liu
- **Testing tools:** *AChecker*, AccessLint.com, WAVE Evaluation Tool
- **Guideline:** WCAG 2.0 (Level AAA)

5.1.1 Login and Register Pages

Login Page

URL of the login Page: <http://www.weibo.com/>

Table 8 Automatic Testing Result of Login Page

Login Page		
Tool Name	Testing result	
	Types and Numbers	Details
<i>AChecker</i>	Known problems (2)	<ul style="list-style-type: none"> • Document language not identified. • Document has invalid language code.
AccessLint.com	Need Review (1)	<ul style="list-style-type: none"> • the content on webpage should have the language indicated in the markup
	“looks good” but need to be reconsidered (5)	<ul style="list-style-type: none"> • Elements should support Accessible Rich Internet Applications (ARIA) roles, states and properties. • Text content should have a proper contrast ratio. • Meaningful images should not be used as element background. • The webpage should have a title to describe topic or purpose.
WAVE Evaluation Tool	Errors (68)	<ul style="list-style-type: none"> • 52 elements missing alternative text • 8 elements missing form label • 7 elements are empty links • 1 document language missing
	Alerts (100)	<ul style="list-style-type: none"> • 1 missing first level heading • 92 elements have redundant text/link • 7 tabindex (when it present

		positively, keyboard accessibility decreased)
	Features (57)	<ul style="list-style-type: none"> • 9 alternative text • 46 empty alternative text • 2 Form label
	Structural elements (38)	<ul style="list-style-type: none"> • 2* heading level 2 • 4*heading level 3 • 1*heading level 4 • 26*unordered list • 4*description list • 1*inline frame
	HTML5 and ARIA (0)	-
	Contrast errors (175)	No description

Register Page

URL of Register Page: <http://www.weibo.com/signup/signup.php?lang=zh-cn>

Table 9 Automatic Testing Result of Register Page

Register Page		
Tool Name	Testing result	
	Types and Numbers	Details
<i>AChecker</i>	Known problems (22)	<ul style="list-style-type: none"> • Images missing alternative text • Input and select elements missing associated label • Italic element used (criteria 1.4.4) • Anchor contains no text • Document language not identified • Document has invalid language code
AccessLint.com	Need Review (7)	<ul style="list-style-type: none"> • the content on webpage should have the language indicated in the markup • Meaningful images should not be used as element background. • Focusable elements should be visible and unobscured. • Images should have alt attribute. • The purpose of each link should be clear from the link text. • Text content should have a proper contrast ratio.

	“looks good” but need to be reconsidered (2)	<ul style="list-style-type: none"> • Elements should support Accessible Rich Internet Applications (ARIA) roles, states and properties. • The webpage should have a title to describe topic or purpose.
WAVE Evaluation Tool	Errors (7)	<ul style="list-style-type: none"> • 2 images missing alternative text • 4 elements missing form label • 1 Document language missing
	Alerts (2)	<ul style="list-style-type: none"> • 1 No heading structure • 1 Noscript element (<noscript> cannot be used to provide an accessible version of inaccessible scripted content.)
	Features (0)	-
	Structural elements (3)	<ul style="list-style-type: none"> • 3*unordered list
	HTML5 and ARIA (0)	-
	Contrast errors (25)	No description

5.1.2 Personal Home Page with default settings

Here researcher used her own personal home page on Weibo as the testing sample. At the same time, all other elements which do not belong to default settings were disabled before testing. Thus, the URL of Personal Home Page with default settings:

http://www.weibo.com/lzf0515/profile?rightmod=1&wvr=6&mod=personinfo&is_all=1

Table 10 Automatic Testing Result of Personal Home Page

Personal Home Page		
Tool Name	Testing result	
	Types and Numbers	Details
<i>AChecker</i>	Known problems (2)	<ul style="list-style-type: none"> • Document language not identified. • Document has invalid language code.
AccessLint.com	Need Review (1)	<ul style="list-style-type: none"> • the content on webpage should have the language indicated in the markup

	“looks good” but need to be reconsidered (5)	<ul style="list-style-type: none"> • Elements should support Accessible Rich Internet Applications (ARIA) roles, states and properties. • Text content should have a proper contrast ratio. • Meaningful images should not be used as element background. • The webpage should have a title to describe topic or purpose.
WAVE Evaluation Tool	Errors (103)	<ul style="list-style-type: none"> • 39 elements missing alternative text • 6 elements missing form label • 56 elements are empty links • 1 document language missing • 1 multiple form labels
	Alerts (285)	<ul style="list-style-type: none"> • 2*skipped heading level • 253 elements have redundant link • 1*flash • 29 elements have redundant title text
	Features (53)	<ul style="list-style-type: none"> • 46 alternative text • 7 Form label
	Structural elements (147)	<ul style="list-style-type: none"> • 2*layout table • 1*heading level 1 • 4* heading level 2 • 4*heading level 4 • 127*unordered list • 8*description list • 1*inline frame
	HTML5 and ARIA (1)	<ul style="list-style-type: none"> • 1*HTML 5 video or audio
	Contrast errors (237)	No description

5.1.3 Setting Page

The URL of Setting Page: <http://account.weibo.com/set/index>

Table 11 Automatic Testing Result of Setting Page

Setting Page		
Tool Name	Testing result	
	Types and Numbers	Details

<i>AChecker</i>	Known problems (2)	<ul style="list-style-type: none"> Document language not identified. Document has invalid language code.
AccessLint.com	Need Review (1)	<ul style="list-style-type: none"> the content on webpage should have the language indicated in the markup
	“looks good” but need to be reconsidered (5)	<ul style="list-style-type: none"> Elements should support Accessible Rich Internet Applications (ARIA) roles, states and properties. Text content should have a proper contrast ratio. Meaningful images should not be used as element background. The webpage should have a title to describe topic or purpose.
WAVE Evaluation Tool	Errors (18)	<ul style="list-style-type: none"> 15 elements missing form label 2 elements are empty links 1 document language missing
	Alerts (18)	<ul style="list-style-type: none"> 2*missing fieldset (used for grouping related form elements) 3*fieldset missing legend 1*no heading structure 12*redundant link
	Features (5)	<ul style="list-style-type: none"> 1 fieldset 4 Form label
	Structural elements (19)	<ul style="list-style-type: none"> 1*layout table 12*unordered list 6*description list
	HTML5 and ARIA (0)	-
	Contrast errors (56)	No description

5.1.4 Message Page

The URL of Message Page:

<http://www.weibo.com/at/weibo?leftnav=1&wvr=6&nofilter=1>

Table 12 Automatic Testing Result of Message Page

Message Page		
Tool Name	Testing result	
	Types and Numbers	Details

<i>AChecker</i>	Known problems (2)	<ul style="list-style-type: none"> • Document language not identified. • Document has invalid language code.
AccessLint.com	Need Review (1)	<ul style="list-style-type: none"> • the content on webpage should have the language indicated in the markup
	“looks good” but need to be reconsidered (5)	<ul style="list-style-type: none"> • Elements should support Accessible Rich Internet Applications (ARIA) roles, states and properties. • Text content should have a proper contrast ratio. • Meaningful images should not be used as element background. • The webpage should have a title to describe topic or purpose.
WAVE Evaluation Tool	Errors (85)	<ul style="list-style-type: none"> • 30 elements missing alternative text • 4 elements missing form label • 50 elements are empty links • 1 document language missing
	Alerts (134)	<ul style="list-style-type: none"> • 1*missing first level heading • 66 elements have redundant link • 67 elements have redundant text
	Features (22)	<ul style="list-style-type: none"> • 22 alternative text
	Structural elements (72)	<ul style="list-style-type: none"> • 1*heading level 3 • 4*heading level 4 • 59*unordered list • 5*description list • 3*inline frame
	HTML5 and ARIA (0)	-
	Contrast errors (250)	No description

5.1.5 Hot Topic Page

The URL of Hop Topic Page: <http://d.weibo.com/102803#>

Table 13 Automatic Testing Result of Hot Topic Page

Hot topic Page		
Tool Name	Testing result	
	Types and Numbers	Details

<i>AChecker</i>	Known problems (2)	<ul style="list-style-type: none"> • Document language not identified. • Document has invalid language code.
AccessLint.com	Need Review (1)	<ul style="list-style-type: none"> • the content on webpage should have the language indicated in the markup
	“looks good” but need to be reconsidered (5)	<ul style="list-style-type: none"> • Elements should support Accessible Rich Internet Applications (ARIA) roles, states and properties. • Text content should have a proper contrast ratio. • Meaningful images should not be used as element background. • The webpage should have a title to describe topic or purpose.
WAVE Evaluation Tool	Errors (162)	<ul style="list-style-type: none"> • 99 elements missing alternative text • 3 elements missing form label • 59 elements are empty links • 1 document language missing
	Alerts (131)	<ul style="list-style-type: none"> • 1*missing first level heading • 97 elements have redundant link • 33 elements have redundant text
	Features (15)	<ul style="list-style-type: none"> • 14*alternative text • 1*Linked image with alternative text
	Structural elements (73)	<ul style="list-style-type: none"> • 1* heading level 2 • 12*heading level 3 • 1*heading level 4 • 53*unordered list • 4*description list • 2*inline frame
	HTML5 and ARIA (0)	-
	Contrast errors (171)	No description

5.2 Heuristic Testing

- **Time period:** 30 September, 2016 to October, 2016
- **Researcher:** Zhifeng Liu
- **Devices:** DELL laptop, iPhone 6, MEIZU MX4

5.2.1 Web Weibo

- Devices: DELL laptop with OS Windows 7,
- Assistive Technology: YongDe with version 11.18 (Chinese Screen Reader)
- Browser: Google Chrome with version 53.0.2785.89 m (64-bit)

Table 14 Testing Result of Web Weibo

Success Criteria	Login Page	Register Page	Personal Home Page with default	Setting Page	Message Page	Hot Topic Page
1.1.1	Partial	No	Partial	No	Partial	Partial
1.2.1	N/A	N/A	No	N/A	No	No
1.3.1	Partial	Partial	Yes	Partial	Yes	Yes
1.3.2	Yes	Yes	Yes	Yes	Yes	Yes
1.4.1	Yes	Yes	Yes	Yes	Yes	Yes
1.4.3	Yes	Yes	Yes	Yes	Yes	Yes
1.4.4	No	No	No	No	No	No
1.4.5	No	No (CAPCHA, region flag)	No	No	No	No
1.4.8	Partial (No color selection)	Partial (No color selection)	Partial (Color selection by specific models,)	Partial	Partial	Partial (35-36 Chinese Characters within one line)

Success Criteria	Login Page	Register Page	Personal Home Page with default	Setting Page	Message Page	Hot Topic Page
2.1.1	Partial (No focus)	Yes (No focus)	Partial (No focus)	Partial (Cannot set inside setting)	Partial (Cannot go forward to navigation bar, e.g. comment.)	Partial (No focus)
2.2.1	No	No	No	No	No	No
2.3.1	Yes	Yes	Partial (stickers)	Yes	Partial	Partial
2.4.1	Yes	Yes	Yes	No	Yes	Yes
2.4.2	Yes	Yes	Yes	Yes	Yes	Yes
2.4.3	Partial	Yes	Partial	Partial (setting cannot get inside)	Partial (Cannot go forward to navigation bar, e.g. comment.)	Partial
2.4.4	N/A	N/A	Yes	N/A	Yes	Yes
2.4.5	Yes	Yes	Yes	No	Yes	Yes
2.4.6	Yes	Yes	Partial (Personal Page icon)	Partial (Setting icon and drop-down menu)	Partial (Message icon and drop-down menu)	Yes
2.4.7	No	No	No	No	No	No
3.1.1	Yes (difficult to change)	Yes	Yes (difficult to change, need time)	Yes	Yes	Yes (difficult to change, need time)
3.2.1	Yes	Yes	Yes	Yes	Yes	Yes

Success Criteria	Login Page	Register Page	Personal Home Page with default	Setting Page	Message Page	Hot Topic Page
3.2.2	Yes	Yes	Yes	Yes	Yes	Yes
3.2.3	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4	Yes	Yes	Yes	Yes	Yes	Yes
3.2.5	Yes	Yes	Yes	Yes	Yes	Yes
3.3.1	Yes	Yes	N/A	Yes	Yes	N/A
3.3.2	Yes	Yes	N/A	Yes	Yes	N/A
3.3.3	Yes	Yes	Yes	Yes	Yes	Yes
3.3.4	Yes	Yes	Yes	Yes	Yes	Yes
3.3.5	Yes	Yes	Yes	Yes	Yes	Yes
3.3.6	Yes	Yes	Yes	Yes	Yes	Yes
4.1.1	Yes	Yes	Yes	Yes	Yes	Yes
4.1.2	No	No	Partial	No	No	No

As the table 10 shows, web Weibo obviously performed better in Principle 3 (Understandable – Information and the operation of user interface must be understandable.) and Principle 4 (Robust – Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.). Weibo got many “Yes” in these two parts. It means that the web content on Weibo is understandable and accessible for all users.

However, there is still some problems should be reconsidered although it got “Yes” in heuristic testing. For example, five webpages on Weibo all got “Yes” in the success

criteria 3.1.1: Language of Page. This criterion considers the default human language on webpage can be changed if users want. However, in Login Page, Personal Home Page with default settings and Hot Topic Page, the language can be changed but need extra hard to achieve it. When testing these pages by criteria 3.1.1, they were needed scroll down the whole page, which needs a lot of operation time since the post on Weibo will appear continuously on these webpages, to achieve the language menu. This kind of problems may annoy users and even confuse them, especially for people with disabilities.

Besides, about the criteria 4.1.2: Name, Role, Value, it requires all user interface components on webpage can be determined by users. Four pages in testing failed in this criterion since Weibo have a uniform user interface style except the modules on Personal Home Page can be set to specific patterns which are provided by Weibo. Thus, the Personal Home Page only gained “Partial” in criteria 4.1.2 when other pages got “No”.

Moreover, the posts on Weibo have low-privacy problem since all posts on Weibo is almost public to the Internet. Before sending out, users can only set the post opened to the public, open to user himself / herself, or open to the following people whom also followed them. It cannot be set to specific groups of people.

Except the good parts, web Weibo performed bad in Principle 1 (Perceivable – Information and user interface components must be presentable for users in ways they can perceive.) and Principle 2 (Operable – User interface components and navigation must be operable.). It got 13 “Partial” and 15 “No” in Principle 1 while gaining 16 “Partial” and 14 “No” in Principle 2.

The non-text content on Weibo, such as videos and pictures, do not have alternative text for people using screen readers. Only stickers can be presented by text. However, pictures always mean a lot for users, for instance, if they encounter a CAPCHA when they try to login Weibo, there is no text description of it which result in they cannot login by that way. On the other hand, these pictures cannot be customized by Weibo itself but browser.

Web Weibo received 6 “No” when it was tested by success criteria 1.4.4. This criterion requires that the text on Weibo can be resized by users. However, researcher found that there is no any option or setting for resizing text on Setting Page which leads to all the text on Web Weibo are constant with specific font size and font type.

The visual presentation on Weibo, about the success criteria 1.4.8, also raised Researcher’s awareness since the patterns on Weibo are constant, even some of them cannot be changed, such as Login Page and Register Page. When people login his account successfully, then the pattern of his Weibo can be changed into specific patterns which are provided by Weibo itself. However, not all of these constant patterns are accessible, for example, one pattern is to change the navigation bar into pink color and the texts on bar are also presented by color pink. In this case, people with low vision will have barrier to access the content of navigation bar without assist of screen reader.

The second severe problem appeared on 2.1.1 and 2.4.7 on Weibo is that although users can use keyboard to access most webpages on Weibo, it is difficult to see the current position since there is no visible focus on webpage. What’s more, on Setting Page and Message Page, researcher had trouble to use “Tab” and “Enter” to access the content beside the navigation bar. It means users cannot use keyboard to change any setting options and respond messages but only view.

About success criteria 2.2.1, Weibo also performed badly since all the options on Weibo cannot be adjust operation time. Besides, about the success criteria 2.4.6, it requires that important elements should have headings or labels to describe topic or purpose. Weibo did well on most cases but some are not. For example, on navigation bar, there is an icon for personal home page with user ID (see figure 1 below), but new users use Weibo may confuse by it because it is considered as a contact or manage page in our common sense.

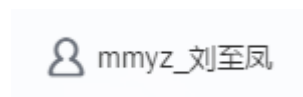


Figure 12 the Personal Home Page icon

To sum up the total scores, we have a summary table for Web Weibo which is shown below:

Table 15 Testing Summary of Web Weibo

Principle	Yes	No	Partial	N/A
1 Perceivable	21	17	13	3
2 Operable	24	14	16	3
3 Understandable	68	0	0	6
4 Robust	6	5	1	0
Total	119	36	30	10

Overall, Web Weibo had a good performance on understanding while having problems with information perceivable and keyboard operable. Some details, such as language setting, visible focus and user privacy also need to be fixed to some extent.

5.2.2 Mobile Weibo

- Device: MEIZU MX4 with Android 4.4.2, iPhone 6 with iOS 8.4.1
- Mobile Weibo: Version 6.8.0 on Android, Version 6.10.0 on iOS
- Evaluation Detail: See Appendix 1

We evaluated mobile Weibo by its 31 functionalities, thus total score of each success criteria is 31. As shown in table 14, we have two different colors to represent the different results from Android Weibo and iOS Weibo. The number with black represented result from Android while red number representing result from iOS. Besides, if the results from iOS and Android are the same, we uniformed the same color – black as the main color to present the data.

Table 16 Testing Summary of Principle 1

	Yes	No	Partial	N/A
Principle 1 Perceivable	59(90)	89(59)	7(6)	-
Small Screen Size	31	-	-	-

	Yes	No	Partial	N/A
Zoom/Magnification	-(31)	30	1	-
1.4.4 Resize text	-	31	-	-
1.4.3 Contrast (Minimum)	14	14	3	-
1.4.6 Contrast (Enhanced)	14	14	3	-

The data from table 13 indicated that both Android Weibo and iOS Weibo did bad performance in Principle 1, which required the content on mobile application should be perceivable according to text resizable and enough proper contrast. However, Android Weibo got 89 “No” and 7 “Partial” in this principle. The main problems are text resizable and contrast. Although there are three font sizes can be chosen by Weibo users, including Large, Medium, Small, the largest font size cannot fulfill the requirement – Text can be resized to 200% without any assistive technologies on mobile, compared to the smallest font size.

On the other hand, the contrast on mobile Weibo also should be raised attention. The buttons for repost, comment, like and favorite are all in color grey, which only have ratio 3.95:1 while the success criteria showing the minimum contrast is 4.5:1. An example is shown in below figure 2.

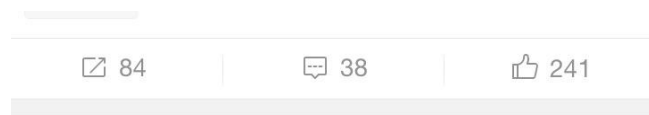


Figure 13 Buttons for repost, comment and like on mobile Weibo

The different result from Android and iOS is about the assistive technology on mobile. We have an Android mobile without build-in assistive technology, so the testing is failed. It means that not all the Android mobile phones have assistive technology which required Weibo include more functionalities about magnification in its mobile applications. What’s more, although iOS mobile phones have better build-in assistive technologies, the iOS Weibo still need to fix the problems about text resizable to 200%.

Table 17 Testing Summary of Principle 2

	Yes	No	Partial	N/A
Principle 2: Operable	216	-	1	62
2.1.1 Keyboard	31	-	-	-
2.1.2 No Keyboard Trap	31	-	-	-
2.4.3 Focus Order	31	-	-	-
2.4.7 Focus Visible	31	-	-	-
Touch Target Size and Spacing	31	-	-	-
Touch screen Gestures	31	-	-	-
Device Manipulation Gestures	-	-	-	31
2.1.1 Keyboard	-	-	-	31
Placing buttons where they are easy to access	30	-	1	-

The principle 2 – Operable requires all the framework and content on mobile applications are accessible with external physical keyboard. Obviously, mobile Weibo got good result in this principle with 216 “Yes” and 1 “Partial”. The “Partial” happened in success criteria: Placing buttons where they are easy to access. When Weibo user wants to use Favorite the post, he needs to tap and enter the post. Or if he did not follow the user, he needs to tap the information button and find out “Favorite” option from a list of options. Researcher thought it is not easy for users with visual impairments to do a series of movements to achieve “Favorite”, so researcher gave “Partial” in this success criterion.

Table 18 Testing Summary of Principle 3

	Yes	No	Partial	N/A
Principle 3: Understandable	288	64	3	48

	Yes	No	Partial	N/A
Changing Screen Orientation (Portrait/Landscape)	-	31	-	-
3.2.3 Consistent Navigation	31	-	-	-
3.2.4 Consistent Identification	31	-	-	-
Positioning important page elements before the page scroll	31	-	-	-
Grouping operable elements that perform the same action	31	-	-	-
2.4.4 Link Purpose (In Context)	21	1	-	9
2.4.9 Link Purpose (Link Only)	21	1	-	9
Provide clear indication that elements are actionable	31	-	-	-
3.2.3 Consistent Navigation	31	-	-	-
3.2.4 Consistent Identification	31	-	-	-
Provide instructions for custom touch screen and device manipulation gestures	1	-	-	30
3.3.2 Labels or Instructions	28	-	3	-
3.3.5 Help	-	31	-	-

For this principle – Understandable, it aims to make sure every single element, including its layout, its purpose and its meaning, can be understood by users. Mobile Weibo got 31 “No” in success criteria: Changing screen orientation. Since when the testing mobiles turn on orientation option, mobile Weibo still maintain the vertical presentation without

any changes. On the other hand, concerning to link purpose, the icon of “Friends Follow” (see below figure 3), which aims to show the Weibo users that your following users recently following, does not present its meaning visually. Even the icon can be thought that it does not convey any meaning itself.



Figure 14 the icon of Friends Follow on Mobile Weibo

The most important is there is no help or any assistant options for users to refer how to operate on mobile Weibo. The context-sensitive help indeed show and provide operation information when users first download and open mobile Weibo. However, they disappeared immediately after clicking “Done” button and won’t show again in the next days.

Table 19 Testing Summary of Principle 4

	Yes	No	Partial	N/A
Principle 4: Robust	8	-	-	85
Set the virtual keyboard to the type of data entry required	-	-	-	31
Provide easy methods for data entry	8	-	-	23
Support the characteristic properties of the platform	-	-	-	31

In the principle 4 – Robust, mobile Weibo looks good with 8 “Yes” and 85 “N/A”. We knew that mobile Weibo have already provided enough easy methods for users to input information. Besides, the 31 functionalities are all about viewing and operating on Weibo. Thus there are a lot of irrelevant criteria and we marked as “N/A”.

5.3 User Testing

5.3.1 Observation

Web Weibo

There are two people involved in observation of web Weibo. During the tasks, researcher found that they all have problems when they tried to login their personal account. There are two ways to login: one is general login with username and password, the other one is to use mobile phone camera to scan the QR code provided by Weibo. In the general login, we found that participants need to use “Tab” key to achieve the login area after getting through with all content of that web page. In the login with QR code, we noticed that it was difficult for them, people with visual impairments, to aim at the code appeared on screen. During the whole login process, two participants both were confused and frowned at the same time. One participant took around 5 minutes to login while the other one taking 4 minutes.

From the description written by participants, they also mentioned that they all failed to register Weibo on web because they cannot know the CAPCHA if no people without visual impairment help them. Besides, there are many labels didn't have proper descriptions which also confused them, for example, when they tried to repost a post, the label for repost only include the repost number but no any word about “repost”, which means they do not know what it is just through screen reader if they first use Weibo.

Mobile Weibo

We involved 4 participants in observation of mobile Weibo. Among them, two people use Android mobile while two using iOS.

Although we didn't involve the functionality of reset password, the naturalistic observation gave us a new finding. One of our participants tried to reset his password through iOS mobile, however, Weibo asked him to match the profile icon of users, which he followed, to the username. Only pass this so that he can start to reset password. The participant turned to researcher and expressed that how he can match the correct icons

without seeing them before. Moreover, there is no other way to skip this identity authentication step.

On the other hand, from the description written by participants, both Android Weibo and iOS Weibo have problem in proper descriptions for labels and buttons. Besides, one participant using Android mobile responded that if there are several links included in one post, he only can get access and open the first link even when he tapped the last link. For instance, see the figure below, there are three video links in this post, if people using Talkback want to access the third link “Black Mirror S03E02-04”, then Android Weibo failed to open that.



Figure 15 an example of post included several link

5.3.2 Interview

- Time Period: 18, July, 2016 to 22 July, 2016
- Location: Shenzhen City, Guangdong Province, China
- Interviewer: Zhifeng Liu
- Interviewee: 6 people with different visual impairments in IARA
- Recorder: Newsmy Recorder RV90

We had six participants in total who took part in interviews. Five of them signed consent form and the interview was recorded by audio. One participant did not agree with the interview recording but he took part in interview with noting by interviewer.

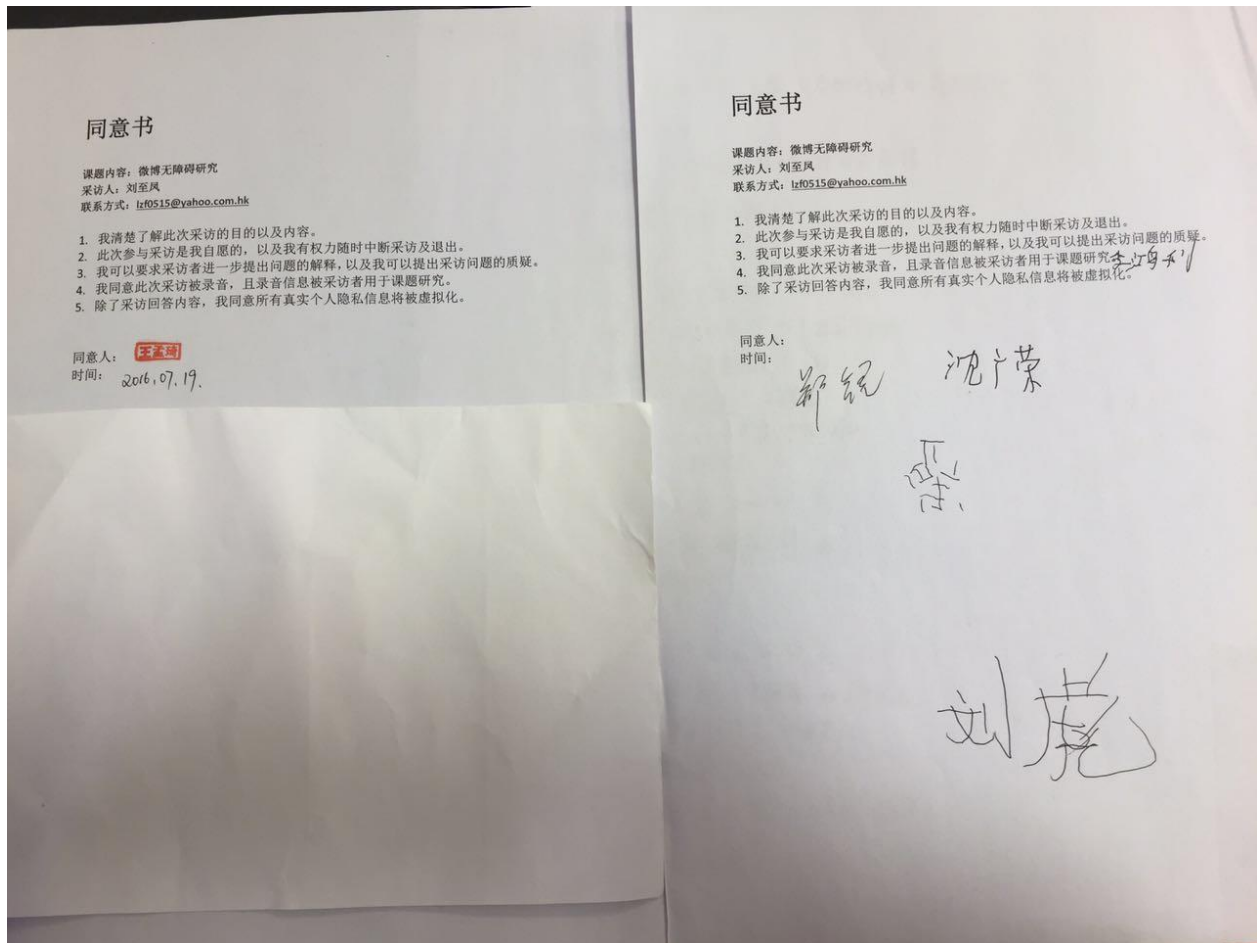


Figure 16 the consent forms signed by participants

Participant A, aged 23, the total blind, who has 7-year experience with Internet, said that he started using Weibo since almost everyone around him used Weibo at that time. He often uses Weibo three to four times a day and read some posts from famous users. He used PC-Secretary to customize web Weibo. Besides, he also used Weibo through Android Mobile. He mentioned that when he tried to post with picture on Weibo, he failed to select his photos on albums since there is no description about the taking time of photo which is an information for identifying the pictures he want to upload. On the other hand, some words on Weibo, such as the functionality of "Like", he heard "Xiuan", which have ambiguity between favorite and like in Chinese. It confused him at the beginning.

Participant B, aged 26, who can identify day and night without vision, responded that the CAPCHA without alternative text is the most difficult barrier when he login Weibo. It is

one of the reasons why he only uses Weibo once a month. Another reason is that there is no hotkey setting on web Weibo so he could not skip out current area by using keyboard.

Participant C, aged 27 with extremely low vision, used Weibo often from 2010 through Android mobile. As for web Weibo, he thought that the relation between different elements didn't make sense for him, which often confused him a lot. It means Weibo has some logical problems in web layout design. Besides, when user try to login on web, the first way appeared on page is login with QR code. Participant C responded that he felt it difficult to find the entry of general login with username and password, which cost him a lot of effort to skip other elements so that he can find the right one. This is also a problem related to web layout design. What's more, the CAPCHA on web Weibo is an inevitable barrier for him, for instance, reset password with matching profile icon to username and not all the long post on Weibo is text-based. He cannot finish these operations only with screen reader on his own.

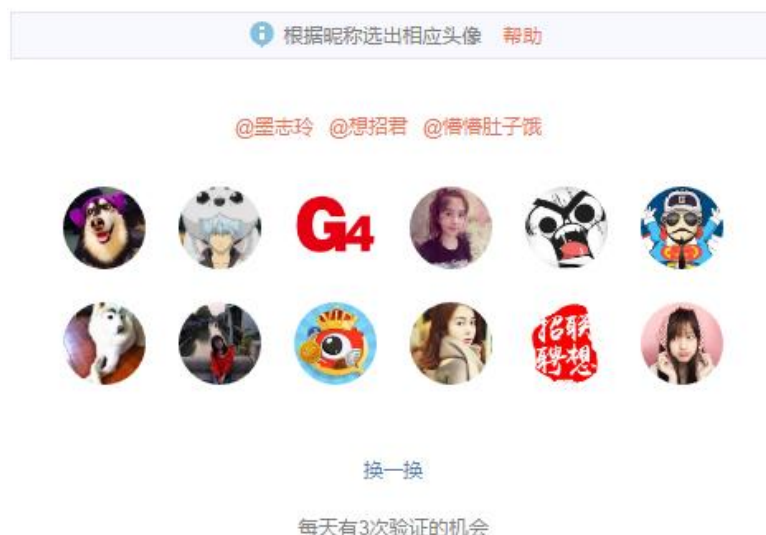


Figure 17 a screen shot of reset password with matching profile icon to username

Participant D, aged 27, the total blind, who does not like using Weibo. In observation, he chose web Weibo to experience. He responded that the different areas on web Weibo have no logic which made him annoyed when accessing post, for example, when he tried to get down from top menu to message, the keyboard focus went down first with

some advertisements. On the other hand, the prompt message on web Weibo fading in a very short time is also barrier for him.

Participant E, aged 28, the total blind, is a software developer. PC-Secretary is one of his products. In interview, he told interviewer that the unclear structure of web Weibo is one of the reasons why he created a special port in PC-Secretary to adjust the component layout and filter unnecessary information on web Weibo. Meanwhile, some unreasonable web widgets, such as calendar, which need people using screen reader to access all the date on calendar. He also recommended that the drop down menu may be a better choice for making calendar according to his experience with software and screen reader. The login area on web Weibo is presented in an air view way and that is why user using keyboard only need to access the whole page in order to arrive at login area. For him, it is not a strict way to design such an important webpage.

Participant F, aged 20, the total blind, said that it was the first time to use Weibo in observation. When he first registered Weibo account through his iOS mobile, he found that he cannot choose his gender by using Voiceover. What's more, the meaning of buttons and labels are described in a complex way, he thought they could be interpreted more precisely in order to be understood easily. About setting on iOS mobile, he responded that the Voiceover cannot read the status of each item which leads to he didn't know the current switch is on or off.

Notifications of new messages	
Mentions	Following >
Comments	Following >
Likes	>
Message	<input checked="" type="checkbox"/>
Group Notifications	<input checked="" type="checkbox"/>
Strangers' messages	Following >
Follower	Following >

Figure 18 A screen shot of a part of Weibo settings on iOS mobile

5.4 Summary

The survey result showed that only 10% participant never use Weibo before. From the response, over 50% participants access to Weibo daily to get latest news and share something personal. Meanwhile, they prefer web Weibo to mobile Weibo, although there are many barriers for visually impaired people to access Weibo with the help of screen reader on browser. These review that users with visual impairments would like to use Weibo as general users do on Weibo. According to the report by ("About 6.34% people with disability. The growth of disabled is still increasing.," 2008), there was 12 million people in China have different kinds of visual impairments. From the report by Tecent Report Institute ("Report on Chinese Internet users with visual impairments," 2016), the number has increased to 13 million in 2016. This shows that Weibo has to consider the needs of such a large amount people. Otherwise, it will lose 13 million potential users.

The question about favorite functionality on survey reviews that people with visual impairments use "Like" and "@" less than generalization. The possible reason of that was reflected in interview. Participant A explained that the "Like" on Weibo is translated into "Xihuan" in Chinese verbally in his screen reader. He thought "Xihuan" has ambiguity meanings between "Like" and "Favorite". For general users on Weibo, "Like" is one of main functionalities for interacting with other users. It is used to represent appreciation and support without typing a word. It has same function as "Repost" and "Comment". Besides, there are many buttons and labels do not have proper description, which creates much confusion, for instance, users using screen readers can only hear the repost numbers when they select "Repost" button.

Both of mobile Weibo and web Weibo were required improved accessibility according to the survey respondents. The histogram of the fifth question shows that all the options, receive 300 choices on average. Among these options, "Proper explanations for labels and buttons" got the highest scores. From that, we can consider that Participant A, who thought "Like" functionality has improper explanation, is not the only user who meets with this kind of accessible problems on Weibo.

The survey result gave this research a more solid foundation, which means people with visual impairments indeed need Weibo in daily life and Weibo need to improve its

accessibility to include the requirements from people with visual impairments. Except survey, the different tests review many accessible problems.

5.4.1 Perceivable of Weibo

First, web Weibo lack of the alternative text for non-text content (success criterion 1.1.1), such as images, CAPCHA, video and audio. It is difficult for people using screen readers to access the integrated information on Weibo webpage. It makes the information inequality between people using screen readers and people do not use screen readers. Especially CAPCHA without alterative text, they rarely login web Weibo successfully without help. This situation was also mentioned by Participant B and C. Besides, the text on Weibo cannot be resized and the font type cannot be changed by Weibo settings (success criterion 1.4.4). It makes people with low vision and elderly cannot use Weibo only by seeing but screen reader and other extra tools. As for visual presentation (success criterion 1.4.8), the constant layout patterns provided by web Weibo were not accessible since the default text on navigation bar is constant with patterns and users cannot change it. Secondly, although users are able to use keyboard to access webpages on Weibo, there is no Hotkey setting or ARIA tag for efficient operations. This inaccessible problem was not only discovered by automatic tools, but also was mentioned by Participant B.

The visible problems on mobile Weibo are concerned with resizable setting and contrast. Mobile Weibo only provides three sizes for users to choose. However, the largest size still cannot fulfill WCAG 2.0 requirements. Secondly, the contrast between background and text on mobile Weibo should be adjusted since some contrast is only 3.95:1 from heuristic testing. The requirement (success criterion 1.4.6) from WCAG 2.0 is at least 4.5:1. Secondly, from the feedback given by interviewer, they recommended mobile Weibo should read description of selecting photos when users want to post with photos from their mobile album. The description of photos should include taking time, taking location, etc.

5.4.2 Operable of Weibo

Web Weibo does not have visible focus when users use keyboard to operate (success criterion 2.1.1 and success criterion 2.4.7). On the other hand, the operation time cannot

be changed on web Weibo setting (success criterion 2.2.1). On mobile Weibo, the responding time for prompt messages is too short for people with visual impairments to read (success criterion 2.2.1). Many headings, labels and links on web Weibo do not have proper description for propose (success criterion 2.4.6 and success criterion 2.4.9). For example, in automatic testing, most pages lack of first heading level while most of links do not have alternative text. Besides, some labels on web Weibo, such as the label for login input field is just described as "Login" in English. However, according to the report by Hong Kong Blind Union ("The situation about people with visual impairments in Hong Kong," 2014), many people with visual impairments have low education which means they do not know English before. It creates barriers for people with visual impairments to navigate on Weibo. On the other hand, according to the heuristic result, web Weibo has keyboard traps on Setting Page and Message Page, which created navigation barrier for people with visual impairments, especially for blind and people with low vision, since most of them using keyboard to navigate Weibo on computers.

5.4.3 Understandable of Weibo

Third, from the heuristic testing result, we conclude that web Weibo has well understandable (Principle 3). However, the language setting is in the bottom of webpage which means users need to scroll down whole page to achieve it. It fulfills the requirement (success criterion 3.1.1) but it need improve anyway.

Several participants in interview responded that the layout components are presented in an illogic way for them. They strongly recommended that Weibo should improve it so that everyone can read Weibo by preference. The focuses on Weibo were invisible for people with visual impairments. Weibo didn't provide any shortcuts for users. The images on Weibo do not have alternative text. On the other hand, mobile Weibo cannot change screen orientation (Understandable - Changing Screen Orientation).

5.4.4 Robust of Weibo

On Facebook, there is a webpage for Facebook Accessibility. People with disabilities not only can report what they think is inaccessible, but only can learn keyboard shortcuts on that page ("Accessibility for People with Disabilities,"). For instance, users not only can report types and versions of assistive technologies they using, but also can

search and learn the shortcuts they want on Facebook. This solution basically improves Facebook compatibility. However, as one of the most popular social media in China, Weibo do not have such a webpage for people with visual impairments. We cannot say Weibo has bad compatibility, but it does not provide an alternative way for people with disabilities to report and learn something accessible. Besides, most webpages on Weibo cannot be changed UI component by users (success criterion 4.1.2).

6 Discussion

6.1 *Result Examination*

This project aims to identify the accessibility issues for people with visual impairments in Weibo. For data collection, I used 3 evaluation methods, including automatic testing, heuristic testing and user testing. In addition, a survey was made for better understanding people with visual impairments before evaluations.

The survey has shown that only 10% participant never use Weibo before while over 50% participants accessing to Weibo daily to get latest news and share something personal. Visually impaired people use functionality “Like” less than generalization since it has ambiguity meaning with functionality “Favorite”.

The main finding of automatic testing are about language of page (success criterion 3.1.1), missing alternative text for non-text content (success criterion 1.1.1) and missing labels in form elements (success criterion 3.3.2).

The heuristic testing demonstrated that web Weibo do not have alternative text for non-text content (success criterion 1.1.1), such as image, CAPCHA, video and audio. CAPTCHA as a necessary authentication process makes it very difficult for people with visual impairments. there is no option or setting for resizing text in the Setting page (success criterion 1.4.4).although it is possible to use keyboard to navigate in most web pages, it is difficult to know the current position since there is no visible indication of the keyboard focus (success criterion 2.4.7).There were also issues with the visual presentation in Weibo (success criterion 1.4.8). The color schema in Weibo is mostly consistent. For pages such as Login and Register, the schema cannot be changes. When users log in to their account, they can change the other schemas provided by Weibo. However, some of these schemas create accessibility problems. For example, one schema changes the navigation bar into pink color and the texts on bar are already in pink, which now become invisible.

On the other hand, in heuristic testing, it reviewed many accessibility issues in mobile Weibo. In mobile Weibo, although it is possible to choose Large, Medium, Small font size, it is not possible to resize to 200% without any assistive technology. All the text on

web Weibo is pre-defined with a specific font size and font type. Screen orientation is confusing for users (Understandable - Changing Screen Orientation). When the mobiles turn on orientation option, mobile Weibo still maintains the portrait presentation without any changes. There is no help or any assistant options for users to refer how to operate on web or mobile Weibo. The context-sensitive help indeed shows and provides operation information when users first download and open mobile Weibo. However, they disappeared immediately after clicking “Done” button and won’t show again in the next days.

During the user testing, we found that participants encountered barriers from logging in to Weibo. There are two ways to log in: one is to use username and password and the other one is to use mobile phone camera to scan the QR code provided by Weibo. In the case of using username and password, the participants needed to use “Tab” key to get through all content in the page before they could reach the login area. In the case of using QR code, we observed that it was very difficult for the participants who have visual impairments to aim at the code appeared on screen.

The registration page has CAPTCHA and this created barriers for the participants. All of them needed help to get through the CAPTCHA for registration. In addition, there are many labels that do not have proper descriptions, which created much confusion. For example, when they tried to repost a post, the label for Repost only includes the repost number, not the action “repost”. Screen reader users then only hear the repost number and have problem understanding what the action is.

In addition, the user testing revealed many accessibility issues in Weibo, both the web version and mobile version. The most frequent issues are:

- Ambiguous presentation, such as the label for Like and Favorite.
- No alternative text for non-text content
- No hotkey setting – no alternative access through keyboard
- Illogical components and layout
- Using inaccessible web widgets to design webpage
- Buttons have complicated and confusing labels and representations

In literature review, we found that the online form on Twitter was illogic for people with disabilities (Lee et al., 2013). In their research, user testing, including observation and interview, were adopted. Researchers took task success rate and user satisfaction level as the measurements. Twitter is one of the social media they chose. Four of eight participants are people with visual impairments, including blind person and people with low vision. Twitter got 2.2 of 5 satisfaction level since participants with visual impairments commented that the online forms were illogical and placed in pop-ups. It creates an evitable barrier for them to re-tweet and messages. This situation also happened in Weibo. In our project, observation and interview were also used in user testing. During the interview, several participants responded that the layout components are presented in an illogic way for them. They strongly recommended that Weibo should improve it so that everyone can read Weibo by preference. On the other hand, the focuses are invisible in web Weibo. In addition, in automatic testing and user testing, evaluation tools and participant responded that web Weibo do not have shortcuts for users. Our observations are not new since these similar problems also exist in Twitter. (Lee et al., 2013) in their study found that the focuses on Twitter were invisible for people with visual impairments. Twitter didn't provide any shortcuts for users. The images on Twitter do not have alternative text.

This is the first project, to our knowledge, to evaluate accessibility of Weibo – the Chinese social media. We used three different methods to include as much as information about people with visual impairments using Weibo. There are some apparent differences among different methods.

Automatic testing showed the code-based accessibility issues which is only used to test webpage. Three automatic tools simply check if web Weibo has these elements according to WCAG 2.0. For example, missing labels in form elements and missing alternative texts for non-text content are found in web Weibo. Heuristic testing provided something improper and detailed problems exist in Weibo based on WCAG 2.0 and mobile accessibility consideration. The result of heuristic testing gave us an overview of Weibo accessibility. Both automatic testing and heuristic testing are from expert's aspect. In heuristic testing, researcher also identified some accessibility issues which

are detected by automatic tools. However, some issues, like missing language of page (success criterion 3.1.1), need to be checked webpage code. Automatic tools save the total time-consuming.

In addition, in order to involve users with visual impairments, we also adopted user testing. In user testing, the accessibility issues are checked from user's aspect. In other words, we collected user experience in user testing. Participants were asked to give some feedback and comments about something inaccessible they thought. During user testing, some common accessibility issues, such as missing alternative text and keyboard trap, were also reviewed by participants. Besides, they gave us responses about the illogic presence of web Weibo, ambiguity presentation of labels and buttons, no hotkey setting and using inaccessible web widgets. These accessibility issues are hardly detected by experts since these are not included into WCAG 2.0. On the other hand, in interview, we got the reason why people involving in survey chose "Like" less than other options. Participants commented that "Like" is described as "Xihuan" in Chinese, which has ambiguity meaning as "Favourite". Interview enable us get some important details about accessibility of Weibo directly.

However, we encountered some difficulties in user testing. For example, some participant rarely used Weibo and even never used it before our testing. Researcher explained every single item that they cannot understand in Weibo, such as the functionality "Favourite". In addition, at the beginning of interview, some participants only stated that Weibo is not good, is not friendly for people with visual impairments. Some of them had no idea how to explain their thought in accessibility way. In our plan, every interview is 15 minutes. Due to this reason, some interviews lasted for about 20 to 30 minutes.

6.2 Limitations

The project has a number of limitations. Researcher tested the web Weibo and mobile Weibo within three months, which is from July, 2016 to September, 2016. Three versions of Weibo were included into tests. However, Weibo was updated for several times when we did this project. Now we not only have mobile Weibo and web Weibo, but also International Weibo. On the other hand, in this user testing, we only recruited

male participants due to limitation of resource and time. All of our participants have good training with IT knowledge. However, according to an report by Hong Kong Blind Union ("The situation about people with visual impairments in Hong Kong," 2014), there are many visually impaired people with low education. Weibo, as a widely used social media, need to include them, too.

6.3 Ethical Consideration

6.3.1 Consent form

To get agreement from participants, consent form is designed for presenting what participants should know and do during the whole participation. Before signing consent form, researcher needs to specify the research goal and what the interview is going to about verbally. Some particular details, such as recording method, should be included at the same time. The consent form is a transcript of research information and agreements. Participants should read clearly and understand each item on consent form so that there is no misunderstanding during and after interview.

In this study, we designed a consent form. Researcher decided to use voice recorder to record each interview from beginning to the end, which is a method for helping researcher identify the conversation details afterwards. Researcher also did some notes during interviews but it is not enough since we could not require participants to slow down or specify details again which time consuming for participants. Thus, to adopt using voice recorder is a better way both for researcher and participants. The consent form below is the translation from Chinese version when all the participants are Chinese and we designed consent form in Chinese as well (see Appendix 2).

6.3.2 Communication with participants

The communication skills are quite important when a study included interview or any activities with human being. Our study involved the participants with disabilities so we do need to consider the communication skills when facing to our interviewees.

What we mainly paid attention to in interviews is that we would present our thanks in the beginning and the end with gentle words firstly. It made participants relaxed themselves

and got ready to take part in. During the interview, interviewer fully presented her respect to the participants, for instance, using the word “people without disability” instead of “ordinary people”. Besides, when participants have any further query about the interview questions, interviewer would explain the purpose with patience. Since all of our participants are people with visual impairments, we could not do any non-verbal communication, such as eye contact, to show our attention. Therefore, interviewer used some words, like “Um”, “Yea...” to show that “I am hearing what you are saying”. On the other hand, one of our participants not only has visual impairment but also have some hearing problems, so interviewer decided to sit near to them instead of face-to-face interview.

6.3.3 Data storage

In our study, we have three kinds of data need to be stored: observation notes, consent form and interview recording files. The recording files are stored in researcher’s computer, which would be maintained as protected files until this research finished. The notes and consent form in observation and interviews are kept by researcher. All the data relevant to participants are stored in a private place that is safe and private.

7 Conclusion and Future Work

Weibo is one of the most popular social media in China. To our knowledge, there was no previous research focusing on the accessibility of Weibo. According to ("Report on Chinese Internet users with visual impairments," 2016), there are over 13 million Chinese with visual impairments. We have chosen visually impaired people as our project target group. Our research question is:

What are the accessibility issues in Weibo?

In order to gain a deeper understanding accessibility issues in Weibo, we conducted a survey and three tests to collect data. Testing by automatic tools, heuristic testing by accessibility experts and user testing with the target group were used. Both web Weibo and mobile Weibo were tested.

We received 548 survey responses. Six persons with visual impairments participated in user testing and survey. Through the data collection and analysis, we found a series of accessibility issues based on WCAG 2.0 and W3C mobile accessibility considerations.

In summary, the most frequent accessibility issues we identified in Weibo are:

1. Ambiguous presentation

This issue was found in user testing and surveys. Interview participants reported many ambiguous labels and buttons, such as the labels for Like and Favorite.

2. No alternative text for non-text content

All the tests showed this accessibility issue. Excepting stickers, the non-text content, including pictures, audios and videos, do not have alternative text. This creates an accessibility barrier for people with visual impairments.

3. No hotkey setting – no alternative access through keyboard

We found this issue through automatic testing and user testing. Testing by automatic tools showed that the Webpages on Weibo do not support ARIA tags. One interview participant mentioned that Weibo has no hotkey setting.

4. Illogical components and layout

This issue was commented by most participants in user testing. We also found that the automatic tools also reported Webpages missing proper headings causing an illogical presentation of Weibo.

5. Using inaccessible web widgets to design webpage

Participants in user testing reported that the login area on web Weibo is shown in suspended window. We also found this issue in heuristic testing. It requires keyboard users to scroll down the whole webpage to find it, which is time-consuming and adds to inaccessibility.

6. Buttons have complicated and confusing labels and representations

This issue was found in heuristic testing and user testing. For instance, the button description for Home page on mobile Weibo is “Selected, Home, Zero item, tag one of five”. It is too complicated when it only needs to show that “This is Home page”.

7. Disabled resize options

We found this in heuristic testing. On web Weibo, there is no resize option for users. On mobile Weibo, there are only three available font sizes: Large, Medium and Small. It is not possible to resize to 200% without assistive technology.

8. Low contrast

The color contrast ratio in heuristic testing is 3.95:1 (light grey text on white background), while the success criterion 1.4.6 requires the minimum contrast being at least 4.5:1. Besides, the color schema in Weibo is mostly customized. For pages such as Login and Register, the schema cannot be changed. When users log into their account, they can change the other schemas provided by Weibo. However, some of these create

accessibility problems. For example, one schema changes the navigation bar to pink while the texts on bar are already pink, i.e. low contrast.

The following accessibility improvements may remove the above barriers:

- Make every presentation for buttons and labels precise and clear
- Provide alternative text for non-text content
- Provide Hotkeys and ARIA tags for easier and efficient keyboard navigation
- Improve the logical design of page
- Provide context-sensitive support
- Use accessible web widgets to design webpage
- Provide resize options
- Improve color contrast

We plan to test new Weibo versions and the International Weibo. We will recruit more participants including both female and male so that we can cover user experience from more people with visual impairments. We will seek cooperation with the Sina Weibo Company and its designers to improve user experience and accessibility of Weibo. Through these activities we hope to contribute to the improvement user experience and accessibility of Weibo. Facebook Accessibility Department is doing a good job on accessibility improvement. We hope to promote the continuous improvement of accessibility in Weibo as well.

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9 Appendices

Appendix 1 Heuristic Testing Result

Table 20 Checking Result of Home page on Android Weibo

	Reposit	Comments	Likes	Choose Groups	Manag e Group	Favorit e	Friends Follows	Radar	Searc h
Principle 1: Perceivable									
Small Screen Size	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoom/Magnification	No	No	No	No	No	No	No	No	No
1.4.4 Resize text	No	No	No	No	No	No	No	No	No
1.4.3 Contrast (Minimum)	No (3.95)	No (3.95)	No	Yes	Yes	Partial	Yes	Yes	No
1.4.6 Contrast (Enhanced)	No	No	No	Yes	Yes	Partial	Yes	Yes	No
Principle 2: Operable									
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Device Manipulation Gestures	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes
Principle 3: Understandable									
Changing Screen Orientation (Portrait/Landsc	No	No	No	No	No	No	No	No	No

	Reposit	Comments	Likes	Choose Groups	Manag e Group	Favorit e	Friends Follows	Radar	Searc h
ape)									
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.4 Link Purpose (In Context)	N/A	Yes	N/A	Yes	Yes	N/A	No	Yes	N/A
2.4.9 Link Purpose (Link Only)	N/A	Yes	N/A	Yes	Yes	N/A	No	Yes	N/A
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Partial	Yes	Partial	Partial	Yes	Yes
3.3.5 Help	No	No	No	No	No	No	No	No	No
Principle 4: Robust									
Set the virtual	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Reposit	Comments	Likes	Choose Groups	Manag e Group	Favorit e	Friends Follows	Radar	Searc h
keyboard to the type of data entry required									
Provide easy methods for data entry	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 21 Checking Result of Message page on Android Weibo

	Mention s	Comments	Likes	Message s	Find Group	chat	Private Chat
Principle 1: Perceivable							
Small Screen Size	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoom/Magnifi cation	No	No	No	No	No	No	No
1.4.4 Resize text	No	No	No	No	No	No	No
1.4.3 Contrast (Minimum)	Yes	Yes	Yes	Yes	Yes	No	No
1.4.6 Contrast (Enhanced)	Yes	Yes	Yes	Yes	Yes	No	No
Principle 2: Operable							
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Device Manipulation	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Mentions	Comments	Likes	Messages	Find Group	chat	Private Chat
Gestures							
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Principle 3: Understandable							
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No	No	No	No
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.4 Link Purpose (In Context)	Yes	Yes	Yes	N/A	Yes	N/A	N/A
2.4.9 Link Purpose (Link Only)	Yes	Yes	Yes	N/A	Yes	N/A	N/A
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Mentions	Comments	Likes	Messages	Find Group	chat	Private Chat
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No	No	No	No
Principle 4: Robust							
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Provide easy methods for data entry	N/A	N/A	N/A	Yes	N/A	Yes	Yes
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 22 Checking Result of Post page on Android Weibo

	Text	Photos/Video	Top Article	Check in	Live	More
Principle 1: Perceivable						
Small Screen Size	Yes	Yes	Yes	Yes	Yes	Yes
Zoom/Magnification	No	No	No	No	No	No
1.4.4 Resize text	No	No	No	No	No	No
1.4.3 Contrast (Minimum)	No	No	No	No	No	No
1.4.6 Contrast (Enhanced)	No	No	No	No	No	No

	Text	Photos/Video	Top Article	Check in	Live	More
Principle 2: Operable						
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes	Yes
Device Manipulation Gestures	N/A	N/A	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes	Yes
Principle 3: Understandable						
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No	No	No
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that	Yes	Yes	Yes	Yes	Yes	Yes

	Text	Photos/Video	Top Article	Check in	Live	More
perform the same action						
2.4.4 Link Purpose (In Context)	Yes	Yes	Yes	Yes	Yes	Yes
2.4.9 Link Purpose (Link Only)	Yes	Yes	Yes	Yes	Yes	Yes
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No	No	No
Principle 4: Robust						
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A	N/A	N/A
Provide easy methods for data entry	Yes	Yes	Yes	Yes	Yes	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A	N/A

Table 23 Checking Result of Discover page on Android Weibo

	Search	Hot topic	Hottest Weibo	Add Follow
Principle 1: Perceivable				
Small Screen Size	Yes	Yes	Yes	Yes
Zoom/Magnification	No	No	Partial	No
1.4.4 Resize text	No	No	No	No
1.4.3 Contrast (Minimum)	No	Yes	Yes	No
1.4.6 Contrast (Enhanced)	No	Yes	Yes	No
Principle 2: Operable				
2.1.1 Keyboard	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes
Device Manipulation Gestures	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes
Principle 3: Understandable				
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No
3.2.3	Yes	Yes	Yes	Yes

	Search	Hot topic	Hottest Weibo	Add Follow
Consistent Navigation				
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes
2.4.4 Link Purpose (In Context)	N/A	Yes	N/A	Yes
2.4.9 Link Purpose (Link Only)	N/A	Yes	N/A	Yes
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	Yes	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No

	Search	Hot topic	Hottest Weibo	Add Follow
Principle 4: Robust				
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A
Provide easy methods for data entry	N/A	N/A	N/A	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A

Table 24 Checking Result of Me page on Android Weibo

	Personal Page	Following	Followers	Add Friends	Settings
Principle 1: Perceivable					
Small Screen Size	Yes	Yes	Yes	Yes	Yes
Zoom/Magnification	No	No	No	No	No
1.4.4 Resize text	No	No	No	No	No
1.4.3 Contrast (Minimum)	Yes	Partial	Partial	Yes	Yes
1.4.6 Contrast (Enhanced)	Yes	Partial	Partial	Yes	Yes
Principle 2: Operable					
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes

	Personal Page	Following	Followers	Add Friends	Settings
Device Manipulation Gestures	N/A	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes
Principle 3: Understandable					
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No	No
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes	Yes
2.4.4 Link Purpose (In Context)	Yes	Yes	Yes	Yes	Yes
2.4.9 Link Purpose (Link Only)	Yes	Yes	Yes	Yes	Yes
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes
3.2.3	Yes	Yes	Yes	Yes	Yes

	Personal Page	Following	Followers	Add Friends	Settings
Consistent Navigation					
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No	No
Principle 4: Robust					
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A	N/A
Provide easy methods for data entry	N/A	N/A	N/A	N/A	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A

Table 25 Checking Result of Home page on iOS Weibo

	Repost	Comments	Likes	Choose Groups	Manage Group	Favorite	Friends Follows	Radar	Search
Principle 1: Perceivable									
Small Screen Size	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoom/Magnification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1.4.4 Resize text	No	No	No	No	No	No	No	No	No
1.4.3 Contrast	No	No (3.95)	No	Yes	Yes	Partial	Yes	Yes	No

	Reposit	Comments	Likes	Choose Groups	Manag e Group	Favorit e	Friends Follows	Radar	Searc h
(Minimum)	(3.95)								
1.4.6 Contrast (Enhanced)	No	No	No	Yes	Yes	Partial	Yes	Yes	No
Principle 2: Operable									
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Device Manipulation Gestures	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes
Principle 3: Understandable									
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No	No	No	No	No	No
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Repos t	Comments	Likes	Choose Groups	Manag e Group	Favorit e	Friends Follows	Radar	Searc h
2.4.4 Link Purpose (In Context)	N/A	Yes	N/A	Yes	Yes	N/A	No	Yes	N/A
2.4.9 Link Purpose (Link Only)	N/A	Yes	N/A	Yes	Yes	N/A	No	Yes	N/A
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Partial	Yes	Partial	Partial	Yes	Yes
3.3.5 Help	No	No	No	No	No	No	No	No	No
Principle 4: Robust									
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Provide easy methods for data entry	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 26 Checking Result of Message page on iOS Weibo

	Mention s	Comments	Likes	Message s	Find Group	chat	Private Chat
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	Mentions	Comments	Likes	Messages	Find Group	chat	Private Chat
Principle 1: Perceivable							
Small Screen Size	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoom/Magnification	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1.4.4 Resize text	No	No	No	No	No	No	No
1.4.3 Contrast (Minimum)	Yes	Yes	Yes	Yes	Yes	No	No
1.4.6 Contrast (Enhanced)	Yes	Yes	Yes	Yes	Yes	No	No
Principle 2: Operable							
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Device Manipulation Gestures	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Principle 3: Understandable							
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No	No	No	No
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Mentions	Comments	Likes	Messages	Find Group	chat	Private Chat
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.4.4 Link Purpose (In Context)	Yes	Yes	Yes	N/A	Yes	N/A	N/A
2.4.9 Link Purpose (Link Only)	Yes	Yes	Yes	N/A	Yes	N/A	N/A
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No	No	No	No
Principle 4: Robust							
Set the virtual	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Mentions	Comments	Likes	Messages	Find Group	chat	Private Chat
keyboard to the type of data entry required							
Provide easy methods for data entry	N/A	N/A	N/A	Yes	N/A	Yes	Yes
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 27 Checking Result of Post page on iOS Weibo

	Text	Photos/Video	Top Article	Check in	Live	More
Principle 1: Perceivable						
Small Screen Size	Yes	Yes	Yes	Yes	Yes	Yes
Zoom/Magnification	Yes	Yes	Yes	Yes	Yes	Yes
1.4.4 Resize text	No	No	No	No	No	No
1.4.3 Contrast (Minimum)	No	No	No	No	No	No
1.4.6 Contrast (Enhanced)	No	No	No	No	No	No
Principle 2: Operable						
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes	Yes
Device Manipulation	N/A	N/A	N/A	N/A	N/A	N/A

	Text	Photos/Video	Top Article	Check in	Live	More
Gestures						
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes	Yes
Principle 3: Understandable						
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No	No	No
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes	Yes	Yes
2.4.4 Link Purpose (In Context)	Yes	Yes	Yes	Yes	Yes	Yes
2.4.9 Link Purpose (Link Only)	Yes	Yes	Yes	Yes	Yes	Yes
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes	Yes

	Text	Photos/Video	Top Article	Check in	Live	More
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No	No	No
Principle 4: Robust						
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A	N/A	N/A
Provide easy methods for data entry	Yes	Yes	Yes	Yes	Yes	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A	N/A

Table 28 Checking Result of Discover page on iOS Weibo

	Search	Hot topic	Hottest Weibo	Add Follow
Principle 1: Perceivable				
Small Screen Size	Yes	Yes	Yes	Yes
Zoom/Magnification	Yes	Yes	Yes	Yes
1.4.4 Resize text	No	No	No	No
1.4.3 Contrast (Minimum)	No	Yes	Yes	No
1.4.6 Contrast (Enhanced)	No	Yes	Yes	No

	Search	Hot topic	Hottest Weibo	Add Follow
Principle 2: Operable				
2.1.1 Keyboard	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes
Device Manipulation Gestures	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes
Principle 3: Understandable				
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes
Grouping operable elements that	Yes	Yes	Yes	Yes

	Search	Hot topic	Hottest Weibo	Add Follow
perform the same action				
2.4.4 Link Purpose (In Context)	N/A	Yes	N/A	Yes
2.4.9 Link Purpose (Link Only)	N/A	Yes	N/A	Yes
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	Yes	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No
Principle 4: Robust				
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A
Provide easy methods for data entry	N/A	N/A	N/A	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A

Table 29 Checking Result of Me page on iOS Weibo

	Personal Page	Following	Followers	Add Friends	Settings
Principle 1: Perceivable					
Small Screen Size	Yes	Yes	Yes	Yes	Yes
Zoom/Magnification	Yes	Yes	Yes	Yes	Yes
1.4.4 Resize text	No	No	No	No	No
1.4.3 Contrast (Minimum)	Yes	Partial	Partial	Yes	Yes
1.4.6 Contrast (Enhanced)	Yes	Partial	Partial	Yes	Yes
Principle 2: Operable					
2.1.1 Keyboard	Yes	Yes	Yes	Yes	Yes
2.1.2 No Keyboard Trap	Yes	Yes	Yes	Yes	Yes
2.4.3 Focus Order	Yes	Yes	Yes	Yes	Yes
2.4.7 Focus Visible	Yes	Yes	Yes	Yes	Yes
Touch Target Size and Spacing	Yes	Yes	Yes	Yes	Yes
Touch screen Gestures	Yes	Yes	Yes	Yes	Yes
Device Manipulation Gestures	N/A	N/A	N/A	N/A	N/A
2.1.1 Keyboard	N/A	N/A	N/A	N/A	N/A
Placing buttons where they are easy to access	Yes	Yes	Yes	Yes	Yes
Principle 3: Understandable					
Changing Screen Orientation (Portrait/Landscape)	No	No	No	No	No
3.2.3	Yes	Yes	Yes	Yes	Yes

	Personal Page	Following	Followers	Add Friends	Settings
Consistent Navigation					
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes
Positioning important page elements before the page scroll	Yes	Yes	Yes	Yes	Yes
Grouping operable elements that perform the same action	Yes	Yes	Yes	Yes	Yes
2.4.4 Link Purpose (In Context)	Yes	Yes	Yes	Yes	Yes
2.4.9 Link Purpose (Link Only)	Yes	Yes	Yes	Yes	Yes
Provide clear indication that elements are actionable	Yes	Yes	Yes	Yes	Yes
3.2.3 Consistent Navigation	Yes	Yes	Yes	Yes	Yes
3.2.4 Consistent Identification	Yes	Yes	Yes	Yes	Yes
Provide instructions for custom touch screen and device manipulation gestures	N/A	N/A	N/A	N/A	N/A
3.3.2 Labels or Instructions	Yes	Yes	Yes	Yes	Yes
3.3.5 Help	No	No	No	No	No

	Personal Page	Following	Followers	Add Friends	Settings
Principle 4: Robust					
Set the virtual keyboard to the type of data entry required	N/A	N/A	N/A	N/A	N/A
Provide easy methods for data entry	N/A	N/A	N/A	N/A	N/A
Support the characteristic properties of the platform	N/A	N/A	N/A	N/A	N/A

Appendix 2 Consent Form

(English version)

Project: The Accessibility of Chinese social media – the case of Weibo

Researcher: Zhifeng Liu

Contact Email: lzf0515@yahoo.com.hk

1. I confirmed that I have read and understood the purpose of this interview and have had the opportunity to ask questions.
2. I understand that I am willing to take part in this interview, and I am free to withdraw at any time, without giving reasons. Upon my withdrawal data collected as a consequence of my participation or part participant will be destroyed.
3. I understand that I can have right to ask the researcher to clarifying questions, and query the interview questions.
4. I agree that data gathered as a consequence of my participation will be recorded by audio and used for research purpose.
5. Except for the interview, all of my private information, such as name, will be covered virtually.

Participant Signature and Date:

(Chinese version)

课题内容：微博无障碍研究

采访人：刘至凤

联系方式： lzf0515@yahoo.com.hk

1. 我清楚了解此次采访的目的以及内容。
2. 此次参与采访是我自愿的，以及我有权力随时中断采访及退出。
3. 我可以要求采访者进一步提出问题的解释，以及我可以提出采访问题的质疑。
4. 我同意此次采访被录音，且录音信息被采访者用于课题研究。
5. 除了采访回答内容，我同意所有真实个人隐私信息将被虚拟化。

同意人：

时间：

Appendix 3 Conference Paper

How Accessible is Weibo for People with Visual Impairments?

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Abstract. Weibo is one of the most popular Chinese social media services. The literature has shown that social media have potential to empower people with disabilities. However, digital accessibility is a new area in China and very few studies have focused on the accessibility of Chinese social media services. This research aims to evaluate the accessibility of Weibo for people with visual impairments. A survey, interviews and user testing were used to identify accessibility issues of Weibo. On the basis of the findings, recommendations are made to improve accessibility.

Keywords. Weibo, social media, accessibility, visual impairments

1. Introduction

The use of social media services is increasingly popular in China. Kantar Group Limited [1] reports that China ranks third for social media activity when compared with the USA, the UK, France and Brazil. Social media services in China provide platforms for communication and for the sharing of information. One of the most popular services in China is the Weibo microblog, a Twitter-like Chinese social media service.

In 2008, China had about 83 million people who suffered from disabilities, i.e. 6.34% of the total population, 12 million of them having visual impairments [2]. This number has increased to 13 million according to a report published by the Tecent Research Institute [3].

Social media services are regarded as having the potential to empower the elderly and persons with disabilities [4-6]. However, accessibility issues with social media services, such as poor colour contrast, small font size and missing captions in videos, make it difficult to understand and use them, creating new digital barriers and causing inequality in the sharing of information and participation in societal activities.

In recent years, equal rights for people with disabilities have gained increased attention in China. Social media have become an important platform for increasing awareness and sharing information. However, digital accessibility is a new area in China. Although some studies have been conducted on the accessibility of non-Chinese social media services, such as Facebook, Twitter, etc. [4; 7-10], these services are often unavailable in China. Very few studies have focused on the accessibility of Chinese social media services, such as WeChat, QQ and Weibo.

The goal of the project is to identify the accessibility issues in Chinese social media and to provide recommendations for improvement. In this paper, we focus on Weibo and the accessibility issues of Weibo for people with visual impairments.

2. Method

2.1 Survey

We conducted a survey to map the usage of Weibo among people with visual impairments in China to determine which features are most used and what barriers this user group encounters when using Weibo. The questions in the survey were carefully designed to cover these aspects.

The survey was published on a platform called PC Secretary, which is an assistive software for users with visual impairments for browsing web pages. PC Secretary has more than 40,000 active daily users. Based on a screen reader, PC Secretary uses an Application Programming Interface (API) to filter information appearing in websites. It also provides a simple but logical sequence for websites. The survey appeared when the users opened PC Secretary. Users could choose to skip or answer the survey. The survey was available for 3 days.

2.2 Automatic Testing

Automatic testing of Weibo's web pages was conducted using web accessibility evaluation tools based on WCAG (Web Content Accessibility Guidelines) 2.0. These tools included two online tools (AChecker and AccessLint.com) and one browser plugin (WAVE). On the basis of the common social media features they contained, five pages in

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Weibo were chosen: a Login and Register page, a Personal Homepage with default settings, a Setting page, a Message page and a Hot Topic Page.

2.3 Heuristic Testing

The heuristic testing for Weibo was conducted on both the web version and the mobile version of Weibo. The details of the platforms, versions and devices are shown in Table 1. When testing the web version, the same five pages were tested as in the automatic testing. Relevant WCAG 2.0 success criteria, especially for users with visual impairments, were used as heuristics. The heuristic testing for the mobile version was based on mobile accessibility considerations by the World Wide Web Consortium [11]. We gave a score (yes, no or partial) for each guideline/criterion. N/A was given if the criterion was not applicable or related.

Table 1. Operation systems, devices and Weibo version evaluated

Operating System	Device	Weibo Version
Windows 7	Dell	Online Weibo
iOS 8.4.1	iPhone	6.10.0
Android 4.4.2	Meizu MX4	6.8.0

2.4 User Testing

In order to have a deeper understanding of Weibo’s accessibility barriers for users with visual impairments, we also conducted user testing on both the web version and the mobile version of Weibo. Six participants with different levels of visual impairment and s basic knowledge about accessibility participated in the user testing (Table 2).

Table 2. Participants

Participants	Age	Visual impairment	Experience with Weibo
P1	23	Blind	Web & mobile
P2	26	Can identify day and night, but no vision	Mobile
P3	27	Low vision	Mobile
P4	27	Blind	No
P5	28	Blind	Web
P6	20	Blind	No

We selected the most common functionalities in Weibo, which are the basic features for general Weibo users including Login (login with QR code, general login), Register, Repost, Comment, Like, View @ (posts mentioned me), Personal Homepage, Settings, Private chat, Hottest topic and posts, Search and Navigation.

The participants were allowed to use their own devices and were asked to choose features that they would like to test. They were interviewed before and after the testing. Their testing processes were observed and notes were taken during the testing.

The testing environments were as follows:

- P1: Vivo Xplay 5s with Android 6.0 + Talkback 5.0.2 + Android Weibo 6.7.2
- P2: Dell + Windows 7 with Internet Explorer (IE) browser 11 + Yongde with version 11.18 (Chinese screen reader on computers) + web Weibo
- P3: Samsung S4 with Android 5.0.1 + Talkback 4.5 + Android Weibo 6.7.2
- P4: Dell + Windows 7 with IE browser 11 + Zhengdu with version 1.5 (Chinese screen reader on computers) + web Weibo
- P5 and P6: iPhone 6 with iOS 9.3.3 + VoiceOver + iOS Weibo 6.3.2

3. Results

In this section, we present the results from the different types of data collection method.

3.1 Survey

In total, 548 persons answered the survey. Of these, 238 reported that they use Weibo almost every day. The top three most used features in Weibo were Repost, Comment and Write a post, followed by Hot Weibo and Search. According to the survey respondents, Android and Windows Weibo needed more improvements for accessibility than did Weibo in iOS. Figure 1 shows the distribution of the areas in Weibo that the respondents thought needed most improvement. The ‘Others’ area included the reaction speed of Weibo and the compatibility of the screen reader.

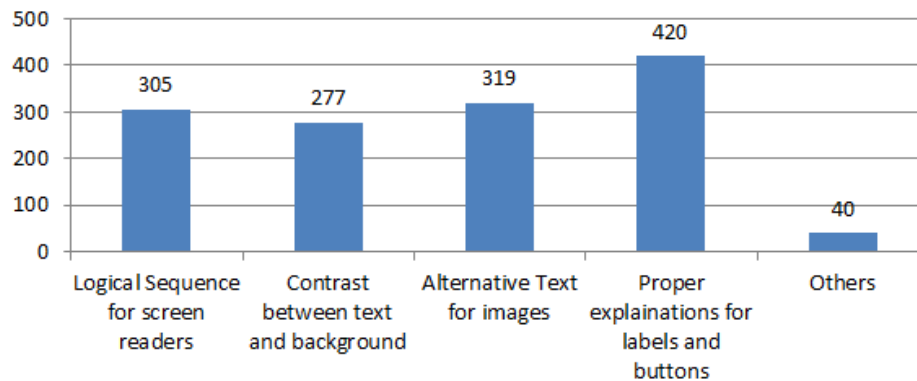


Figure 1. Areas in Weibo that need improvement.

3.2 Automatic Testing

In automatic testing, each individual web page link was input into two selective automatic tools, AChecker and AccessLint.com, and each evaluation tool generated a single report for each page. In addition, using the WAVE browser plugin tool, the accessibility problem list is shown through the internal window generated. For all the automatic testing, we chose WCAG 2.0 Level AAA as the option. Table 3 summarises the number of issues found in the automatic testing process.

Table 3. Summary of automatic testing results

Page	AChecker	AccessLint	WAVE
Login	2	1	68
Register	22	7	7
Personal homepage with default settings	2	1	103
Setting	2	1	18
Message	2	1	85
Hot topic	2	1	162

In Table 3, the accessibility problem identified by all three tools for all pages concerned the language of the page: the language was not defined or the page had an invalid language code (success criterion 3.1.1 – Language of page). A further major issues, identified by WAVE in all pages, was missing alternative text for non-text elements (success criterion 1.1.1 – Non-text element). The third most common issue was missing labels in form elements (success criterion 3.3.2 – Labels or instructions).

3.3 Heuristic Testing

For web Weibo, we tested six web pages using a Dell laptop with OS Windows 7, and with Yongde with version 11.18 (Chinese Screen Reader) on Google Chrome with version 53.0.2785.89 m (64-bit). Table 4 shows the summarised results at the principle level.

Table 4. Heuristic testing summary of web Weibo

Principle	Yes	No	Partial	N/A
1 Perceivable	21	17	13	3
2 Operable	24	14	16	3
3 Understandable	68	0	0	4
4 Robust	6	5	1	-
Total	119	36	30	10

The heuristic evaluation of mobile Weibo was conducted on MEIZU MX4 with Android 4.4.2 and iPhone 6 with iOS 8.4.1. Table 5 shows the summarised results at the principle level. The numbers in black represent the results from Android while those in red represent results from iOS. If the results from iOS and Android are the same, we present the results in black only.

Table 5. Heuristic testing summary of mobile Weibo

Principle	Yes	No	Partial	N/A
1 Perceivable	59(90)	89(59)	7(6)	-
2 Operable	216	-	1	62
3 Understandable	288	64	3	48
4 Robust	8	-	-	85
Total	571(602)	153(123)	11(10)	195

The non-text content in Weibo, such as videos and images, do not have alternative text (success criterion 1.1.1 – Non-text element). As a necessary authentication process, CAPTCHA makes it very difficult for people with visual impairments. In web Weibo, there is no option or setting for resizing text on the Setting page (success criterion 1.4.4 – Resize text). In mobile Weibo, although it is possible to choose Large, Medium or Small font size, it is not possible to resize to 200% without any assistive technology. All the text on web Weibo is pre-defined, with a specific font size and font type. In web Weibo, although it is possible to use the keyboard to navigate most web pages, it is difficult to know the current position since there is no visible indication of the keyboard focus (success criterion 2.4.7 – Focus Visible).

Screen orientation is confusing for users. When a mobile’s orientation option is turned on, mobile Weibo still maintains the portrait presentation, without any changes.

On the web and mobile Weibos, no help or assistant options are provided for users to which they can refer. When users first download and open mobile Weibo, context-sensitive help appears and provides operation information, but they disappear immediately after the ‘Done’ button is clicked and will not show again in subsequent days.

There were also issues with the visual presentation in Weibo (success criterion 1.4.8). The colour schema in Weibo is mostly consistent. For pages such as Login and Register, the schema cannot be changed. When users log in to their account, they can change the other schemas provided by Weibo. However, some of these schemas create accessibility problems. For example, one schema changes the navigation bar to a pink colour and the texts on the bar are already in pink, rendering them invisible.

3.4 User Testing

During user testing, we found that participants encountered barriers when logging in to Weibo. There are two ways to log in: use of the correct username and password or use of the mobile phone’s camera to scan the QR code provided by Weibo. In the case of using the username and password, the participants needed to use the ‘Tab’ key to get through all the content in the page before they could reach the login area. In the case of using the QR code, we observed, it was very difficult for the participants who have visual impairments to aim at the code appeared on screen.

The registration page had a CAPTCHA test and this created barriers for the participants. All of them needed help to get through the CAPTCHA for registration. In addition, there were many labels that did not have proper descriptions, which created much confusion. For example, when the participants tried to repost a post, the label for Repost only included the repost number, not the action ‘repost’. Screen reader users then only heard the repost number and had a problem understanding what the action was. When trying to reset his password for mobile Weibo in iOS, the participant was asked to match his profile icon to his username, which was part of the authentication process (Figure 2). Given his visual impairment, the participant had never seen the icon before. None of the icons had alternative text. Consequently, the participant was not able to do the matching. There was no way to skip this identity authentication step.



Figure 2. Resetting password by matching profile icon to username.

The user testing also revealed many accessibility issues in Weibo, both for the web version and mobile version. The most frequent issues were

- Ambiguous presentation, such as the label for Like and Favourite
- No alternative text for non-text content
- No hotkey setting – no alternative access by keyboard
- Illogical components and layout
- Use of inaccessible web widgets to design a webpage
- Buttons have complicated and confusing labels and representations

4. Discussion

From the survey, only about 10% of the respondents had never used Weibo. Although there are many barriers for people with visual impairments to access the web, about 50% of the respondents use Weibo daily with the help of screen readers. These figures show that Weibo, representing social media, has become an important part of their life. The fact that 258 respondents chose Hot Weibo as the popular feature means that they actually use Weibo to get the latest news, as do people without disability.

In this research, we first used a survey to map the usage of Weibo among people with visual impairments in China. On the basis of the survey, we carefully selected pages and functions in the web version and mobile version of Weibo for heuristic testing and user testing. Since China does not have relevant standards or guidelines for web and mobile accessibility, the heuristics were adapted from WCAG 2.0 and the mobile accessibility considerations of the World Wide Web Consortium [11]. Triangulation was used to capture different dimensions and provide us with rich insights into and a deeper understanding of accessibility issues.

Through the different tests, we identified some serious accessibility issues for Weibo, both the web version and the mobile version. First, Weibo lacks of an alternative description of non-text content (success criterion 1.1.1) and of labels and instructions (success criterion 3.3.2), which makes it very difficult for people using screen readers. Although it is possible to use a keyboard to navigate in web Weibo, the lack of hotkeys or ARIA tags means that it is very inefficient, requiring the user to tab through large amounts of information on a page. The lack of visible focus also creates barriers for people with low vision. In many pages, the colour contrast ratio is 3.95:1 (light grey text on white background), whereas success criterion 1.4.6 requires the minimum contrast to be at least 4.5:1. Another issue is that in mobile Weibo, the prompt messages fade out after a very short time, and it is not possible to adjust this time without changing the programmed code (success criterion 2.2.1).

In their study, Lee et al. [4] found that the online form on Twitter is illogical for people with disabilities. We have identified similar issues in Weibo. Several participants in the user testing reported that they found the elements and layouts in Weibo illogical, which made it difficult to understand and navigate.

5. Conclusions

In order to understand better the accessibility issues in Weibo for people with visual impairments, we conducted a series of tests, including automatic, heuristic and user testing, on both the web and the mobile versions. As a result of the data analysis, we identified accessibility issues and can make the following important recommendations for improvements:

- Provide a text alternative for non-text content
- Provide Hotkeys and ARIA tags for easier and efficient keyboard navigation
- Improve colour contrast and provide resize options
- Provide context-sensitive support

- Improve the logical design of pages

Social media services play an important role in the sharing of information and participation in societal activities. This research identified accessibility barriers in Weibo for people with visual impairments and has made recommendations for improvements. We have also demonstrated the use of WCAG2.0 and the mobile accessibility considerations of the World Wide Web Consortium as heuristics for testing Chinese social media services. Through this research, we hope to contribute to equal participation by raising awareness of digital accessibility and empowering people with disabilities in China.

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