Master's Thesis

Beyond Mere Listening: A User Experience Record Manual to Improve Accessibility of Public Mobile Applications for the Visually Impaired

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A thesis submitted to UNIST
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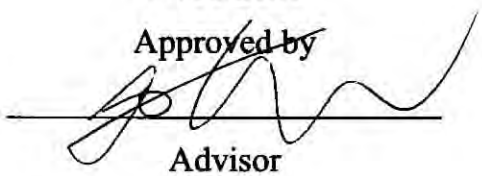

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Project Summary

Accessibility of e-government is a welfare issue for disabled people, include visual impairment users. It is a worldwide phenomenon that information and communication technologies are applied to government services, which is often termed as e-government. South Korea is one of the leading adopters of e-government, making continuous efforts to reach a fully interactive service delivery (Chung, 2015) with a goal to make government services available anywhere and at any time through the likes of websites, mobile applications, and kiosks. However, a large number of citizens experience difficulties when using such digital services since many of these services are developed without complying with accessibility principles. People with disabilities and age-related impairments have limited access that leads to the 'digital divide.' So, this project finds out why digital public services are designed without following accessibility principles and help provide a solution to this problem, however small.

This project aims to explore the various challenges that the visually impaired face in using e-government mobile applications services and to make designerly proposals to improve accessibility regardless of the materiality of the proposal. To do so, I try to scope the project by understanding the digital ecosystem through which the visually impaired manage their daily lives.

In order to understand the lived experiences of users, civil servants, and developers that engage with the use and development of the application I have conducted user studies including interviews, observations, and contextual inquiry. The first is to find out what e-government has efforts and proposals to improve the accessibility of public app services through literature research. And figure out what limitations and problems it has. The second is to explore the challenges that visually impaired users face from digital services through field studies, including interviews and observations. I also get opinions and insight from civil servants and experts on why the government efforts are not working.

Ultimately, I aim to help build user experience record manual through which more equitable public digital services can be designed with improved accessibility so that anyone, including the visually impaired, can use them without any trouble. This thesis is truthful documentation of an attempt to help reduce the frustration of users with visual impairment in using public mobile applications. If accessibility principles were followed in the application development process, anyone, including the visually impaired, would have been able to use them.

Keyword: Digital accessibility, Public mobile application, Service Manual, Mobile application development process

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Terms and Abbreviations

Terms	Meaning
Visual impairment (VI)	Broadly speaking, visual impairment "includes both low vision and blindness" (World Health Organization, 2020). Within the context of this project, I use the term as people who have difficulty getting digital information on digital devices without accessibility. People with visual impairment form a significant portion of users (at least 2.2 billion) in today's digital society.
Accessibility	Accessibility is a principle "to make content and design clear and simple enough so that most people can use it without needing to adopt it while supporting those who do need to adapt things "(GOV.UK, 2018). Within the context of this project, I aim for digital accessibility, including website, mobile application, or electronic document.
E-government	E-government called online government services is "to exchange information and services electronically with citizens, businesses, and other arms of government" (United Nations, 2021). Within the context of this project, I use the term as included municipalities.
World Wide Web Consortium (W3C)	World Wide Web Consortium (W3C) is a key international accessibility standards organization that made common guidelines of digital accessibility and shared by the online platform.
Web Content Accessibility Guideline (WCAG)	Provided by W3C above, Web Content Accessibility Guidelines (WCAG) is a global standard that shared the online platform for improved digital accessibility by W3C. Nations around the world follow WCAG when they create legislation or policies for standardization.
Assistive technology (AT)	The primary purpose of assistive technology is "to maintain or improve an individual's functioning and independence, thereby promoting their well-being" (World Health Organization, 2018). Within the context of this project, I use the term as an embedded part of the operating system of devices (e.g., iOS, Android, Mac OS, Microsoft Windows) that helps users with varying conditions utilize technological devices, such as people with disabilities or elderly population. More broadly, assistive technology can also include devices and peripherals with similar purposes as above, such as hearing aid, large-print keyboard, and color blindness glasses.

TTS (Text-To-Speech)	Text-To-Speech is a kind of assistive technology that "highlights the text as it is being read aloud for people to see and hear the content at the same time"(World Wide Web Consortium, 2010). Today, such technology is often embedded as a part of the accessibility feature of operation systems (e.g., iOS, Android, Windows, MacOS). Within the context of this project, I will often discuss the use of "VoiceOver" in Apple's iOS and "TalkBack" in Google's Android mobile operating systems.

1. Project Introduction

1.1. Personal motivation

I became interested in the accessibility challenges of users with visual impairment when I was working on an applied research project for the Korea Institute of Public Administration (KIPA) in 2020. The project was about understanding disadvantaged users in emerging smart mobility technology and services, and as the last user study activity, we invited various users to a co-design workshop on the UNIST campus. A visually impaired participant during the co-design workshop told me, "When I tried to reserve Bur-mi[1] mobile application, I couldn't use it because of its accessibility issues." She told me that she was looking for the Association for the Visually Impaired in the application, and it wouldn't read what's written in the text field, which made her type in the same word over and over again. Later during my initial research, I found out that visually impaired users cannot reserve Bur-mi without someone's help, even though the application is supposed to be designed for people with disabilities.

Figure 1. A) visual impairment participant took part in KIPA workshop B) Bur-mi application C) Bur-mi application accessibility issue video QR code

It is also possible for visually impaired users to make reservations by making phone calls without using mobile applications. But according to the participant above, she often waits for more than 30 minutes just to talk to the person on the other end of the line during rush hour times or on weekends when many users need the service. This is not because the people with visual impairment do not know how to use the smartphone or applications, but due to the poor design of the application. If accessibility principles were followed in the application development process, anyone, including the visually impaired, would have been able to use them. I wanted to find out why digital public services are designed without following accessibility principles and help provide a solution to this problem, however small.

[1] The official and dedicated taxi service for people with disability in Ulsan metropolitan area

1.2. Accessibility of e-government as a welfare issue

It is a worldwide phenomenon that information and communication technologies are applied to government services, which is often termed as “e-government” (e.g., Marchionini et al., 2003, p. 25). Silcock defines e-government as “the use of technology to enhance the access to and delivery of government services to benefit citizens, business partners and employees” (2001, p. 88). One of the most important aspects is delivering citizens with easier access to government services (Fang, 2002, pp. 1–5). South Korea is one of the leading adopters of e-government, making continuous efforts to reach a fully interactive service delivery (Chung, 2015) with a goal to make government services available anywhere and at any time through the likes of websites, mobile applications, and kiosks. However, a large number of citizens experience difficulties when using such digital services since many of these services are developed without complying with accessibility principles.

Accessibility, as defined by World Wide Web Consortium (W3C), is “about ensuring an equivalent user experience for people with disabilities, including people with age-related impairments (World Wide Web Consortium, 2010).” The W3C encourages accessibility to follow certain standard rules called Web Content Accessibility Guidelines (WCAG), and nations around the world, including South Korea, have set up legislation to comply with these guidelines when creating digital services and content. Unfortunately, accessibility in public digital services is still an under-fulfilled aim. In a practical guideline on digital accessibility, Lazar argues that such lack of accessibility occurs because “developers typically have implemented digital technologies without regard to access by persons with disabilities, and institutional purchasers of those technologies generally have not insisted on accessibility” (Lazar et al., 2015). As a result, people with disabilities and age-related impairments have limited access that leads to the ‘digital divide.’

Needless to say, the vast majority of digital services are delivered through visual interfaces that are in themselves not readily useful for users with visual impairment. The lack of accessibility in e-government services, therefore, presents a critical challenge for people with visual impairment, as these users have challenges to see visual information on digital devices. This is not a small problem, as at least 2.2 billion people have visual impairment globally (World Health Organization, 2019), and around 25 hundred thousands people are legally registered as visually impaired in South Korea (Korean Statistical Information Service, 2019). Given the large population under the influence, poorly designed public digital services can cause a digital divide due to the lack of accessibility. This is also corroborated by the statistics of the complaints filed by visually impaired users. According to the National Human Rights Commission of Korea report, the number of complaints about government digital services related to information access and communication by visually impaired people accounted for 45.16% (1036 out of 2294 cases) between 2008 and 2016 (2017).

This project aims to explore the various challenges that the visually impaired face in using e-government services and to make designerly proposals to improve accessibility regardless of the materiality of the proposal. Ultimately, I aim to help build user experience record manual through which more equitable public digital services can be designed with improved accessibility so that anyone, including the visually impaired, can use them without any trouble. To do so, I try to scope the project by understanding the digital ecosystem through which the visually impaired manage their daily lives. The first is to find out what e-government has efforts and proposals to improve the accessibility of public app services through literature research. And figure out what limitations and problems it has. The second is to explore the challenges that visually impaired users face from digital services through field studies, including interviews and observations. I also get opinions and insight from civil servants and experts on why the government efforts are not working.

1.3. **Scope**

As of 2020, the Korean government operates and manages around 780 public mobile applications, each of which is produced to serve the needs of municipalities or government institutions. Given the limited time allocated for a master's thesis project, I explore the real-life experience of users with visual impairment using mobile applications provided by the government and how such applications are designed and developed focusing on one government service. It is a disability support car reservation service called Bur-mi. That application is designed to provide welfare to citizens, and other local governments also offer similar welfare services using the mobile application. Therefore, although the number of applications I investigate is limited, the implications of the findings and the solutions may be relevant for the broader context of application development in South Korea. I pursue highly qualitative and explorative research methods, such as interviews, participatory observations, contextual inquiry(Beyer & Holtzblatt, 1999). In doing so, the aim is to get to know the real-life context of users and developers – public servants, designers, and programmers alike – and gain inspirations to explore possible solutions, not a scientistic conclusion that would work as a panacea (more and detailed description of research and design process can be found in Chapter 3).

2. Background

2.1. E-government fail to manage digital service

There seem to be overall problems when it comes to the mobile application created by the public sector. Although it is difficult to pinpoint why a large portion of public mobile applications get removed every year, this is certainly indicative of the thoughtless development of mobile applications by the public sector.

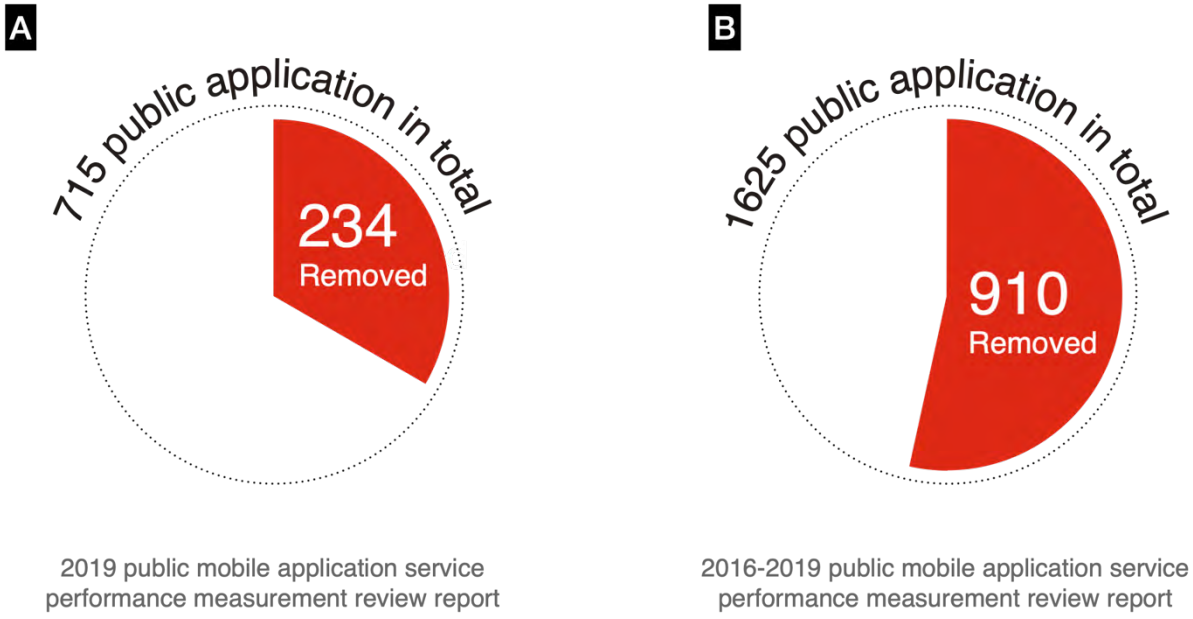


Figure 2. A) 2019 public mobile application service performance measurement review report B) 2016-2019 Public mobile application service performance measurement review report by National information Society Agency and Ministry of the Interior and Safety

According to a public mobile application service performance measurement review[2], Last year, 32.7% (234 out of 715 cases)of application removed, and if you look at between 2016 and 2019 about 4years, 56% (910 out of 1625) of application removed (Ministry of the Interior and Safety, 2019). The amount spent creating 910 discarded applications exceeded more than 40 billion KRW. This means in practice, the governments are making applications without much consideration and planning, and those are not maintained properly.

This is also consistent with the ways the government treats accessibility in mobile applications. According to the E-government mobile applications accessibility report from Korea Forum on the Rights of Persons with Disabilities, 10 mobile e-government applications accessibility scored an average of 60 points. This means of the score is that disabled people can't use those applications (2017, pp. 9–12). As you can see in Figure 3.

[2] In Korean: 모바일 대민서비스 어플리케이션 (공공앱) 성과측정 및 정비계획 검토 결과 보고서 (2019)

Figure 3. The accessibility score average of 10 public mobile applications: all public mobile applications low scored than the moderate area, which means disabled people can't use those applications

10 applications are very common services that anyone can use. The case of the safety report application, which received about 60 points, serves to help citizens easily report on safety risks encountered in their daily lives and check the results of their treatment. This application should help all citizens conveniently report their difficulties, but they do not comply with accessibility and cannot report if they have a disability.

Unsuccessful management of mobile application by the public sector

These issues are not only seen in this report. It can be seen in news articles that many public applications operated by the public sector in South Korea have been continuously requested for improvement and disposed of during the last 5 years. Nevertheless, public mobile applications that have not been improved are still being released. For example, the ECONOMY Chosun news article said, the taxi reservation service called 'S-taxi' made with huge budgets in the public sector has not been managed due to low utilization. In Seoul, 25 out of 60 public mobile applications disappeared for the same reason in three years(Kim, 2019). As of 2018, 386 out of 771 public mobile applications received recommendations for improvement and retirement due to negligence in operation and management. Public application evaluations are conducted annually, but there is no penalty for getting a low score (H. Park, 2019). In the past four years, 11 public mobile applications operating in Ulsan City have been abolished, and the cost of creating apps has been over 600 million. It is necessary to prepare regulations such as reasonable initial evaluation criteria development process for public mobile application production(Cho, 2020).

Of course, there is a limitation that news articles may have different intentions depending on the tendency of the reporter. However, if several news articles are arranged in chronological order, various problems occurring in society can be viewed more realistically. News articles show the various challenges that people with visual impairment face in a digital society.

2.2. Accessibility is changing the lives of people with visual impairment

The beginning of a digital society has changed the way we live. Today, web and mobile application services enable anyone can get information and use the service anywhere. The center of the digital devices has recently shifted to mobile devices called a smartphone. According to a report published by Pew Research Center in 2018, South Korea had the highest smartphone penetration rate among 27 countries surveyed at 95% (Silver, 2019). As well as Israel, Netherlands, Sweden also had a penetration rate of over 85%. In other words, using the smartphone has become one of the phenomena globally.

Smartphones are a very important tool in the digital society even for visually impaired users. This is because using a smartphone allows people with visual impairment to cross physical barriers and receive various benefits. Then how people with visual impairment can use a smartphone? The two conditions must be fulfilled. The first is that the smartphone must have its accessibility, and the second is that the application being developed must comply with the accessibility guidelines. Fortunately, smartphones, starting with the iPhone 3gs, have included assistive technology for accessibility in their own operating system. The most representative assistive technology was a screen reader that provides text and image contents as speech. It is called VoiceOver in Apple iOS operating system and TalkBack in Google's Android operating system. The visually impaired could use applications such as calling and sending a message provided by smartphones by using assistive technology. But needless to say, to further use a smartphone, we need to download and use various applications in application stores. In other words, the compliance of mobile applications with accessibility is directly related to the ability of visually impaired users to use their smartphones. So the application must comply with accessibility.

Mobile applications for the visually impaired are developed with complying with the W3AG standards provided by W3C. IT companies or associations around the world are releasing various mobile application services in consideration of visually impaired users. There are a variety of services, from audiobook services that users can read the books through the voice to support services where volunteers read any information through the smartphone camera. It's challenging to list all of them, as various services are constantly being released. However, to see the overall status of smartphone apps, the services and simple contents found in this project are summarized in Table 1.

However, most mobile applications are developed without complying with accessibility principles noteworthy except in Table 1. No matter how good an application is for people without a disability, it

often cannot be used by visually impaired users if they do not provide the basic accessibility features. Such lack of accessibility is more easily found to find digital e-government platforms. A news article shows the various challenges that people with visual impairment face in a digital society.

Table 1. Global commercial application services for visually impaired users in 2020

Title	Type	Contents	Web URL	Similar services
Be my eyes	Visual aid based on volunteer	It provides visual assistance by connecting visually impaired users and volunteers through real-time video calls.	www.bemyeyes.com	
Prizmo	Scanning	Scan any document with Optical Character Recognition (OCR) and speech and translate it to 59 languages.	www.creaceed.com	Adobe Acrobat, My vision helper
Sullivan +	Visual aid based on AI	Support visually impaired users, various features such as taking a photo, finding text, recognizing face through a smartphone camera	www.mysulivan.org	Seeing AI (Microsoft), Aipoly Vision
BlindSquare	Wayfinding	Guide location for visually impaired users to provide information using audio navigation.	www.blindsquare.com	G-eye, ClickAndGo, Right here, Lazarillo
Sori market	Shopping	Read the text in the image using OCR for visually impaired users	www.waddlelab.com	
Siloam Pone	Entertainment	Offer various contents such as audiobooks, magazines, travels, laws, cooking, faith for visually impaired users	www.eyefree.org	

Challenge of Digital Accessibility for the Visually Impaired users

Users with visual impairments are more likely to face barriers in the digital society. People think that when laws and guidelines are formed, everything will be solved, but users with visual impairments already know that they are not. For example, the government of South Korea created the 'Anti-Discrimination against and Remedies for Persons with Disabilities Act[3]' to improve accessibility for disabled people. It has been more than 10 years since the law was enacted, but the law has not brought effective improvement. Significantly, the accessibility of web services necessary for daily life, such as finance and shopping services, lacks accessibility in their websites. There are no detailed guidelines for frequent content changes, advertisements, contents arrange on the shopping-related website (J. Park, 2019). Digital services that do not comply with accessibility pose a lot of difficulties for users with visual impairments. Captcha, a secure authentication technology, requires the recognition of visual information such as images and text. Visually impaired people feel difficulties that cannot be certified without someone's help. Captcha with voice is being developed as an alternative technology, but it is not universal (Joe, 2019). And Kiosk, mostly self-service for ordering food and drinks, is rapidly spreading without complying with accessibility. In November 2020, as a result of a survey of kiosks installed in public institutions in Seoul, about 72% of devices received an evaluation that it is difficult for visually impaired people to use(Baek, 2020). As digital services that do not comply with accessibility are increasing indiscriminately, the challenges to the daily life of the visually impaired are increasing a lot. Recently, digital services related to Covid-19, which are directly connected to life, have also been developed without complying with accessibility, which is causing controversy. The Korea Ministry of Education has developed a 'healthy self-diagnosis mobile application and website to check symptoms of Covid-19. Before going to school, all students need to submit diagnostic results using that service, but accessibility issues make it difficult for visually impaired students to use it (Lee, 2020).

Accessibility is the most critical issue for the visually impaired user in the digital society. The whole goal of accessibility is making sure that as many people as possible can access the content of digital platforms using the tools that make them feel the most productive. It is essential to understand the various barriers to access faced by users with visual impairments.

[3] In Korean 장애인차별금지법

2.3. Why policy and guidelines have limited impact in improving digital accessibility in Korea

Little follow-up for accessibility Guidelines

The purpose of guidelines is how to make digital content more accessible to disabled people. Internationally, Web Content Accessibility Guidelines called WCAG share online platforms created by World Wide Web Consortium. The most representative international organization related to standards and guidelines is the W3C. The W3C is developing international Web standards which define an open web platform to improve digital accessibility. Within the W3C, working groups create various web standards, guidelines, and supporting materials. The most general standard guideline is WCAG, consisting of three steps: principles, guidelines, and requirements. The first version 1.0 was published in 1999 for those developing websites and the second version 2.0 was published in 2008 for more precise and technologically flexible. Now, version 2.1 was published in 2018.

Nations around the world, include South Korea, have set up guidelines based on international standards. South Korea has several guidelines such as Korea Web Content Accessibility Guidelines (KWCAG), E-government website UI, UX guidelines, Software Accessibility Guidelines, etc. Most of this material is a technical support guideline, and it requires many resources and experts to adhere to itself, and the content is also pervasive. Also, no systems and personnel can limit the development process or give feedback, even if the IT organization does not comply with it. So no one followed because most of them related technical support guidelines and it needs too many resource and no one forced to follow. Accessibility is a mandatory requirement, but there is no real disadvantage even if it is not followed. It is related to accessibility legislation that I mention in detail in the 'Low level of punishment' section.

Policies are a double-edged sword for accessibility

Policies may or may not improve accessibility. South Korea has a certification system called 'Web Accessibility Mark' one of the representative accessibility improvement policies that recognize the level

Figure 4. web accessibility mark in UNIST official website

of web accessibility of sites that comply with web accessibility standards and guidelines. Gaining the mark means that the website can be used by users with visual impairments who used assistive technology such as Voiceover, Talkback. Websites that have acquired the web accessibility mark are mainly shown at the bottom of the page, same as Figure 4.

However, websites with certification marks do not necessarily provide good accessibility. This is because all pages are not checked for accessibility and are not periodically monitored. For a visually impaired user to use the website, the accessibility of all pages must be observed. Of course, accessibility is improving compared to before as the web certificate mark is created, but inadequate verification procedures negatively affect the long term. An example of this policy being abused is when only part of the page is accessible. If the mobile certification mark produced in the future is also used for the same operation and policy, eventually, blind users will only use part of the application.

Low level of punishment

Laws are the most common way governments can ensure and comply with digital accessibility in the public sector. Digital accessibility laws or acts can affect a wide range of areas, which become a means to solve the digital divide. International governments have enacted various legislations to ensure more equitable public digital services can be designed with improved accessibility, so that anyone, including the visually impaired, can use them without any trouble. The legal system varies from country to country with differences in scope and contents. Table 2 shows a brief comparison of digital accessibility laws in the United States, European Union, Korea among 22 countries that have joined the W3C.

Table 2. International Digital accessibility laws based on W3C international Laws & Policies

Country	Title	Year enacted	Scope	WCAG based
United States	Section 504	1990	Public sector	WCAG1.0 derivative
United States	Section 508 of the US Rehabilitation Act of 1973, as amended	1998	Government	WCAG 2.0
South Korea	Act on Welfare of Persons with Disabilities	2008	Public sector, Private sector	WCAG 2.0 derivative
United States	Americans with Disabilities Act of 1990 (ADA), as amended	2009	Public sector, Private sector	None

United States	21st Century Communications and Video Accessibility Act of 2010 (CVAA)	2010	Private sector	None
European Union	Web and Mobile Accessibility Directive	2016	Public sector	WCAG 2.0
European Union	European Accessibility Act (proposed)	Draft	Public sector, Private sector	WCAG 2.0 derivative

Nations around the world make laws to ensure access to digital services for disabled people include the visually impaired. Several laws in the United States, including the Americans with Disabilities Act (ADA), are already demonstrating the effectiveness of ensuring accessibility to digital services. Korea also enacted an Act on Welfare of Persons with Disabilities in 2008. However, the laws of South Korea are not as effective as the United States laws. The reason is that they have different punishments. An example of the Americans with Disabilities Act (ADA) in the United States and the Act on Welfare of Persons with Disabilities law in Korea can be seen more clearly. For example, Target Corporation vs. National Federation of Blind (NFB) is a very famous episode in the United States (Rosencrance, 2006). In August of 2008, Target Corporation, the eighth largest retailer company in America, paid $6 million to the National Federation of the Blind because the target website did not comply with accessibility. The National Federation of the Blind (NFB), a non-profit organization representing the blind and visually impaired in the United States, has notified Target Corporation's official website, Target.com, of non-compliance with accessibility for blind and visually impaired users. Critical issues cited were, 1) a lack of alternative text on the contents at the site, 2) online purchases could not be completed without using a mouse, 3) image maps to show store locations were inaccessible, 4) headings essential to navigating the site were missing. So Target Corporation settled the class-action lawsuit filed by the National Federation of the Blind(NFB) in August 2008 and agreed to pay class damages of $6 million. Those case studies show the positive benefits of high punishment accessibility laws. However, the law of South Korea is not such a high punishment that a justifiable matter cannot be found. Of course, South Korea has a case that online shopping malls vs. 963 people with visual impairment. About 960 people with visual impairments sued three large online shopping malls because those websites lack accessibility, so visually impaired users can’t get information. In February of 2020, the online shopping mall pays $3 hundred million to the 960 people with visual impairments. It is good news, but it is only 1/20 of the Target Corporation cases. These two examples explain the importance of punishment in accessibility laws.

3. Overall process

I carried out this project for 7 months in total from October 2020 to April 2021. It began in October 2020 with primary literature research to know hard system which digital accessibility policies, laws, guidelines, etc. At the same time, I started approaching experts, such as accessibility consultants and agencies on digital accessibility. From October 2020 to January 2021, I conducted a field study to determine the development process of public mobile applications. So, I heard various experiences and opinions from accessibility experts and civil servants experienced in creating public mobile application services.

Meanwhile, I tried to meet various visual impairment types to understand challenges and issues from public mobile application services. In the field study, I used a design ethnography approach include interviews, observations, and contextual inquires, then get insight based on analysis. From February to March 2021, I repeated the process that created an idea based on interesting insights and tested it with visually impaired users to create the design proposal. After that, I focused on writing project reports until June.

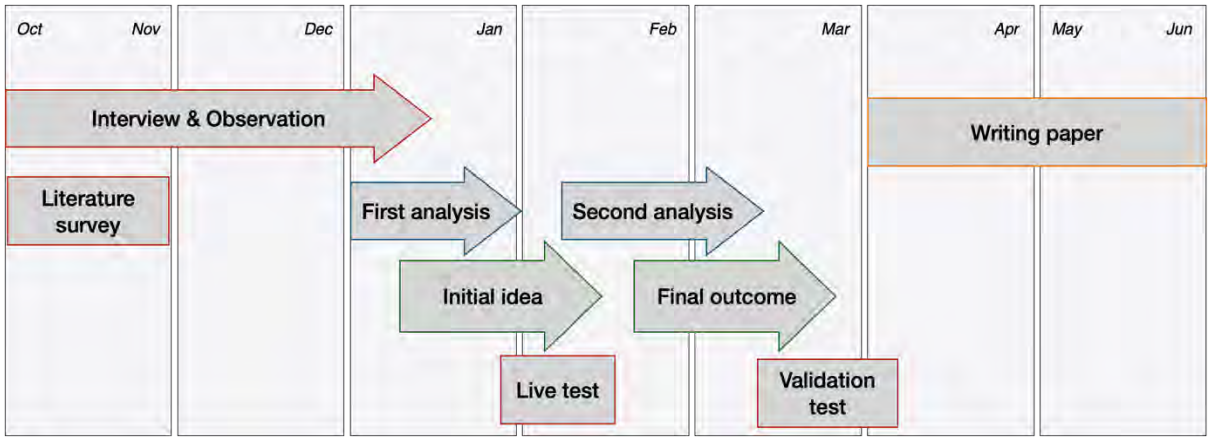


Figure 5. overall process

In this project, I needed to understand not only what the public mobile applications development process is but also the accessibility issues that arise when people with visually impaired users using public mobile applications. Therefore, I pursued maximum variation sampling (Marshall, 1996) to meet diverse relevant stakeholders to obtain information about the significance of various circumstances. Images to pay for the experiment fee. Therefore, at the end of each interview, I was asked to introduce other people with visual impairment and increase interviewees and observations.

Besides, I used snowball sampling (Faugier & Sargeant, 1997) to meet people with visual impairment because they are relatively difficult to access. People with visual impairment need to support from mobility or personal assistant when they go anywhere. There was also a practical challenge for me, such as submitting personal information.

The research was conducted through two methods. First, through the interviews, I gained background knowledge on digital accessibility by meeting an expert such as a consultant specializing in digital accessibility or an accessibility team lead belonging to the company. Also, I understood the public mobile applications development process by meeting the civil servants who planned the public applications or being introduced to the IT partner in charge of production. Second, observations were conducted with the interview. It was observed focusing on how the visually impaired users live using public mobile applications. Interviews and observations were possible in all three groups of interviews because some of the interviewees with experts and civil servants were visually impaired.

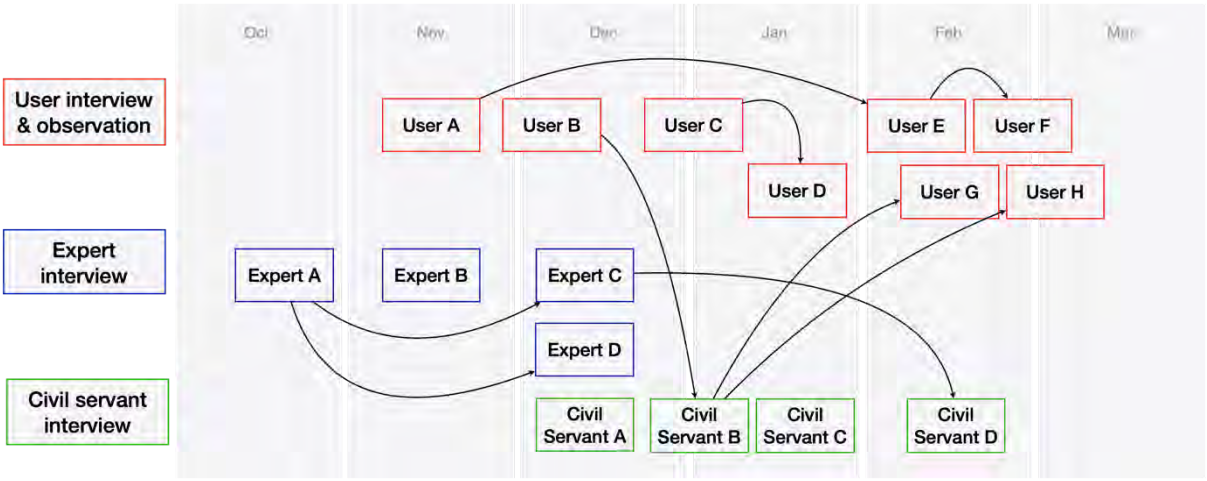


Figure 6. Snowball sampling

After interviews and observations, I proceed with primary analysis using affinity diagram methods. Insight from the first analysis became an essential factor to the initial idea. The users evaluated the initial idea through rapid prototyping. The first analysis and initial idea live test were used as data for the secondary analysis to develop the outcome.

3.1. Field study

At the start of the project, I made a list of interviewees what I need to meet to understand the ecosystem. Starting with the experts listed in the list, I contacted companies, welfare centers, private companies, and digital accessibility experts for the visually impaired and visually impaired.

Most interviewees were reluctant to reveal their personal information because of their position and affiliation. Since the most important goal of this study is to hear honest opinions and experiences from various stakeholders, all the personal information of interviewees was private. However, to ensure transparency of information, minimum information is permitted and specified. All interviews were audio-recorded with the interviewees' permission. Important notes found during the interview were documented in more detail within 24 hours along with the full interview description.

Table 3. List of interviewees

No.	Group	Position	Methods	Date	Code
1	Expert	Team lead of certification Company	Interview	2020.10.26	AA
2	Expert	Designer	Interview	2020.11.05	AB
3	User	Psychotherapist	Interview, observation	2020.11.24	AC
4	User	Accessibility Instructor	Interview, observation	2020.12.04	AD
5	Expert	UX accessibility consultant	Interview	2020.12.10	AE
6	Expert, User	Accessibility team lead of company	Interview	2020.12.10	AF
7	Civil servant	Team lead of disability association	Interview	2020.12.22	AG
8	Civil servant	IT engineer	Interview	2021.01.06	AH
9	Civil servant, User	Team lead of blind welfare center	Interview	2021.01.14	AI
10	User	Out of work	Interview, observation	2021.02.10	AJ, AK
11	User	Massager	Interview, observation	2021.02.14	AL, AM
12	Civil servant	Accessibility researcher	Interview	2021.03.05	AN
13	User	Accessibility Instructor	Interview, observation	2021.03.08	AO
14	Civil servant, User	Team lead of blind welfare center	Interview, observation	2021.03.12	AP
15	User	Staff of welfare center	Interview	2021.04.02	TD1
16	User	Staff of welfare center	Interview	2021.04.02	TD2

3.1.1. *Interviews*

In this project, an interview that one of the majority forms of data generating activity research method to understand the digital accessibility ecosystem. The application development process is generic but complying with digital accessibility standards is a very specialized field. In particular, most public applications are developed in outsourcing to IT companies or organizations, making it difficult to find detailed information. Therefore, experts who have the experiences and stories of the relevant will be of great help in getting context in a short amount of time.

For this project, I conducted a semi-structured interview. The primary interview guide structure was created through literary research but attempted deeper conversations by following the interviewee's flow as much as possible. At the end question, I used the interview method called 'Five Whys' to better understand the background or hidden intent of the answer. That was a valuable way to find the underlying problem.

The interviews were conducted with 18 participants. The interview guides are written based on 3 groups: digital accessibility experts, civil servants, and users. However, this group was not completely divided. Some of the interviewees were accessibility experts with low vision, while civil servants with blindness. Therefore, based on the common interview guide in Table 4, detailed questions were revised in consideration of the characteristics of the interviewees. Table 5, Table 6,

Table 7 have example guides with more specific questions, and all interviewed questions guides are attached to the appendix.

Table 4. common interview guide

Group	Question list
All	Greeting & Introduce project
	Get permission for recording
Expert	The main works of accessibility expert
	Expert opinion of current digital accessibility trends
	Problem and issue on digital accessibility (include public sector)
	Expert contributions and role to improve digital accessibility
	Way and solutions to improve digital accessibility
	The request for support and partnerships
Civil servant	The main works and role of civil servant

	Describe the experience of the mobile application development process
	Problem and issue on the development process
	Communication and contact point with users
	The request for support or help
User	Motivation for using the smartphone
	Introduce assistive technology for using smartphones
	The situation of using smartphone in daily lives
	Challenge and issue when visually impaired user use a smartphone
	Personal tips for using smartphones well
	Recommend application as good accessibility and bad accessibility
	Comments and opinions to improve digital accessibility (include government)

Table 5. detail expert interview guide

2020.10.26 Expert interview (Team lead of certification Company, Code AA)	
Greeting & Introduce project	Introduce project purpose, the progress of interview, etc.
Get permission for recording	If allowed, discuss what form it will look like at the report
Introduction	Please introduce yourself.
The main works of accessibility expert	What is the role of a web accessibility certification company? What are your major works in a company?
Expert opinion of current digital accessibility trends	What do you think of digital accessibility as an expert? How were digital accessibility trends? Which organizations have the most significant impact?
Problem and issue on digital accessibility	What is the challenge to improving digital accessibility? What is the reason lack of digital accessibility in the public sector?
Expert contributions and role in improving digital accessibility	What are your efforts to improve digital accessibility? What is the role and contributions of expert?

Way and solutions to improve digital accessibility	What is the most effective way to improve awareness? What needs to be supplemented to improve accessibility?
The request for support and partnerships	What area of cooperation and support do you need? Which policy do you need for works?

Table 6. detail civil servant interview guide

2020.12.22 Civil servant interview (Team lead of visual impairment association, Code AG)	
Greeting & Introduce project	Introduce project purpose, the progress of interview, etc.
Get permission for recording	If allowed, discuss what form it will look like at the report
Introduction	Please introduce yourself.
The main works and role of civil servant	What is the role of a visual impairment association? What are your significant works as a civil servant?
Describe the experience of the mobile application the development process	Please introduce the application development process. Are there any companies or people you worked with during the process? Are there any steps of efforts for care digital accessibility? How did you record and manage progress?
Problem and issue on the development process	What is the challenge or issue point of the development process? What are the limitations and restrictions in the process?
Communication and contact point with users	Are there any steps to communicate with users? So what kind of conversation will happen?
The request for support or help	What resource and policy do you need?

Table 7. detail visually impaired user interview guide

2021.01.14 Expert interview (Person with visual impairment, Code AI)	
Greeting & Introduce project	Introduce project purpose, the progress of interview, etc.
Get permission for recording	If allowed, discuss what form it will look like at the report

Introduction	Please introduce yourself.
Motivation for using the smartphone	Why did you come to use a smartphone? What does a smartphone mean to you?
Introduce assistive technology for using smartphones	What assistive technologies do you use? Please introduce your favorite assistive technologies.
The situation of using smartphone in daily lives	When do you often use your smartphone? How does it help you in your life?
Challenge and issue when visually impaired user use a smartphone	What is the challenge to using a smartphone? Have you ever experienced recurrent problems? Why do you think digital accessibility isn't followed?
Personal tips for using smartphones well	If you have your tips using a smartphone, please introduce them.
Recommend application as good accessibility and bad accessibility	Which mobile application is convenient to use? Which mobile application is inconvenient to use?
Comments and opinions to improve digital accessibility	Which policy do you need for better use of smartphones? What efforts are needed to improve accessibility?

3.1.2. ***Observation***

Observation is one of the user research methods to understand what users do. The observation method is critical because it can show how visually impaired users use smartphones in their daily lives. It is one of the appropriate ways to quickly understand areas or culture you are not familiar with it.

In this project, I conducted observations for the visually impaired user and found their own tips and know-how. The visually impaired users generally have applications they like and dislike unwanted applications. I requested that the visually impaired user use both applications using smartphone and assistive technology and at the same time proceeded with a contextual inquiry, asking questions whenever an especial behavior or unexpected situation arises. After observations, I try to write a thick description(Geertz, 1973) for recorded in more detail within 24 hours.

The user's behavior can't be predicted in advance. So, I didn't prepare a linear question list and observation list as a timetable. Instead, I focused on setting up areas to focus on and gaining basic

background knowledge not to miss important phenomena.

Table 8. Observation guide

Attitude	Focused of observation
Avoid as much as possible that the user feels observed.	Before using a smartphone, check the user behaviors, habits, etc.
Focus on user behaviors and find hidden purpose.	What is the different point, behaviors, method between visually impaired users and without visually impaired users?
	How do users react when faced with accessibility issues?
	Opportunities and risks point when they use a smartphone.
	How do users use a smartphone in various ways?

3.2. Primary Analysis

Because the data corps was so large and extensive, I used the affinity diagram method used in qualitative research to extract important insights. The Affinity diagram enables sorting a large number of resources into intelligible groups to find new insights. It is the process of freely arranging and clustering by assigning codes to important information obtained through literature review and field studies. The affinity diagram was repeated several times until the project was complete after a small amount of data was collected. This process has helped to improve understanding of the project by finding patterns in the data corps.

Figure 7. Affinity diagram in a digital collaboration tool

The most important insight gained from the primary analysis is the understanding public app development process in local government and finding opportunities to improve digital accessibility at each stage. Literary data, experts, civil servants, and users have become resources to visualize the app development process step by step. Interestingly, there is a big difference between the public app development process suggested by accessibility experts and the actual development process. For example, the process suggested by an accessibility expert is to listen to the diversity of users' opinions and test during the development process, but the civil servant who I met did not go through that process.

When I did Affinity Diagram, I needed digital tools to arrange vast amounts of information freely. The most used digital tool in the affinity diagram process is the MIRO board. That service gave the same effect as the experience of sticking a note in a virtual space and could be used at any time in an online environment. Figure 7 shows the progress of the affinity diagram for the primary analysis on a digital collaboration tool.

3.3. Contextual inquiry

Interviews and observations aimed to understand the challenge of visually impaired users about lack of accessibility and to know the public mobile applications development process. On the other hand, contextual inquiry(Beyer & Holtzblatt, 1999) aimed at users to gain a robust understanding of work practices and behaviors. Contextual inquiry is useful for many areas, but it is especially suitable for understanding users' interactions with complex systems and in-depth processes.

The contextual inquiry has conducted a total 3 steps. First, introduce 2 public mobile applications and take time to use them. At the same time, request for aloud to speak what they think while using the application. Second, check and record which stage makes accessibility issues at applications. Third, find the customer center number and provide feedback and comments on identified accessibility issues. The most important point of contextual inquiry is encouraging users to quickly talk about what they are doing and why when they are doing it.

When I used the contextual inquiry, the test applications are 1) local payment applications and 2) disability supports reservation application called 'Bur-mi' mentioned above.

Table 9. Contextual inquiry plan

Step	Progress	Consideration
Intro	Introduce project purpose and live test & setting	Get permission for record
First	Introduce public mobile applications and use it 15min. Using the Think aloud method: Request speak aloud	If it fails to install, give the extra device to participants

	what they feel, think and listen through the applications.	
Second	Talk about what they think about the accessibility. Record which stage makes the barrier to use it using screen capture, video, writing on the sticky notes.	Assists write and record what user said
Third	Find the contact number that they want to give recorded feedback and called to send it.	Record what they said to each other

In the first step, I introduced 2 public mobile applications, but 2 users were already using them, and 1 user knew what it was but there was no negative effect on the progress of the experiment. Instead, users already using the applications knew where accessibility is not reflected and used the necessary functions based on their know-how. At the same time, the think-aloud method which users express thought about the experience helped to keep up with the user's behavior flow. It was an opportunity to sympathize with the visually impaired lives more. However, it was one problem that difficult to talk about their thoughts while listening to the voice information by the screen reader on their smartphone. I asked the user to say their thoughts after listening to the voice information, ensuring that the voice information did not overlap.

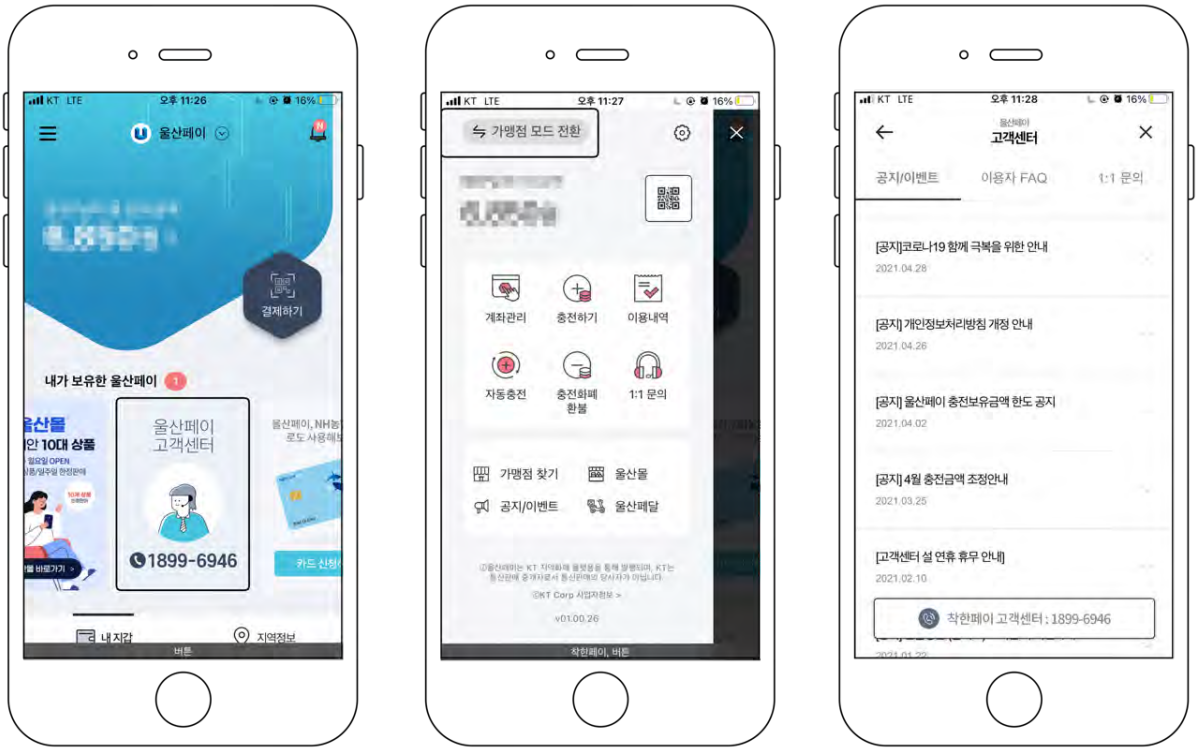


Figure 8. Smartphone screenshots of a visually impaired user

In the second step, I understood the problems and challenges that visually impaired users faced when using public mobile applications. The users had several issues completing the missions given in the test applications and even suggested solutions or tips based on their own experience. Each of the two

applications had different accessibility issues. In the first case, the Local pay application did not provide the alternative text, so all elements were read just ‘button.’ In the second case, the disability support car reservation application did not respond to what users type in the arrival text field. I've helped users write down this kind of feedback in as much detail as possible. People with visual impairment had difficulty reading and writing so I took note of what users said and read it when they want. Some users performed the screen capture function themselves for recorded what they had accessibility issues. Some users even asked for a video introducing the most efficient delivery method they had experienced.

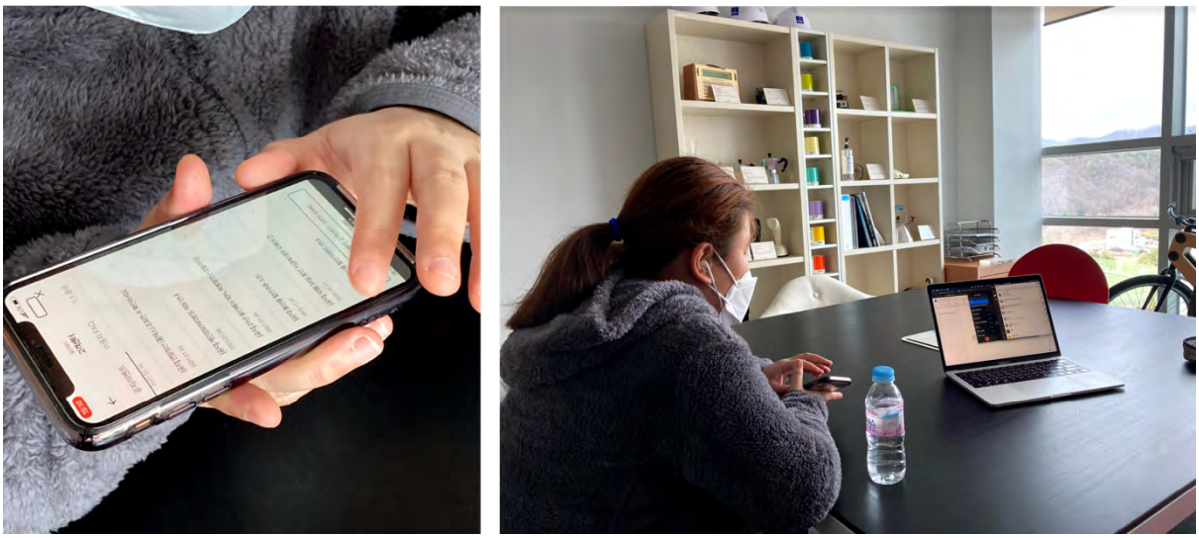


Figure 9. Visually impaired users using smartphone at contextual inquiry process

In the third step, users passed feedback recorded in the second step directly to the customer centers or civil servants related to 2 public mobile applications. This step aimed to deliver the accessibility issue through an official communication route to improve application updates. However, this process totally failed due to two major problems. First, it is challenging for users to find the official contact number in the applications to help them when they are in trouble. For example, the local pay application guides the official contact number on the home page and menu page, but visually impaired users cannot

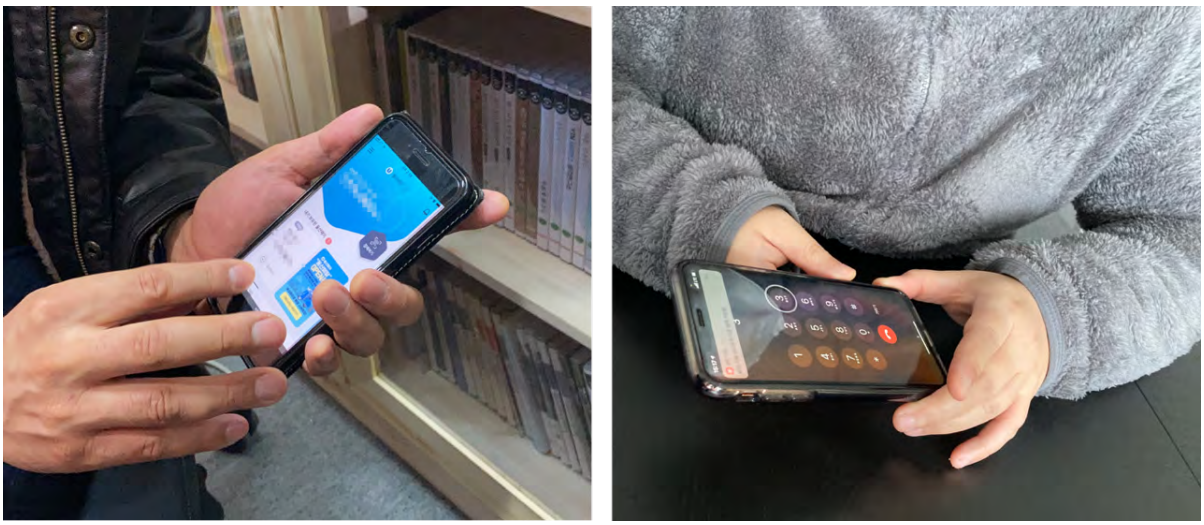


Figure 10. contextual inquiry: visually impaired user explored the public mobile application

recognize the information. Several button information including official contact numbers in the application that does not comply with accessibility is read as meaningless information through the screen reader. As a result, visually impaired users could not find the contact number, which is why the users were forced to move away from the complaint process. Second, official customer center staff or civil servants did not understand the user's accessibility complaint issue. 3 users were able to talk about feedback 4 out of 6 attempts, but none of them had accessibility knowledge and background. At one time, the user explained feedback that the button was not being read, but the staff made a completely different interpretation, and the feedback was not delivered. Of course, the user explained it repeatedly, but the customer center representative did not go smoothly.

3.4. Secondary analysis

The secondary analysis was conducted in the same way as the primary analysis, but the difference is that it summarizes the insights that can be included based on the added data. The first analysis included data from interviews and observations, while the second analysis added resources from additional interviews and contextual inquiry. I focused on connecting new resources with primary data to discover new patterns and insights from the affinity diagram. In this project, finding patterns using an affinity diagram was more helpful in generating

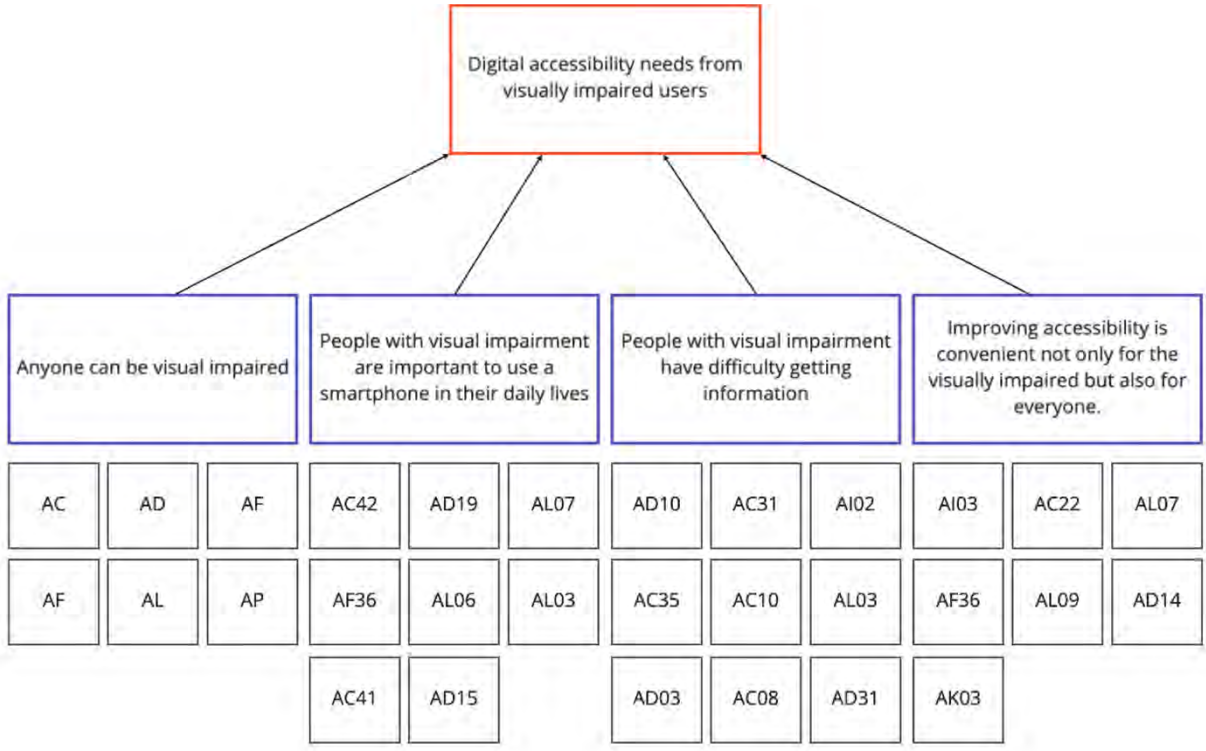


Figure 11. An example of a resulting category from affinity diagramming

4. Insights from the user study

In this chapter, I describe all the results from qualitative research and summed up with several insights. Insights were derived from patterns that organized and gathered large amounts of data. Each insight includes data from experts, civil servants, and visually impaired users' opinions and experiences who participated in the project user study. The data mentioned in the text are specified at the end of the sentence using their own codes. I have brought one sentence out of the large research content, so if you have any research questions, you can go down to the appendix to read the full text.

Unfortunately, all the data and related insights cannot mean the same thing forever, such as total disability population, presence or absence of policies, or how to test application comply with accessibility because knowledge and information are constantly changing and this project didn't continuously research all stakeholders. Therefore, this insight should be regarded as a starting point for empathizing with the difficulties faced by visually impaired users in South Korea's digital society and realizing the lack of digital accessibility of public mobile applications.

Chapter 4 is largely divided into 3 parts: Ideal process, real-life practice, Insight. First, the ideal process derived from experts and literature suggests the role and communication of stakeholders necessary to ensure that accessibility is not excluded from the mobile application development process. A simple system map has been drawn to make this process easier to understand, and related information can be found in more detail below. Secondly, real-life practice takes a closer look at the development process of a single mobile application and finds the point where the ideal development process suggested by experts does not work. In this process, there may be situations in which accessibility experts cannot participate in the development process due to resource problems, and in some cases, development is performed without user testing. This is a process in which the connected communication disappears from the ideal process. Finally, I summarize various insights from the user study. It is largely divided into 4 parts and each part has several insights and data corps. The insights are derived from several affinity diagrams based on interviews and observations of experts, civil servants, and users. So, for each insight, the underlying data is organized together.

4.1. The ideal process according to the experts and literature

Outsourcing is a frequently used development process method in the public sector. Chen said, "Outsourcing is a prominent method to address two major barriers to e-government: a shortage of skilled staff and a lack of financial resources" (2002, p. 558). According to experts and civil servants said who I met through user study, most of the Korea public mobile applications is also developed through outsourcing system with external IT companies or agencies. Outsourcing is an appropriate development process when government or municipalities lack IT experts and resources, but it is not easy because the

cooperation process requires close attention. In particular, it is an environment where it is easy to miss elements such as accessibility requirements that are not essential. So, there are several things to consider to ensure accessibility in these outsourcing systems.

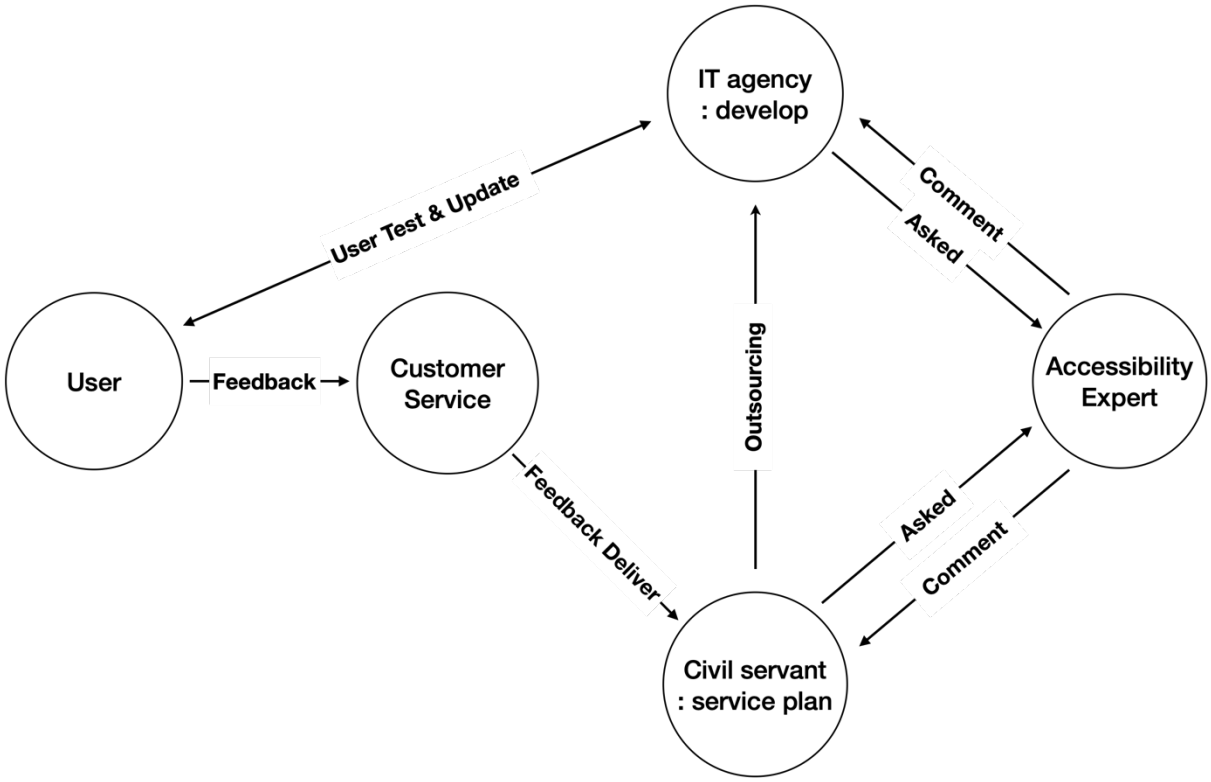


Figure 12. System map of ideal public mobile application development process to the expert and literature

Figure 12Figure 12 explains the ideal process according to experts and literature. What the experts emphasize is "Consider accessibility early stage and throughout the development process (AE58, AE59, AF25, AF27)." This means that accessibility must be continuously considered from initial development to the update process, and all stakeholders involved in development must comply with accessibility. To comply with accessibility throughout the entire development process, experts insist that feedback should be done proactively from two perspectives: technical feedback and usability feedback.

First, technical feedback comes from accessibility experts. Civil servants and IT agencies handle mobile application development. Civil servants make the service plan and IT agencies develop applications according to the service plan. Most civil servants work with external IT agencies because they lack IT knowledge and do not have IT experts inside the team. Therefore, accessibility experts identify accessibility weaknesses and improve accessibility for civil servants and IT agencies. An interview with an expert said, "Accessibility experts sometimes directly edit the code considering accessibility. (AE16)"

On the other hand, another feedback comes from the experience of visually impaired users. Since each

mobile application has different characteristics, management systems, and operational policies depending on the service, even if the mobile application is technically compliant with accessibility, accessibility issues can arise from users' real-life experiences. Therefore, the IT agency must continuously conduct tests for users during the development process and reflect user feedback. After the mobile application is released, user feedback will be delivered to the customer center. The expert explained that user feedback received through the customer center should be recorded in detail and passed on to the civil servants to reflect in the next update.

4.2. Real-life practice (Bur-mi application development process)

This chapter explains how the ideal process suggested in chapter 4.1 works in real-life practice. Given the limited time allocated for a master's thesis project, I deeply explore the Bur-mi application development process. As you can see in Figure 13, Bur-mi applications did not satisfy most of the ideal processes.

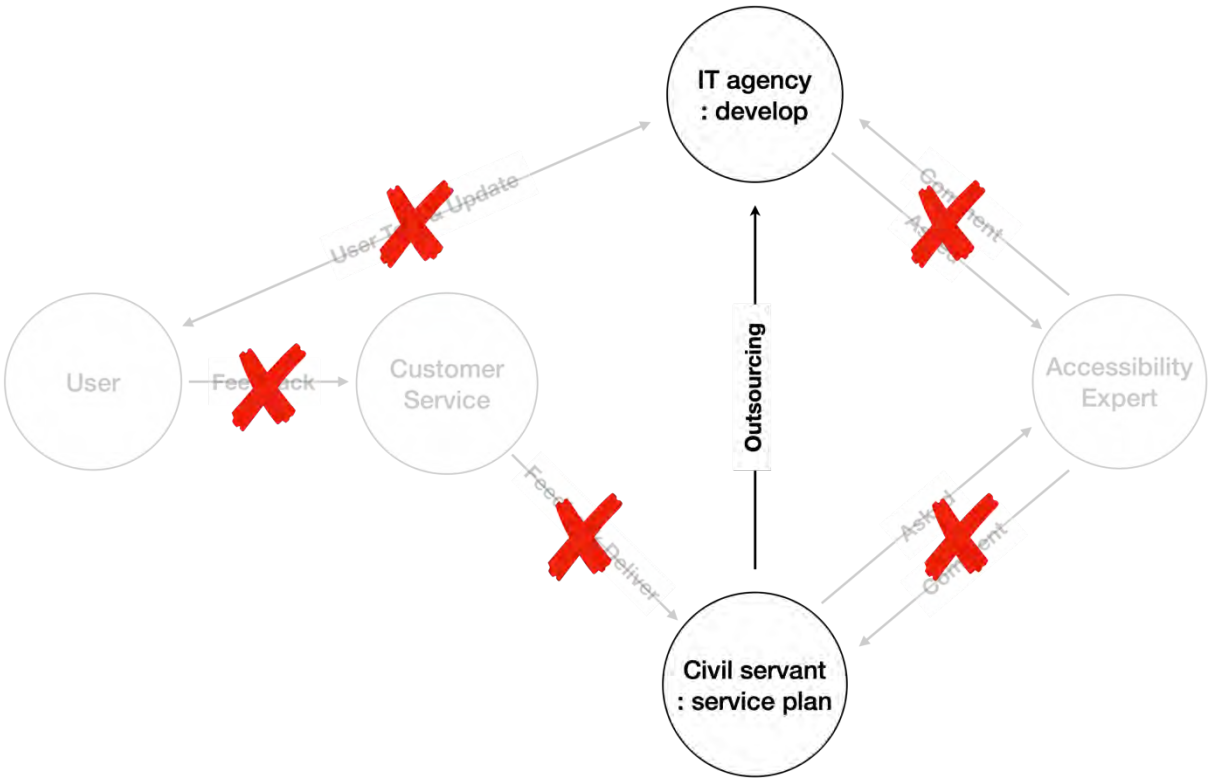


Figure 13. system map of real-life practice about Bur-mi application development process

The biggest difference from the ideal process was that users and accessibility experts could not participate in the development process. The civil servants responsible for overall service planning did not know about accessibility and did not know that they had to work with accessibility experts during the development process. Therefore, it can be seen that accessibility guidelines or technical direction were not reflected in the mobile application service. Because accessibility experts were not involved in the development, there were no feedback or accessibility considerations between civil servants and the

IT agency, accessibility issues such as alternative text, voice response, focus were not provided. Also, comments or feedback from users were not reflected in the development process. Although it is difficult to pinpoint the reasons users are not joined in the development process. However, it was an interesting insight that there was a fear that civil servants might not reflect when users participated in the development process and provided feedback (AG05).

The Bur-mi application was developed without expert technical feedback and user usability feedback. This development process looks fine at first, but problems arise when users start using the application. According to an interview with the Bur-mi application developer, that application has been updated more than 10 times a month since the first release (AG17). This real-life practice process makes users and developers – civil servants, programmers alike - more uncomfortable. Users with visual impairments are still challenging to use even though the application has been updated (AC26, AC33).

4.3. Insights

4.3.1. *Digital accessibility needs from visually impaired users*

Anyone can be visual impaired at one point of their lives

In this project, I met a total of 11 people with visual impairment, of which only 2 people were early visual impairment. About 9 people have visual impairments that later become acquired due to car accidents (AP), age-related disease (AC), glaucoma (AD), unknown vision loss (AF), etc. For example, the visually impaired person who I met through the Local Blind Association was healthy enough to serve in the military service until the age of 26, but a bicycle accident affects his vision (AL). Another visually impaired person had no vision problem until the age of 40, but her decline in vision occurs naturally with age (AC). She said it took a long time to realize because there were no external shocks or accidents. As shown, no one thought they would get visual impairment. Most people suddenly get visual impairment. That said, while the concept of accessibility may be unfamiliar right now, I always have to think that accessibility can be very closely related to our lives at any time. For this reason alone, it can be argued that you need access to all digital services.

Smartphone is important for the daily lives of visually impaired users

It is a prejudice to say that people with visual impairment have low social activity because they have less physical activity. All the visually impaired people who participated in the project were using smartphones, and they were actively using services such as YouTube, audiobooks, chat, and Facebook. (AC42, AD19, AL07, AF36). In particular, users with visual impairments all enjoyed Facebook and actively expressed their thoughts. For example, 2 people with visual impairment used YouTube to share videos of their soccer team, another user enjoys keeping up with the latest trends in digital releases on online community sites (AI28). As follows, the smartphone is an important tool for visually impaired

users, visually impaired person said it made a big difference in his life before and after purchasing an iPhone. (AL06).

Needless to say, it takes a lot of time and effort for visually impaired users to use the smartphone. One visually impaired person used a smartphone more than 8 hours a day to easily use it (AL05). Visually impaired users share smartphone usage tips (AL03), people who are accustomed to using smartphones want to use the same as without visually impaired users. (AC41, AD15). Therefore, it is important to recognize that a smartphone is also a very useful tool for visually impaired people.

People with visual impairment have difficulty getting basic information

Smartphones may or may not help visually impaired users to get information. This means that it depends on how well the visually impaired user can use the smartphone and how well the information complies with accessibility. It is said that people with visual impairment usually buy a smartphone out of curiosity, but it is often not possible to use it because they do not know how to use it (AD10). One participant with a visual impairment said that initially he did not know how to use a smartphone, so he only used call and text functions (AC31). Fortunately, the local welfare center for the visually impaired has provided an education program on how to use smartphones so that the visually impaired can receive an education if they wish (AC08, AD03, AI02, AC10). However, given that educational programs are also information, it is not easy for visually impaired users to get information online such as websites, applications, messages (AC16, AC35). Hence, some accessibility instructors I met in the project user study argue that it is more important to teach visually impaired people how much information they can get through a smartphone than to teach them how to use smartphones (AD16, AD31, AC34).

Improving accessibility is beneficial not only for the visually impaired but also for everyone.

Mobile applications that comply with accessibility provide convenient usability for all users include visually impaired users. It is important to reduce the steps to get the information that the user wants. Since many contents and functions are included in one application, it takes a lot of time for users to get the information they want, so effectively reducing that time feels convenient for all users. In particular, when people with a visual impairment uses a smartphone to listen to information by voice, it takes a relatively long time compared to the method of using the screen visually, so it is essential to reduce the access step (AI03). For example, according to the visually impaired experience through user studies, the ‘Toss’ ‘Kakao Bank’ service in South Korea, which can perform complex remittance services with a simple procedure, was convenient for the visually impaired (AC22). In addition, ‘YouTube’ and ‘Facebook’ services globally are also convenient services for visually impaired users (AL07). This means that considering the user's convenience is different from considering the convenience of visually impaired users. That's why some visually impaired users believe that the more users use the service, the

easier it will be to access it (AC23, AF36, AC18, AL09). On the other hand, there are times when certain skills or features improve accessibility. According to visually impaired participants, unlike in the past, biometrics or Face ID technology has made the unlocking method very convenient for entering the security pad (AD14). In addition, by introducing a technology that automatically displays the certification code on the keyboard, the process of repeatedly moving the screen and entering the certification code was simplified so that the visually impaired can use it easily (AK03). This makes it possible to understand that improving accessibility is not just an effort for users with disabilities.

4.3.2. *Conflict of interest in public application development*

Accessibility is considered as an option because of budget and resources

From the users' perspective, improving accessibility is important, but from the developers' perspective, it was a real problem that improving accessibility was not a priority (AB01, AB05, AC43). Even if developers understand the purpose of improving accessibility, it is said that there are limitations due to budget problems and a lack of experts (AB01). For this reason, some civil servants are reluctant to engage users in the planning step. (AH23). In particular, it is challenging to improve accessibility in small associations and organizations even with large-scale updates because the budget is always insufficient (AN11, AD40). Fortunately, accessibility could be reflected when an accessibility expert is included in the planning step of the development process, but it is difficult to continuously improve accessibility if the direction of decision-makers does not coincide with accessibility improvement (AE29).

In some cases, accessibility improvement is selectively considered by comparing accessibility-related litigation costs with the cost of accessibility consulting (AE25, AE30). In this case, depending on the cost, the number and duration of consulting training ideally proposed by accessibility experts could be affected. If the budget is tight, accessibility improvements are sometimes excluded from the development and update processes (AE12, AE14). Consequently, improving accessibility awareness alone cannot solve real problems.

Civil servants experience difficulties in accumulating adequate accessibility knowledge due to repetitive personnel movement

One of the biggest reasons for the difficulty in improving accessibility in the public sector is the repetitive workforce shifts called personnel movement. To consider accessibility in the service development process, it is most important for civil servants to know what accessibility is (AE35). However, it is difficult for civil servants to be aware of issues related to accessibility constantly, and most are struggling because they do not have knowledge related to service development (AF37, AG25). If the new civil servant does not consider improving accessibility in the development process, the ongoing project could be returned to the origin (AH14). Without knowledge of accessibility, civil

servants will be swept away from IT partners (AF38, AA23). If there is insufficient knowledge about accessibility, there may be a problem that development proceeds according to the accessibility guidelines developed in the past (AA25).

Sometimes developers and users communicate directly to solve accessibility issues (AG29). If civil servants do not repeatedly understand the user's request, most experts argue that the service will be challenging to consider accessibility consistently. Through this, it is necessary to think about the accessibility issue that arises as a system problem in the public sector.

Accessibility awareness training improves the effectiveness of project

Needless to say, improving accessibility is a very complex problem, so it is difficult to impro ve in the short term. However, accessibility experts suggest that if accessibility training for developers can be performed in the advanced step of the development process, the project can be carried out while considering accessibility (AE35). According to the experiences of accessibility experts I met through a user study, there is a big difference between accessibility awareness training cases and non-progress cases. In particular, just because an individual developer is interested in accessibility does not mean that accessibility can be improved as a whole, so all stakeholders involved in the development process must clearly understand why accessibility needs to be improved (AF33, AE05). Of course, it is also imperative to change decision-makers perceptions, and conflicts of interest remain unchanged throughout the development process. (AF35). However, experts argue that providing accessibility awareness training before proceeding with development projects can reduce unnecessary conflicts in the development process. (AE06).

4.3.3. *Toward standardized public mobile application for improved accessibility*

Consider accessibility issue throughout the mobile application development process with various users

Developing an accessible mobile application is the same as considering a variety of user environments. However, according to user study, many applications, including the Bur-mi application, are being developed without listening to user feedback (AF32, AG05). In this project, accessibility experts said that improving accessibility is difficult for services that have already been developed without considering accessibility. (AF29, AF30). Users with visual impairments often complain about systems that do not receive user feedback during development because they have a lot of experience struggling with services that have already been developed. (AG04, AD42).

Furthermore, some users suggested directions for improved accessibility compared to applications in other services of regions. (AG03). Fortunately, it was an interesting point that the feedback system is a

required direction for both developers and users. According to the IT agency in charge of developing Bur-mi applications, unnecessary updates can be reduced if users who can represent each type of disability participate in the development stage and give their opinions. (AH20).

Needs to develop and share standard UI considering accessibility

In South Korea, local governments with similar population sizes and characteristics often develop similar services. If there is a mobile support service for the disabled in Ulsan, the same service exists under different names such as Busan, Seoul, Daegu, and Daejeon. This means that if a user visits Busan while using the Bur-mi application in Ulsan, they will have to re-download from the Busan application. In this case, visually impaired users need a lot of time to adapt to the new application (AK08). Of course, there is a real-life practice problem that application integration is difficult because operations and service policies are different by region (AH13). However, in the case of a service that can unify operation and policy, it seems necessary to develop a standardized UI so that all local governments can operate the service based on the same application (AE60).

4.3.4. *Lack of accessibility management system*

Needs for a command center that manages and overseas accessibility issue

As a variety of digital services are created, efforts are constantly required to maintain the accessibility of the services. However, there is still no commend center in South Korea to manage accessibility from newly created digital services to existing digital services (AF49). Experts say that there is no comment center overseeing accessibility issues, making it difficult to continue improving the accessibility ecosystem (AF45). Currently, in South Korea, accessibility issues are managed by different institutions for each case. The accessibility issues from the public sector are handled by the Ministry of the Interior and Safety accessibility, Ministry of Science and ICT handles the private sector, issues related to discrimination are handled by the National Human Rights Commission of Korea, and the Ministry of Health and Welfare handles accessibility issue related to legislation. Thus, accessibility issues are being treated as areas of no interest, as the tragedy of commons. Even if users are faced with accessibility issues, they don't know which institution to contact, and the developers are also in a situation where they have to take personal responsibility when an accessibility issue arises (AC44, AF46).

As a result, very few are interested in the accessibility of services developed in the public sector, including the private sector. Even when the application is released, there is no institution in charge of checking accessibility (AF49). Users also ask for a way to deliver their opinions about accessibility officially (AC44). There are fewer accessibility experts compared to the size of the digital platform market in South Korea (AF04). Table 10 summarizes accessibility consultant agencies in South Korea through user studies. Considering that there are about 5 companies that perform accessibility consulting, it is few accessibilities consulting companies in Korea (AF50).

Table 10. Accessibility consultant agency list in South Korea

Name	Area	Works	Web URL
Naver Nuli	Affiliate	Seminar, community, tools, experience	nuli.navercorp.com
Linkage lab	Subsidiary	Improve Kakao platform accessibility	www.linkagelab.co.kr
SNC lab	Consulting agency	Consulting, system integration, R&D	www.snclab.kr
Web soul lab	Consulting agency	Consulting, system integration, management	www.websoul.co.kr
Pentacreed	Consulting agency	Consulting, system integration, IT outsourcing	www.pentacreed.co.kr
Upleat	Consulting agency	UI/UX consulting, system integration	www.upleat.com

There are several systems for certification of accessibility, but it has many loopholes

As mentioned in Chapter 2, Korea has laws, policies, and guidelines to comply with accessibility. The representative law, Anti-Discrimination against and Remedies for Persons with Disabilities Act, comprehensively includes a kiosk, application, web (AN01, AN02). In addition, as the ICT market is constantly changing, experts predicted that related revisions would come out (AA21). However, the problem is that accessibility is not being maintained in the real world. There are many reasons, but experts point out that the weak penalties of the law and avoidable exceptions are the main reasons (AN03, AI26, AA29). For example, in the accessibility certification mark system, there are cases where accessibility is not improved by abusing a method called 'exception clauses' that cannot be implemented with current technology (AF44). Also, it is pointed out that there is a problem with the accessibility mark system, which does not check the entire service page because the authentication mark inspection is performed in a sampling method once a year (AF41). Of course, the government has also established a system to determine accessibility using guidelines in the inspection process, but it is limited to the web (AE49, AE50). In addition, even if a user sues a service to improve accessibility, there is also a problem that involves a lot of time and procedures (AN10, AE34). In advance, it is necessary to consider how to flexibly impose penalties when services are not complying with accessibility to solve the problem.

4.3.5. *Little follow-up for accessibility after an application is launched*

Needs for a system that takes accessibility into account in the update process

Mobile applications are platforms in which user feedback and requests are continuously generated (AH10). Therefore, mobile application development is essential, but the process of updating based on user feedback is also very important. This is the same in terms of improving accessibility. It is also important to consider accessibility to mobile applications for the first time, but it is important to consider accessibility each time an update proceeds (AD39). However, experts still say it is challenging to consider accessibility during the update process consistently.

Visually impaired users who need a lot of time to get used to the application using assistive technology are susceptible to updates issues. The first impression of the application becomes a necessary criterion for users with visual impairments (AI13). This is because accessibility improvements are often missed during the update process. In particular, if an application that was available before the update becomes unavailable after the update, the visually impaired users challenging to use it. (AC24, AD28, AC40). For example, a visually impaired who enjoyed Samsung Pay with their smartphones also had difficulties in the payment situation due to the update. The problem is that the way Samsung Pay works have changed as the application is updated. If users can see the screen visually, it won't be a big challenge, but visually impaired users feel it's the same as learning a new application (AI25).

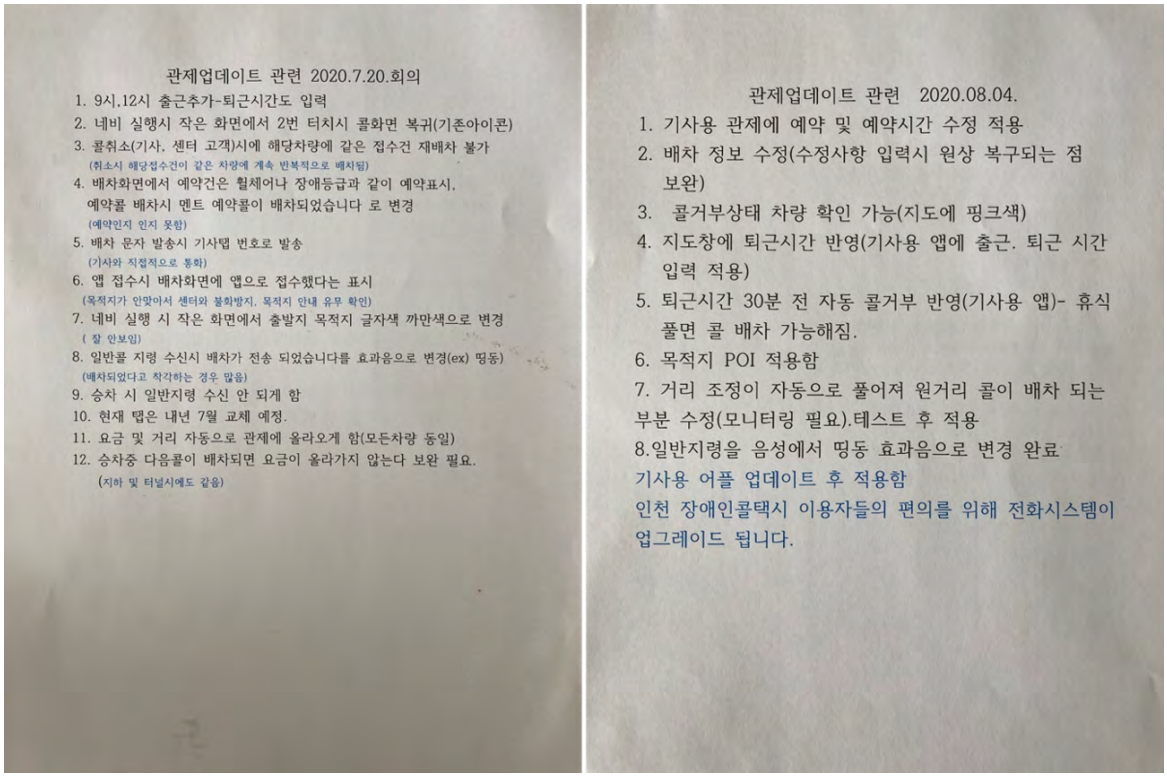
An organization's mission or agenda that doesn't change when people change is critical to ensuring that accessibility improves during service development. (AF48). For example, it is said that local governments with a high interest in accessibility held public hearings so that they could know the opinions of various people with disabilities whenever there was an update of public application services (AJ09). The visually impaired participant who attended the public hearing felt safe to have a channel to convey their opinions. This example proves what positive effects can be achieved when a system that considers users is in place.

Systems in which user feedback is not delivered or reflected

According to the findings of this project, public mobile services have not yet formed a system that systematically records and reflects user feedback. The Bur-mi application also confirmed that content related to service improvements, such as user feedback, service update, service issue, were not systematically managed (AG20).

According to share by the civil servant who planned the Bur-mi application, it can be seen that the content is implied as a brief description in sentences. Therefore, users do not know how to deliver their opinions when they have difficulty using the service (AC28), or even though users have provided feedback, the service will not be improved (AC29). It is difficult to explain for one reason why it is

difficult for user feedback to affect service improvement directly, but the reality is that users are tired of repeated accessibility issues. Specifically, if a user has provided feedback on a service issue but still does not receive any feedback, the user no longer wants to provide feedback on the service (AK17, AD25). Another visually impaired participant was also unable to describe the problem by voice alone, so he recorded videos to provide feedback. (AM05). However, despite the efforts of these users, users feel disappointed when they hear repeated answers and negative comments (AK11, AK13, AL15).



관제업데이트 관련 2020.7.20.회의

1. 9시,12시 출근추가-퇴근시간도 입력
2. 네비 실행시 작은 화면에서 2번 터치시 콜화면 복귀(기존아이콘)
3. 콜취소(기사, 센터 고객)시에 해당차량에 같은 접수건 재배차 불가
   (취소시 해당접수건이 같은 차량에 계속 반복적으로 배차됨)
4. 배차화면에서 예약건은 휠체어나 장애등급과 같이 예약표시,
   예약콜 배차시 멘트 예약콜이 배차되었습니다 로 변경
   (예약인지 인지 못함)
5. 배차 문자 발송시 기사탭 번호로 발송
   (기사와 직접적으로 통화)
6. 앱 접수시 배차화면에 앱으로 접수했다는 표시
   (목적지가 안맞아서 센터와 불화발생, 목적지 안내 유무 확인)
7. 네비 실행 시 작은 화면에서 출발지 목적지 글자색 까만색으로 변경
   (잘 안보임)
8. 일반콜 지령 수신시 배차가 전송 되었습니다를 효과음으로 변경(ex) 띵동)
   (배차되었다고 착각하는 경우 많음)
9. 승차 시 일반지령 수신 안 되게 함
10. 현재 탭은 내년 7월 교체 예정.
11. 요금 및 거리 자동으로 관제에 올라오게 함(모든차량 동일)
12. 승차중 다음콜이 배차되면 요금이 올라가지 않는다 보완 필요.
    (지하 및 터널시에도 같음)

관제업데이트 관련 2020.08.04.

1. 기사용 관제에 예약 및 예약시간 수정 적용
2. 배차 정보 수정(수정사항 입력시 원상 복구되는 점 보완)
3. 콜거부상태 차량 확인 가능(지도에 핑크색)
4. 지도창에 퇴근시간 반영(기사용 앱에 출근. 퇴근 시간 입력 적용)
5. 퇴근시간 30분 전 자동 콜거부 반영(기사용 앱)- 휴식 풀면 콜 배차 가능해짐.
6. 목적지 POI 적용함
7. 거리 조정이 자동으로 풀어져 원거리 콜이 배차 되는 부분 수정(모니터링 필요).테스트 후 적용
8. 일반지령을 음성에서 띵동 효과음으로 변경 완료

기사용 어플 업데이트 후 적용함

인천 장애인콜택시 이용자들의 편의를 위해 전화시스템이 업그레이드 됩니다.

Figure 14 Bur-mi mobile application development process document

Lack of understanding and empathy for the visually impaired users' behaviors.

One of the reasons accessibility improvements aren't happening is that it's difficult to empathize with the behavior of visually impaired users. Basically, visually impaired users use assistive technologies such as screen readers to use their smartphones, but most without of visually impaired users and developers do not even know what assistive technologies are. The problem arises when the customer service staff who listen directly to the user's feedback do not know about accessibility. When a user with a visual impairment feels that it is difficult to use a mobile application, they call the customer service center. Still, the staff does not know what a screen reader is, so it is difficult to deliver their opinions (AJ08, AK16). It is less difficult for users and contact center staff to look at the same screen together, but communication is only voiced in most cases. (AJ10). One visually impaired participant said it was a great comfort to know that the contact center staff knows what accessibility is (AL11).

5. Design proposal

Chapter 5 suggests a design proposal to appropriately document the experience of visually impaired users in using the public mobile application. As discussed in Chapter 4, the existing general mobile applications development process has the opportunity to improve digital accessibility that can be accessed through a variety of pathways. I propose to create possible idea opportunities and solutions through the ‘what if’ approach commonly used in the design. Design proposals called Outcomes may be generated based on incomplete information, but these outcomes will be an opportunity for re-validation to derive new insights.

I propose design intervention - a user experience record manual for adequate documentation of user feedback. The user experience record manual is a guidebook provided to customer center staff who often listen to user feedback and complaints. Generally, when users have a problem or issue using public mobile application services, users contact the customer service center. But according to this project field studies, if visually impaired user sends a complaint to the customer center to request improved accessibility, but nobody understands what assistive technology is and what is required for accessibility. The Ministry of the Interior and Safety provide a guidebook called 'Civil Servants Respond Manual (2019)' dealing with how civil servants can respond to customers, but there is only one page dedicated to helping users with visual impairment. This is not sufficient to appropriately responding to complaints such users have in using public mobile applications. Failure to understand and record the user's difficulties reduces the possibility of service improvements. This user experience record manual helps understand and adequately record the complaints of visually impaired users who have difficulties in using public mobile applications. The ultimate goal is to ensure that customer feedback recorded adequately and shared through the user experience record manual and reflected in the digital service update process. I believe this process will be a starting point for public mobile applications to comply with accessibility.

5.1. User Experience Record Manual

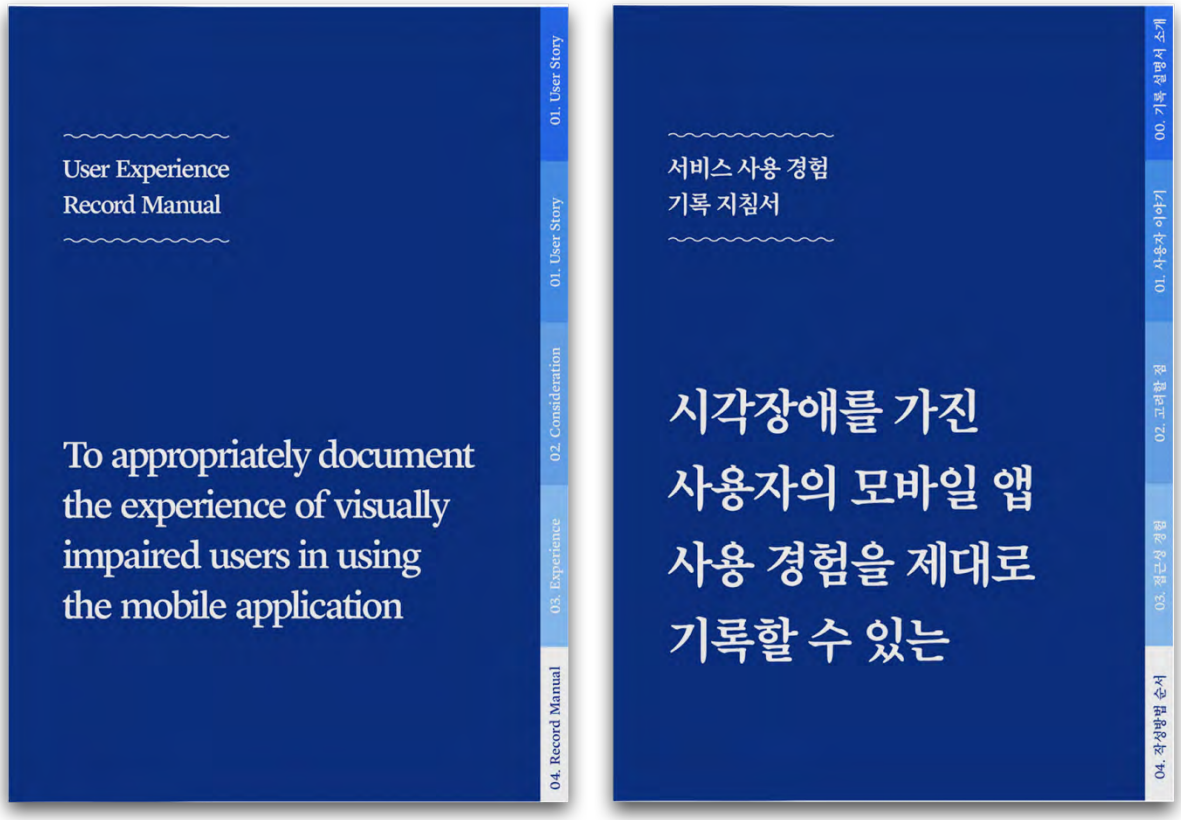


Figure 15. user experience record manual covers English version(left), Korean version(right)

According to the insights found through the project, it is important to develop according to accessibility, but update management is also necessary along with continuous accessibility improvement. This includes considering the accessibility of mobile application development and improving the accessibility of the update process. From the experiences of the various stakeholders who I met, it is essential to focus on user feedback to improve accessibility throughout the entire development and management process continuously. In particular, to obtain feedback related to accessibility, it is necessary to ask appropriate questions and deep sympathy to consider the characteristics of the user's use of the smartphone. In this context, the user experience record manual guides customer service staff on quickly relating to and responding to users, even those with no experience in accessibility.

The user experience record manual is in the form of a booklet with 4 chapters and 12 pages. The single side is A5 size, so people can easily print and read it by folding it in half. This manual contains content to help you understand the real-life experiences of users with visual impairments, and it is based on research data from this project. I recommend that you read all the chapters from the beginning to the end, but if you don't have enough time, you can read each page first using a side chapter mark, depending on your purpose.

5.1.1. *Motivation*

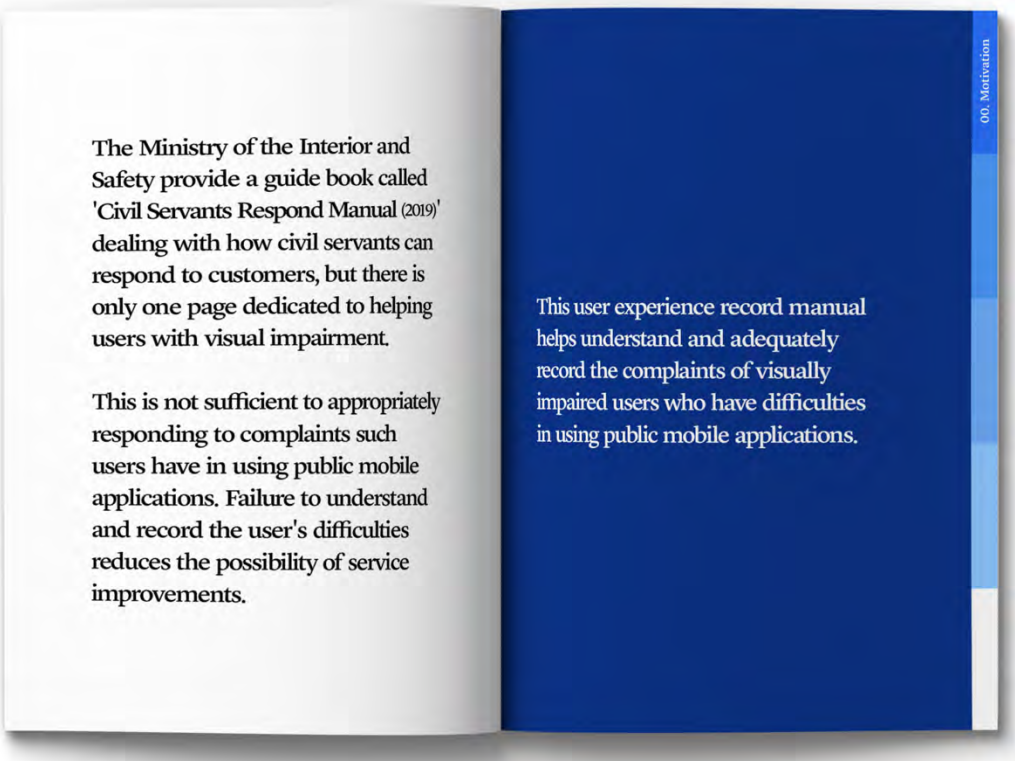


Figure 16. user experience record manual motivation chapter

The user experience record manual motivation chapter consist of 2 pages and has a brief introduction to the background in which the user experience record manual was created. The contents point out the background and lack of existing manual. The full text of the motivation is as follows.

Background

The Ministry of the Interior and Safety provide a guidebook called 'Civil Servants Respond Manual (2019)' dealing with how civil servants can respond to customers, but there is only one page dedicated to helping users with visual impairment. This is not sufficient to appropriately responding to complaints such users have in using public mobile applications. Failure to understand and record the user's difficulties reduces the possibility of service improvements.

This user experience record manual helps understand and adequately record the complaints of visually impaired users who have difficulties in using public mobile applications.

5.1.2. *User Story*

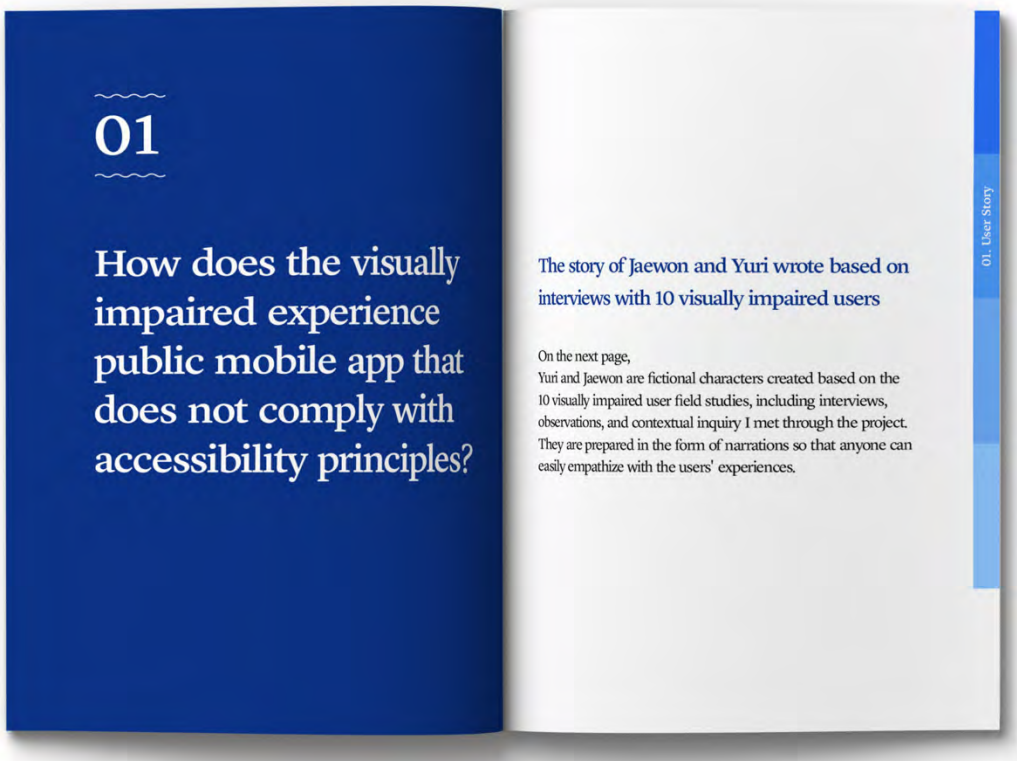


Figure 17. user experience record manual user story

How does the visually impaired experience public mobile app that does not comply with accessibility principles?

The first chapter explains how visually impaired users experience public mobile applications without complying with accessibility. There are two fictional characters, each describing visual impairment in two categories: blindness and low vision. The story of Jaewon with blindness and the story of Yuri with a low vision are fictional character stories created based on the 10 visually impaired user field studies, including interviews, observations, and contextual inquiry I met through the project. They are prepared in the form of narrations so that anyone can easily empathize with the users' experiences. I can't deliver all the difficulties and issues people with visual impairment faced every day through two short stories, but anyone reading this story will be a starting point to empathize with various challenges in real-life experience on public mobile applications. The full text of the two stories is as follows.

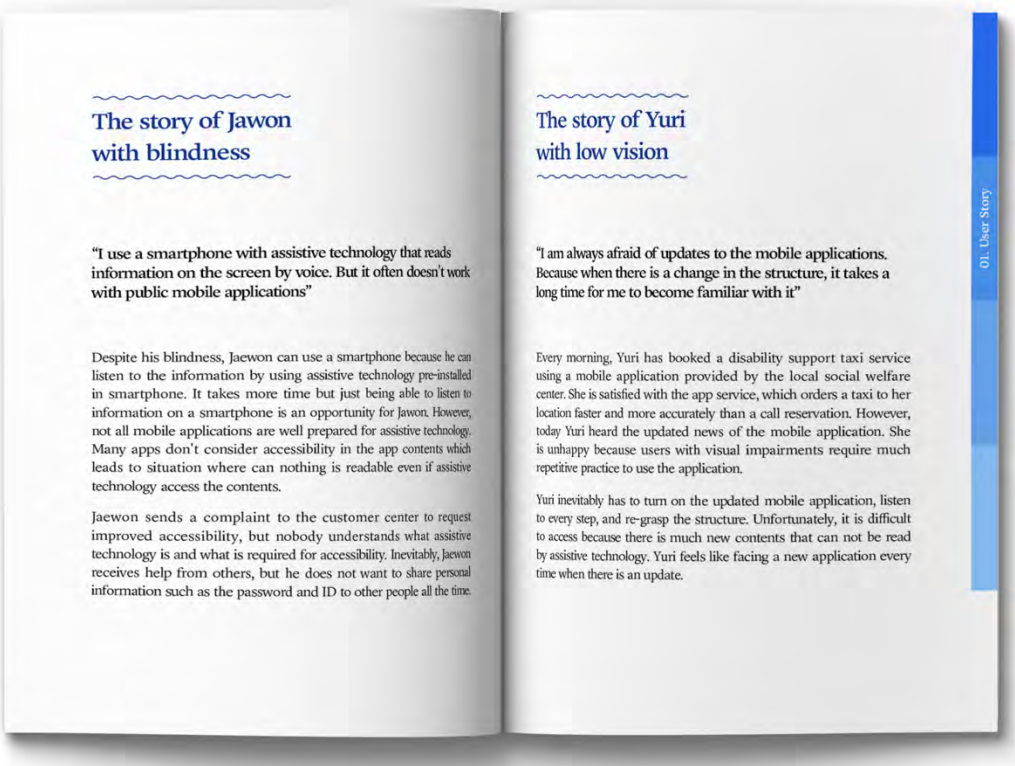


Figure 18. user experience record manual user story contents

The story of Jaewon with blindness

"I use a smartphone with assistive technology that reads information on the screen by voice. But it often doesn't work with public mobile applications"

Despite his blindness, Jaewon can use a smartphone because he can listen to the information by using assistive technology pre-installed in smartphone. It takes more time but just being able to listen to information on a smartphone is an opportunity for Jawon. However, not all mobile applications are well prepared for assistive technology. Many apps don't consider accessibility in the app contents which leads to situation where can nothing is readable even if assistive technology access the contents. Jaewon sends a complaint to the customer center to request improved accessibility, but nobody understands what assistive technology is and what is required for accessibility. Inevitably, Jaewon receives help from others, but he does not want to share personal information such as the password and ID to other people all the time.

The story of Yuri with low vision

"I am always afraid of updates to the mobile applications. Because when there is a change in the structure, it takes a long time for me to become familiar with it"

Every morning, Yuri has booked a disability support taxi service using a mobile application provided by the local social welfare center. She is satisfied with the app service, which orders a taxi to her location faster and more accurately than a call reservation. However, today Yuri heard the updated news of the mobile application. She is unhappy because users with visual impairments require much repetitive practice to use the application. Yuri inevitably has to turn on the updated mobile application, listen to every step, and re-grasp the structure. Unfortunately, it is difficult to access because there is much new contents that can not be read by assistive technology. Yuri feels like facing a new application every time when there is an update.

5.1.3. *Consideration*

Figure 19. user experience record manual consideration chapter

What kinds of considerations are needed to understand the visually impaired experience?

The second chapter describes needs for better communication with visually impaired users. There are two things to consider mobile application accessibility issues with visually impaired users. This consideration becomes even more important, especially if you are unable to speak face-to-face. The full text of contents is as follows.

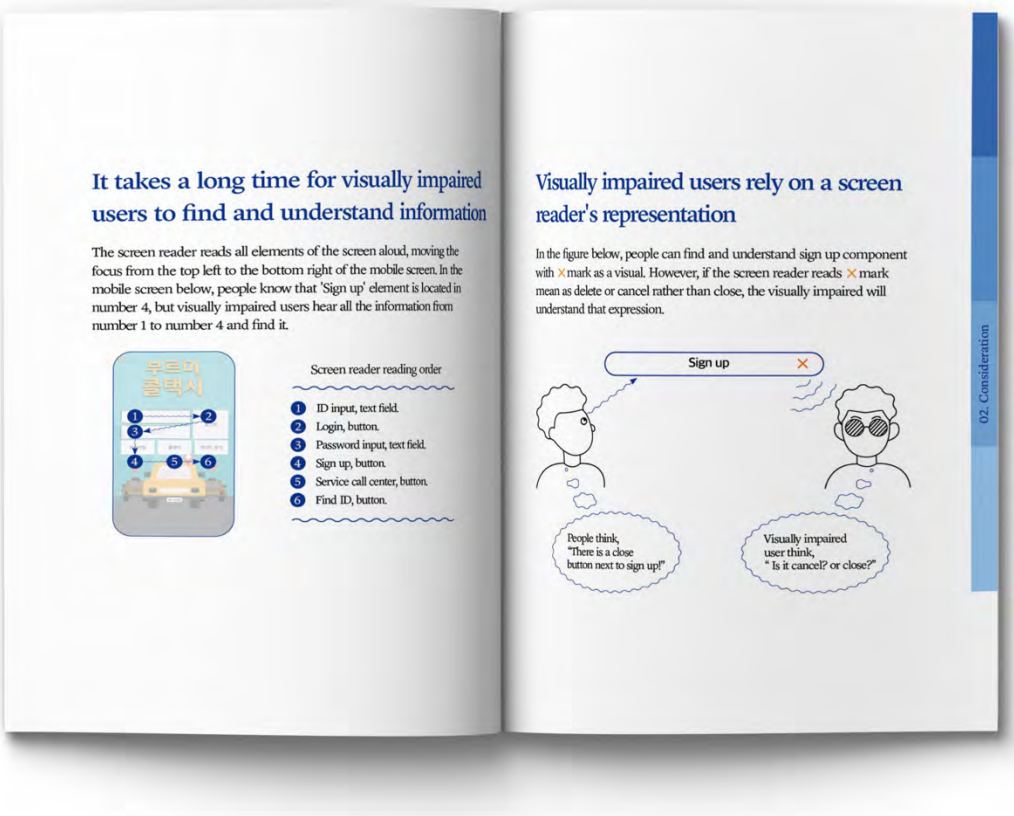


Figure 20. user experience record manual consideration chapter contents

It takes a long time for visually impaired users to find and understand information

A screen reader reads all elements of the screen aloud, moving the focus from the top left to the bottom right of the screen. In the app screen below Figure 21, people know that 'Sign up' element is located in number 4, but visually impaired users hear all the information from number 1 to number 4 and find it.

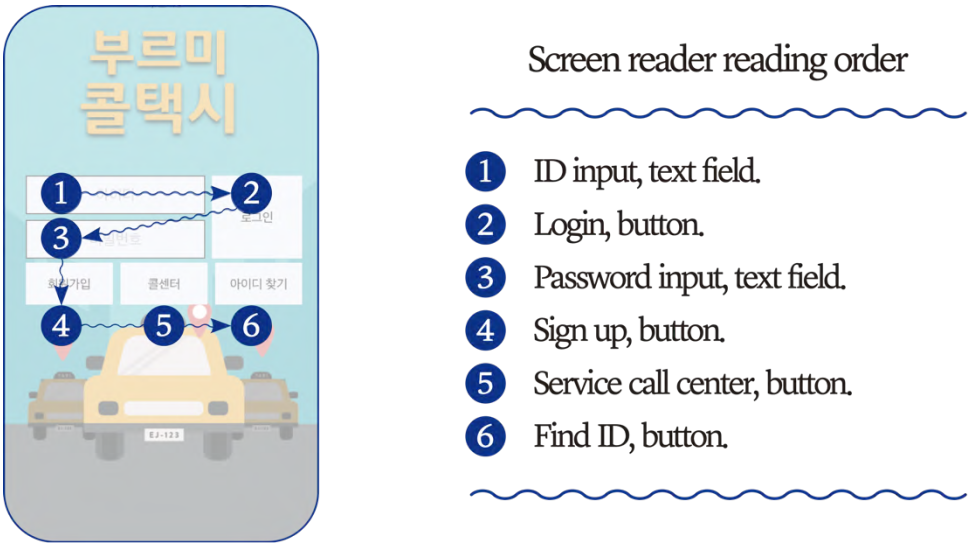


Figure 21. consideration chapter screen reader reading order image

Visually impaired users rely on a screen reader's representation

In the Figure 22Figure 22, people can understand sign up and X mark as a visual. However, if a screen reader

reads X mark mean as delete or cancel rather than close, the visually impaired will understand that expression.

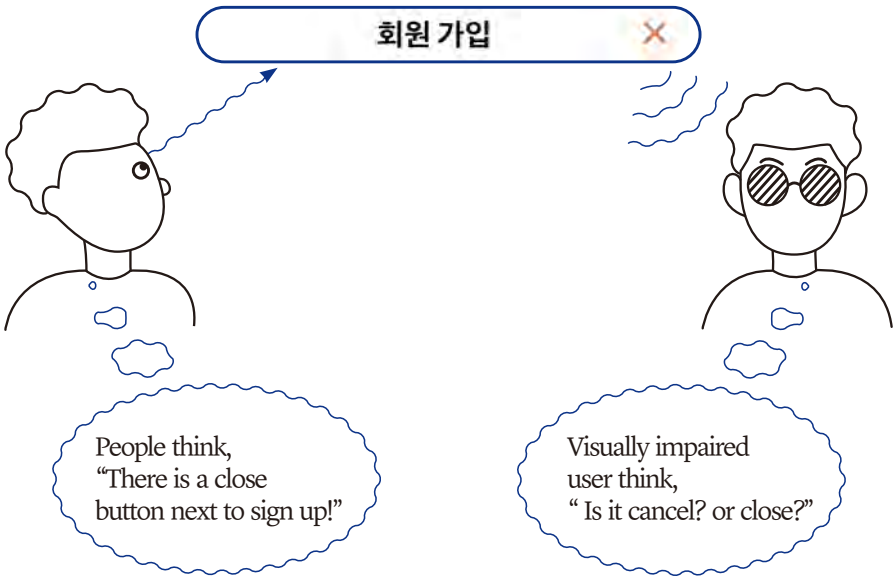


Figure 22. consideration chapter screen reader's representation image

5.1.4. *Experience*

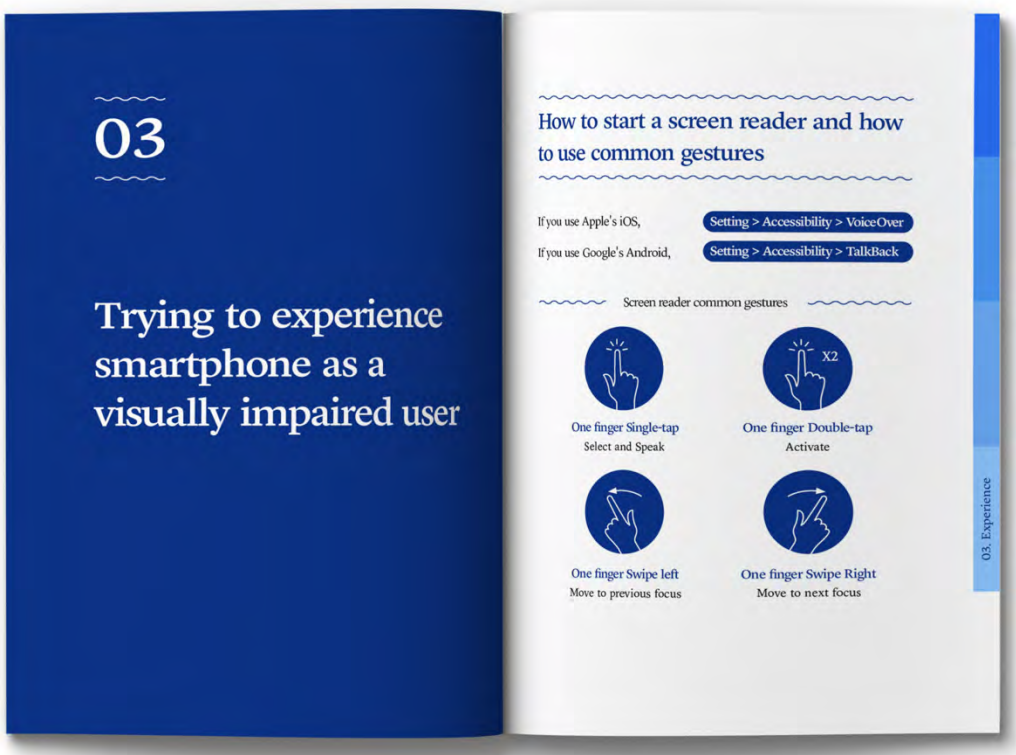


Figure 23. user experience record manual screen reader and common gestures tutorial

Trying to experience smartphone as a visually impaired user

One of the most effective ways to understand someone's real-life is to experience it firsthand. This chapter provides the reader with information on how people with visual impairments use their smartphones. Visually impaired users generally use various assistive technologies in smartphones called screen readers, screen magnifiers, voice access or haptic feedback, etc. In this chapter, I aimed at one of the assistive technologies called the screen reader that renders text and image contents as voice or speech. Screen readers are called differently depending on the operating system that Apple's iOS operating system called VoiceOver and Google's Android operating system called TalkBack. Anyone with a smartphone can use screen readers because it comes pre-installed. So this chapter briefly introduces how to start a screen reader and how to use common gestures. If people try to use a screen reader, they will understand people with visual impairment faster than anyone else. People with visual impairment who I met in this project also said that it would be nice to use a screen reader at least once

to understand their lives. The full image is as follows.

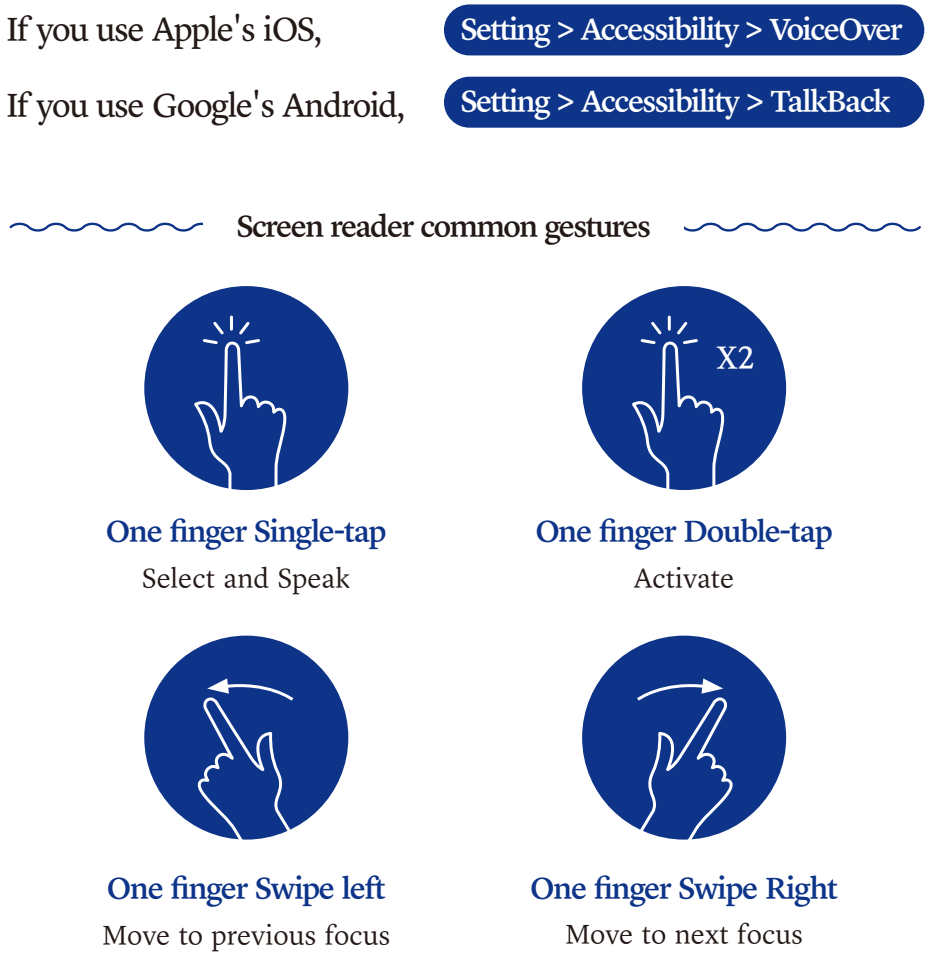


Figure 24. How to start a screen reader and how to use common gestures

5.1.5. *How to write feedback*

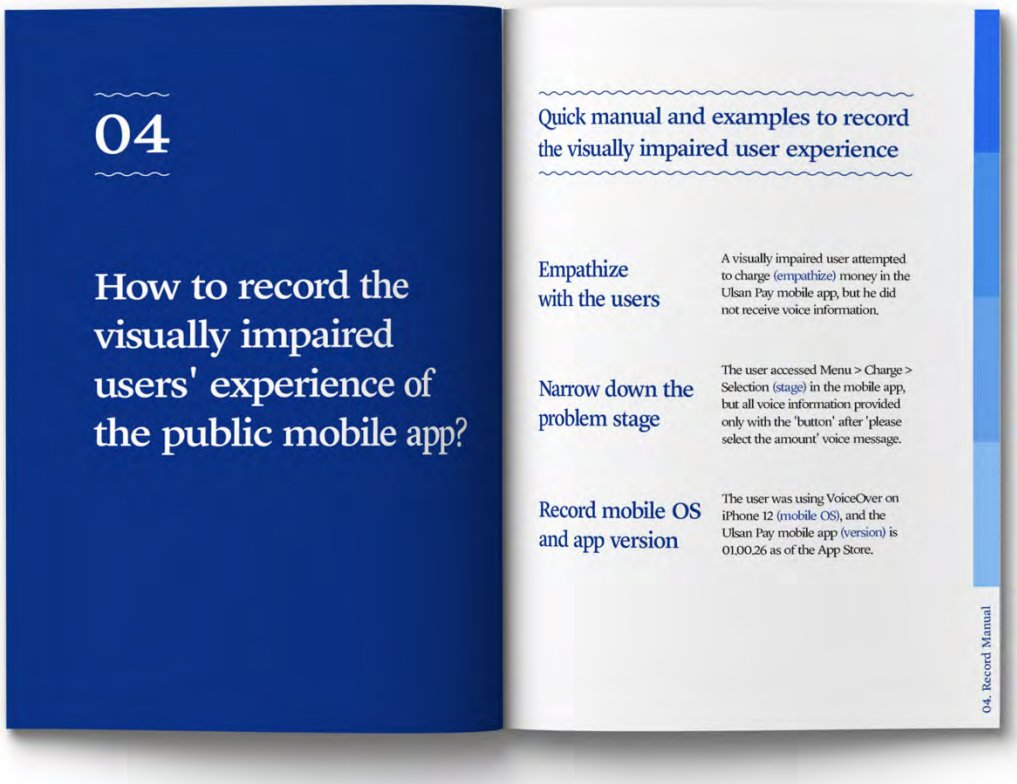


Figure 25. user experience record manual

How to record the visually impaired users' experience of the public mobile app?

The last chapter suggests how to write user feedback more appropriately. Most customer service centers have a guideline or manual on how to respond to user feedback. However, according to the user study conducted in the project, the service providers – civil servants, customer service representatives, staff alike – could not respond appropriately in the context of the visually impaired users delivering feedback on accessibility. For example, They do not understand that users are using assistive technology to access mobile applications. Also, ironically, they tried to communicate with visually impaired users around visual information. As a result, user complaints are isolated from the customer service center and cannot be reflected in the service update process.

This chapter serves as a tool to help communicate between service providers and visually impaired users. The manual that composed of 4 steps explains what the staff thinks and needs to ask. Each step presents a specific direction and a specific question, and if the step is not implemented, it explains what negative consequences will follow based on user study. Figure 25 shows quick manual and examples to record the visually impaired user experience. The full manual is as follows.

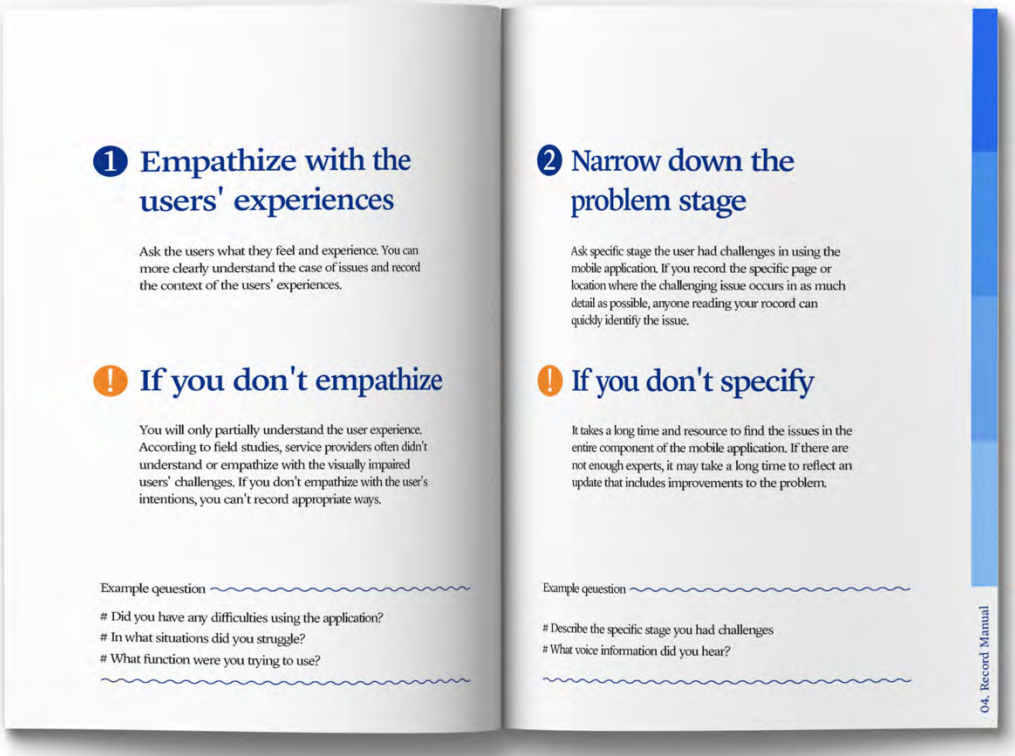


Figure 26. user experience record manual detail 1-2

Figure 27. user experience record manual detail 3-4

6. Reflection (strength & limitation)

This thesis is truthful documentation of an attempt to help reduce the frustration of users with visual impairment in using public mobile applications. In order to understand the lived experiences of users, civil servants, and developers that engage with the use and development of the application I have conducted interviews.

This project embodied the accessibility issues arising from public welfare mobile application called 'Bur-mi' provided by municipalities from the perspective of users and service providers. In doing so, the aim is to get to know the real-life context of users and developers total of 16 people – public servants, designers, and programmers alike – and gain inspiration to explore a possible solution. Based on these resources, the project provides various insights in Chapter 4. People with visual impairments faced various accessibility issues from the increase of public mobile services, and they were expecting various accessibility improvements depending on the situation. In addition, I also discovered practical difficulties and limitations for service providers that were not known through quantitative research. These various insights will serve as a starting point for service providers to improve accessibility in the mobile service development process. In this chapter, I discuss the strength and limitations of this project.

6.1. Value of the proposal and their broader implications

Reducing communication problems that couldn't be addressed by technical guidelines alone

As mentioned in Chapter 2, many technical guidelines have already been developed for digital accessibility compliance. Many accessibility issues can be resolved if developers follow the technical guidelines to develop mobile applications. However, technical guidelines are not a panacea for all accessibility problems. Since each mobile application has its own characteristics, it is necessary to improve not only the technical aspect but also the accessibility issue derived from the user's real-life experience. The point where the user's real-life experience reaches the service provider is the communication process between the customer service center and the users. It is an important touchpoint where users who have experienced the mobile application can provide various feedback. It is expected that this project will serve to complement the technical guideline by providing service providers with a user experience record manual to ensure that users' accessibility feedback is appropriately recorded and shared with various stakeholders.

Increasing awareness of accessibility

It is hoped that the design proposal helps service providers become aware of accessibility. When an important button has accessibility issues in a mobile application, the service provider receives feedback from many users. Addressing accessibility issues that are considered relatively trivial requires reaching

as many stakeholders as possible. This project proposes a solution that allows service providers to consider accessibility issues more carefully.

6.2. Limitations

Despite my best of intentions, the limited scope of my master's thesis given the time allowed and other conditions warrant reflections about the limitation of this thesis. These are discussed below.

Limited scope based on few municipal applications

The project has obvious limitations as it aims to know qualitative insights for the different types of visually impaired users and public service providers possible. First of all, the insights and suggestions of this project are not representative of all mobile applications provided by the Korean public sector, as I have met with service providers related to public mobile applications provided by one of the municipalities. Each mobile application has different needs and resources, and each municipality has different experts and environments. Based on the insights from this project, this is a topic that should be explored further in the following research or service creation process. In addition, the problem of accessibility is not just a problem for the visually impaired but also applies to a variety of people with disabilities. In future research, it is necessary to look at assistive technology from a broader perspective and discuss the direction of improvement.

Accessibility as a wicked problem that won't go away

The design proposal from this project can not completely solve the accessibility problem independently. In particular, just providing a user experience record manual to a service provider does not improve accessibility. Service providers need time to familiarize themselves with the manual, and according to the manual, some incentives and rewards are required when the service provider contributes to accessibility improvement. In addition, in the process of developing public mobile applications, it is necessary to consider a way to make it a process to familiarize and implement the manual through the laws or regulatory guidelines with the high level of punishment. Accessibility is a complex issue, so the design proposal is only a starting point among many solutions and should be accompanied by additionally linked solutions.

Limited access to users due to the COVID-19 pandemic

The year 2020-2021, when this project began, was a time when social distancing should be strictly observed due to COVID-19. Therefore, when conducting user studies on this project, I rented independent spaces to comply with quarantine rules or visited places when social distancing levels were down. However, it was not easy to obtain permission when conducting user studies on the visually impaired with a relatively high-risk group. Users with visual impairments had difficulties using online video technology services due to accessibility issues, so several interviews were replaced with only

voice interviews. Therefore, after COVID-19, it is necessary to look more intensively at how they use mobile services in real life, not in an independent space.

Need for more validation tests

The user experience record manual is not the final outcomes. It is an outcome based on a design thinking approach that validates the possibility of incomplete information rather than an idea that drew the final result by collecting perfect data. Therefore, practical issues such as manual verification methods and manual education program planning should be considered in the future. In addition, the acts of accessibility are an issue that the Ministry of the Interior and Safety, Ministry of Science and ICT, the National Human Rights Commission, and the Ministry of Health and Welfare should consider in a common area. It is challenging for different organizations to improve access towards a common agenda. However, considering that the existing laws and guidelines are reflected in the careful consideration of IT technology, I can see a positive aspect of institutionalization.

REFERENCE

Baek, M. (2020). *The daily life of visually impaired people disconnected by the kiosks*. Ablenews. https://www.ablenews.co.kr/News/NewsContent.aspx?CategoryCode=0014&NewsCode=00142020121609331288476 2

Beyer, H., & Holtzblatt, K. (1999). Contextual design. *Interactions*, *6*(1). https://doi.org/10.1145/291224.291229

Chen, Y.-C. (2002). Managing E-Government outsourcing projects: Lessons from U.S. Local Government. *Americas Conference on Information Systems (AMCIS)*, 557–563.

Cho, W. (2020). *Ulsan removed public mobile applications total 11 during 4 years.* Ulsan Press. https://www.ulsanpress.net/news/articleView.html?idxno=362261

Chung, C.-S. (2015). The Introduction of e-Government in Korea : Development Journey, Outcomes and Future. *Gestion et Management Public*, *3 / n° 4*(2), 107. https://doi.org/10.3917/gmp.034.0107

Fang, Z. (2002). e-Government in the digital era : concept, practice and development. *International Journal of the Computer, the Internet and Management*, *10*(2), 1–22.

Faugier, J., & Sargeant, M. (1997). Sampling hard to reach populations. *Journal of Advanced Nursing*, *26*(4), 790–797. https://doi.org/10.1046/j.1365-2648.1997.00371.x

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. In *Interpretation of Cultures*.

GOV.UK. (2018). *Understanding accessibility requirements for public sector bodies - GOV.UK*. Government Digital Service. https://www.gov.uk/guidance/accessibility-requirements-for-public-sector-websites-and-apps

Hyunju, M. (2017). *E-government mobile applications accessibility report*.

Joe, G. (2019). *Visually impaired users can not use Captcha*. SBS. https://news.sbs.co.kr/news/endPage.do?news_id=N1005482063&oaid=N1005485731&plink=TEXT&cooper=SBSNEWSEND

Kim, S. (2019). *Steps to remove 25 public apps costing 1.4 billion KRW*. ECONOMY Chosun. http://economychosun.com/client/news/view.php?boardName=C03&t_num=13607053

Korean Statistical Information Service. (2019). *The number of The Registered Disabled-by Year,*

Types of Disability and Gender. Ministry of Health and Welfare. https://kosis.kr/eng/statisticsList/statisticsListIndex.do?menuId=M_01_01&vwcd=MT_ETITLE&parmTabId=M_01_01&statId=2008001&themaId=#SelectStatsBoxDiv

Lazar, J., Goldstein, D., & Taylor, A. (2015). Ensuring Digital Accessibility through Process and Policy. In *Ensuring Digital Accessibility through Process and Policy*. https://doi.org/10.1016/C2013-0-13367-3

Lee, H. (2020). *Lack accessibility of "healthy self-diagnosis" application.* The Indigo. https://theindigo.co.kr/archives/11405

Marchionini, G., Samet, H., & Brandt, L. (2003). DIGITAL GOVERNMENT. *COMMUNICATIONS OF THE ACM*, *46*(1), 25–27.

Marshall, M. N. (1996). Sampling for qualitative research. *Family Practice*, *13*(6), 522–525. https://doi.org/10.1093/fampra/13.6.522

Ministry of the Interior and Safety. (2019). *Public Mobile Application Service performance measurement review*.

National Human Rights Commission of Korea. (2017). Status of complaints related to discrimination by type of disability. In *National Human Rights Commission of Korea*. http://humanrights.go.kr/site/program/board/basicboard/view?currentpage=7&menuid=001003001004&pagesize=10&boardtypeid=19&boardid=7600920

Park, H. (2019). *Out of 771 public mobile applications, 386 received low level rating.* BIZ.Hankook. https://www.bizhankook.com/bk/article/18076

Park, J. (2019). *Even online shopping is difficult due to web access barriers.* Etnews. https://www.etnews.com/20190418000322

Rosencrance, C. S. and L. (2006). *Court: Accessibility lawsuit against Target can proceed*. Computerworld. https://www.computerworld.com/article/2547678/court--accessibility-lawsuit-against-target-can-proceed.html

Silcock, R. (2001). What is e-Government? *Parliamentary Affairs*, *54*(1), 88–101. https://doi.org/10.1093/pa/54.1.88

Silver, L. (2019). Smartphone ownership is growing rapidly around the world, but not always equally. *Pew Research Center*.

United Nations. (2021). *What is e-government*. United Nations E-Government Development Database. https://publicadministration.un.org/egovkb/en-us/about/unegovdd-framework

World Health Organization. (2018). *Assistive technology*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/assistive-technology

World Health Organization. (2019). World report on vision. *World Health Organization*, *214*(14), 1–160.

World Health Organization. (2020). *International Statistical Classification of Diseases and Related Health Problems (ICD)*. World Health Organization. https://icd.who.int/browse11/l-m/en

World Wide Web Consortium. (2010). *Accessibility Fundamentals*. W3C Web Accessibility Initiative (WAI). https://www.w3.org/WAI/fundamentals/accessibility-usability-inclusion/

Appendix

Expert Interview (2020.10.26 Code AA)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AA01	시각장애인이 활동하기 위해서는 나침반과 같은 지표가 필요하다.	
AA02	시각장애인은 자신만의 패턴이 있는데 그 패턴을 찾지 못하면 활동이 불가능해진다.	
AA03	시각장애인은 패턴의 복잡도를 줄이기 위해 동일한 종류의 제품, 음식 등을 구매하는 경우가 있다.	
AA04	버스, 택시 등의 교통수단은 항상 동일한 위치에 내려주지 않기 때문에 시각장애인은 두려움을 느낀다고 한다.	
AA05	시각장애인이 고속버스를 이용한다면 가장 어려움을 느끼는 상황은화장실을 다녀오는 일이다.	
AA06	고속버스는 항상 동일한 휴게소에서 정차하는 것이 아니기 때문에 시각장애인이 어려움을 느낀다.	
AA07	일부 전문가는 행정부가 자신들이 직접 참여하지 않고 적은 재원으로 진행되는 프로젝트를 선호한다고 생각한다.	
AA08	시각장애인협회가 독단적으로 과제를 수행하기 어렵기 때문에 행정부 또는 인권위 등의 협조가 필요하다.	
AA09	일부 전문가는 시각장애인 '도' 사용할 수 있는 서비스를 만들어야 한다고 설득한다. 시각장애인이 사용할 수 있는 서비스면 대부분의 약자가 포함될 것이기 때문이다.	
AA10	일부 전문가는 지하철 시각장애인 안내 서비스와 같은 대면 서비스가 비대면 서비스와 균형을 이루어야 한다고 생각한다.	
AA11	웹 서비스가 활성화되기 시작한 1990 년대 후반의 홈페이지는 단순히 정보를 올리는 공간이었다.	
AA12	웹 서비스가 발전하면서 소외된 시각장애인을 보호하고자 2004 년에 한국웹접근성센터가 만들어지게 되었다.	
AA13	웹 서비스의 발전 이전에는 접근성이 주로 이동권에서 가장 많이 사용되던 단어였다.	

AA14	온라인의 정보는 항상 사용자에게 정보를 제공하고자 하지만 시각장애인은 정보습득에 제한을 받는다.	
AA15	시각장애인은 온라인의 폰트, 굵기, 색상 등의 정보를 얻을 수 없기 때문에 모든 정보를 구분해서 들어야 이해할 수 있다.	
AA16	Html 은 정보를 쉽게 표현할 수 있도록 만들어져있지만 개발자가 사용하기 귀찮아하는게 문제라고 생각하는 전문가가 있다.	
AA17	웹 표준 개발 기구 W3C 는 접근성을 강조한 WACG 가이드라인을 제작하여 배포하였다.	
AA18	WACG 는 현재 2.1 버전까지 제작되어 있으며 2.2 버전이 곧 출시될 예정이라고 한다.	
AA19	90% 국가는 WACG 를 그대로 사용하고 한국을 포함한 일부의 국가는 상황에 맞게 활용한다고 한다.	
AA20	한국정보화진흥원에서 모바일 애플리케이션 접근성 지침 2.0 을 쉽게 알리고자 장애 청소년 웹툰 작가들과 함께 웹툰 지침서를 만들었다.	
AA21	ICT 시장은 계속 변하기 때문에 지침서 개정안은 지속적으로 나올 것이다.	
AA22	일부 전문가는 민간기업에 접근성을 규제하는 것은 어렵지만 공공부문은 상대적으로 쉽다고 생각한다.	
AA23	접근성 전문 지식이 없는 공공기관의 실무자는 개발업체에서 원하는 방향으로 끌려가는 경우가 있다고 한다.	
AA24	한국웹접근성센터를 비롯한 3 개의 업체에서는 웹 인증 마크를 부여하는 제도를 시행하고 있다고 한다.	
AA25	접근성을 잘 모르는 공무원일 경우 과거의 가이드라인 또는 제도를 사용하는 경우가 있다고 한다.	
AA26	행정안전부에서는 접근성을 개선시키기 위해 activity 삭제와 같은 일을 하고 있다.	
AA27	행정안전부에서 발주자를 위한 관리자 가이드라인을 만들고 있다고 한다.	
AA28	일부 전문가는 정부에서 만들어지는 가이드라인의 내용이 문서로 너무 방대하여 실제 관리자들이 참고하기에 어려울 것이라고 생각한다.	
AA29	UI,UX 가이드라인이 존재하지만 강하게 규제할 수 있는 법규가 아니라고 한다.	
AA30	미국은 접근성 규제의 일부로써 뉴스에 캡션이 의무적으로 함께 나오도록 되어있다.	

AA31	정책 토론회에 기관의 결정권자 실무진을 초청하기 위해서는 국회의원실의 협조가 필요하다.	

Expert Interview (2020.11.05 Code AB)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AB01	기업의 서비스는 시장에서 독보적인 점유율을 가지지 못하면 접근성을 인지하고 있어도 우선순위에 두고 작업할 수 없다.	
AB02	기업은 잠재적인 사용자를 고려하여 비율이 더 큰 유저를 대상 서비스를 만들게 된다.	
AB03	기업에게 가장 많은 영향을 줄 수 있는 곳은 정부이다.	
AB04	시장에서 점유율이 높은 네이버와 같은 기업은 소상공인과 같은 약자를 케어할 수 있다.	
AB05	접근성은 성장 가능성에 비해 너무 많은 리소스가 필요하기 때문에 기업의 자발적인 참여가 힘들다.	
AB06	기업의 신규프로젝트의 초기단계에서 정부의 협조 또는 압력이 있다면 방향성을 바꿀 수 있는 여지가 있다고 한다.	

User Interview (2020.11.24 Code AC)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AC01	시각장애인은 보통 전맹과 저시력으로 나뉜다.	
AC02	시각장애 판정을 받고 도움을 받을 수 있는 단체를 찾기까지 오랜시간이 걸린다.	
AC03	시각장애 판정을 받고 정보를 알지 못해 집에서만 생활하는 시각장애인들도 있다.	
AC04	시각장애인복지관에서도 홍보의 문제를 자각하고 있지만 마땅한 방법을 못찾아서 어려움을 겪고 있다고 한다.	기존의 접근방식의

		문제점은 무엇인가?
AC05	일부 시각장애인은 시각장애를 판정받게 되면 해당 병원과 관할 지역 복지관이 연계가 되어 곧바로 정보를 받을 수 있는 시스템을 기대한다. (의료와 행정의 협력)	
AC06	새로운 교육을 받을 수 있는 지역 시각장애인복지관은 시각장애인들에게 매우 중요한 장소이다.	
AC07	시각장애 판정을 받기 전 저시력인 상태에서는 본인도 심각성을 알지 못하여 시각장애인이 되었다는 것을 자각하지 못하는 경우가 있다고 한다.	
AC08	시각장애인복지관에서 컴퓨터 교육 안내전화를 받고 방문하게 된 시각장애인도 있다.	
AC09	어린 아이가 있는(3 살 이하) 부모일 경우, 복지관에 직접 방문하여 일정한 시간에 교육을 받는것이 쉽지 않다.	
AC10	복지관이 과거에 비해 IT 기기를 다루는 교육이 더 체계적으로 잡혀가고 있다고 느끼는 시각장애인이 있다.	
AC11	복지관에서는 시각장애인이 IT 기기를 다룰 수 있도록 스크린 리더와 같은 기술을 교육한다.	
AC12	중도시각장애인의 경우, 단축키와 같은 컴퓨터 사용 방법에 능숙하기 때문에 배우는 속도가 빠르다고 한다.	
AC13	시각장애인들을 대상으로 문서 작성, 검색, 인터넷를 활용하여 과제를 수행하는 국민행복 IT 경진대회가 있다고 한다.	
AC14	시각장애인은 대부분 접근성 지원이 우수한 애플제품 사용을 선호한다.	
AC15	시각장애인이 웹에서 특정 내용을 찾고 싶을 때 ctrl+F 를 사용하여 키워드를 찾고 TAB 키로 이동을 한다.	
AC16	웹 접근성을 준수한 홈페이지가 많지 않기 때문에 시각장애인은 일부 웹사이트만 이용이 가능하다.	
AC17	시각장애인들이 함께 내용을 공유하는 홈페이지에서는 재활정보, 병원 정보 등이 주요 컨텐츠이다.	
AC18	구글에서 제공하는 서비스는 시각장애인들이 사용하기에 용이하다.	
AC19	시각장애인들이 사용하는 모바일 서비스에는 영화, 종교, 독서, 취미를 담고 있는 문화 컨텐츠 전용 어플리케이션이 많다.	

AC20	기업 또는 지역의 점자도서관에서는 시각장애인용 모바일 어플리케이션을 개발하여 책을 들을 수 있도록 서비스를 제공한다.	
AC21	시각장애인도 웹보다 모바일로 검색하는 일이 더 많아졌다고 한다.	
AC22	비장애인 편리하게 사용하는 카카오톡 송금기능, 쿠팡, NH 농협 어플리케이션은 시각장애인에게도 편리하다.	
AC23	카카오에서 제공하는 서비스는 비교적 접근성이 좋아 시각장애인이 많이 사용한다.	
AC24	시각장애인은 접근성이 안좋아졌던 경험들 때문에 서비스가 업데이트 되는 것을 두려워한다.	
AC25	부르미고객용 앱 접근성이 좋지 않아 이용에 불편함을 느끼는 시각장애인이 있다.	
AC26	스크린리더를 이용하여 부르미고객용 앱에서 장소를 입력해도 음성 피드백을 주지 않아서 어떤 단어가 입력되었는지 알 수 없다.	
AC27	스크린리더를 이용하여 부르미고객용 앱에서 즐겨찾기 항목을 읽으면 불필요한 텍스트를 너무 많이 제공하여 원하는 정보를 얻기까지 많은 시간이 걸린다.	
AC28	시각장애인은 서비스 이용에 있어 불편함을 느껴도 어떤 경로로 민원을 넣어야 하는지 알지 못한다.	
AC29	시각장애인은 서비스에 대한 민원을 넣어도 반영되지 않는 경험을 자주 받는다.	
AC30	시각장애인이 부르미고객용 앱을 사용하지 못한다면 대기시간이 길더라도 전화로 예약해야하는 불편을 감수해야한다.	
AC31	스마트폰이 있더라도 활용을 잘못해서 통화와 문자만으로 만족하는 시각장애인이 있다.	
AC32	부르미고객용 앱을 하루에 2-3 회 이상 사용하는 시각장애인은 매번 접근성 문제로 인해 사용에 불편함을 겪는다.	
AC33	부르미고객용 앱의 위치검색 기능 중 과거내역을 지우는 버튼이 없어서 본인이 원하는 위치를 찾을 때까지 불필요한 정보를 계속 들어야한다.	
AC34	복지관 내에서만 활동하는 시각장애인도 외부활동을 하려는 노력이 필요하다.	
AC35	지자체에서 온라인으로 제공하는 정보를 시각장애인들은 확인하기 힘들다.	
AC36	서비스 제작과정에서 접근성 전문가가 함께 있어야한다고 생각하는 시각장애인이 있다.	
AC37	시각장애인 IT 전문가가 양성되어 안마사에 국한되어있는 직업군이 더 넓어졌으면 좋겠다고 생각하는 시각장애인이 있다.	

AC38	OCR 기능을 제공하는 서비스 조차 접근성이 낮은 경우가 있다고 한다.	
AC39	구글 번역기를 사진의 텍스트를 읽는 용도로 사용하는 시각장애인도 있다.	
AC40	업데이트가 되었을 때 접근성이 떨어져서 사용하던 기능을 못쓰는 경우도 있었다고 한다.	
AC41	시각장애인도 눈으로 보고 읽는 속도만큼 빠르게 많은 내용을 듣고싶다.	
AC42	페이스북은 시각장애인이 사용하기 편한정도로 접근성이 좋다고 한다.	
AC43	서비스를 제작하는 제작자가 장애를 하나의 분류 또는 배려의 대상으로 생각하기 때문에 접근성이 우선순위에서 밀린다고 일부 시각장애인은 생각한다.	
AC44	접근성에 관한 의견을 대표해서 전달하는 접근성 공식협회 또는 관련기관을 기대하는 시각장애인도 있다.	
AC45	스마트폰 보조기구 라보의 가격이 더 오르고 있어서 부담을 느끼는 시각장애인이 있다.	

User Interview (2020.12.04 Code AD)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AD01	포도막염을 앓게되면 급성으로 수치가 안좋아지는 경우가 있기 때문에 일주일에 한번씩 병원에 방문하여 검사를 받아야 한다.	
AD02	일부 시각장애인은 시각을 잃게된 초반에는 아무것도 할 수 있는게 없다고 느낀다고 한다.	
AD03	최근 복지관은 시각장애인들이 직업을 가질 수 있도록 많은 노력을 기울인다고 한다.	
AD04	일부 시각장애인은 복지관의 도움을 받아 과거 자신의 전공을 살려 직업을 찾는다고 한다.	
AD05	장애인들을 대상으로 하는 국민IT행복대회가 있다.	
AD06	이전에 컴퓨터를 잘 다루거나 익숙하셨던 일부 중도장애인은 시각장애인 보조 도구인 선스리더 또는 스크린리더를 잘 사용하시지만 다수가 잘 이용하지 못하는 분	

	들이라고 한다.	
AD07	시각장애인은 정보를 볼 수 없기 때문에 세상과 단절되어 사회의 발전을 잘 이해하지 못한다고 한다.	
AD08	대부분의 시각장애인은 매번 가던길과 장소만 방문하는 경우가 많다고 한다. ex) 복지관-집-복지관-집	
AD09	시각장애인들이 세상을 더 잘 이해할 수 있도록 돕기위해 도구를 잘 사용하는 일부 시각장애인 강사를 시작하는 경우가 있다.	
AD10	스마트폰이 대중화되어 시각장애인도 구매를 하지만 실제로 사용하는 법을 몰라서 방치되는 경우가 많다고 한다.	
AD11	시각장애인은 스마트폰을 비롯하여 교육을 받지 못하면 생활을 하기 어렵다고 한다.	
AD12	보조 동행인에게 의존도가 높은 시각장애인의 경우 혼자서 할 수 있는 생활이 많지 않다고 한다.	
AD13	최근 2-3년동안 스마트폰 기술이 많이 발전하여 시각장애인도 잘 사용하시는 분들은 속도는 느리지만 비장애인과 만큼이나 필요한 정보를 얻을 수 있다고 한다.	
AD14	스마트폰 기술 중 생체인식 기능이 생기며 보안패드를 입력해야하는 어려움이 사라져 사용하기 더 편리해졌다고 한다.	
AD15	시각장애인이 처음 스마트폰을 사용할 때는 전화와 문자를 편하게 하기 위해서 시작하시지만 점차 다른 시각장애인들이 사용하는 용도를 궁금해하시게 된다고 한다.	
AD16	시각장애인에게 스마트폰을 교육할 때는 방법을 가르쳐주기 보다는 다양하게 활용되는 모습을 보여주어 흥미를 이끌어내는 방법이 있다고 한다.	
AD17	처음 스마트폰을 사용하는 시각장애인은 터치에 따라 음성이 나와서 두려움을 가지는 경우가 있다고 한다.	
AD18	스마트폰 터치에 대한 두려움을 없애는 것이 가장 중요하다고 한다.	

AD19	시각장애인이 처음 가장 많이 사용하고 싶어하는 서비스는 어디서나 알람소리가 들리는 카카오톡 이라고 한다.	
AD20	대기업의 어플리케이션은 스크린리더로 읽을 수 있는 정도는 되지만 제공하는 정보가 많아 단계를 단순화하는 작업이 필요하다고 한다.	
AD21	시각장애인은 스크린리더를 사용하더라도 원하는 서비스에 도달하기까지 너무 많은 단계가 있으면 중간에 이탈하는 경우가 생긴다고 한다.	
AD22	기관이나 협회에서 만든 어플리케이션은 스크린리더를 사용하기 어려울 정도로 접근성이 안좋은 경우가 많다고 한다.	
AD23	시각장애인은 음식을 볼 수 없기 때문에 식약처에서 제공하는 앱을 사용하여 배달음식업체의 위생상태를 체크하고 싶지만 접근성에 막혀 사용하지 못하고 있다고 한다.	
AD24	시각장애인이 해당 앱의 접근성이 막히게 되면 대체할 수 있는 서비스를 찾거나 혹은 포기할 수 밖에 없다고 한다.	
AD25	일부 시각장애인은 접근성에 불편함을 느껴 업체에 민원을 넣어도 개선이 되지 않아 민원을 잘 넣지 않게 되었다고 한다.	
AD26	배달의 민족보다 요기요가 결제까지 가는 단계가 짧아서 접근성이 더 편리하다고 느끼는 시각장애인이 있다.	
AD27	시각장애인이 민원 전화를 넣어도 일반 콜센터 직원이 응대를 하고 접근성 팀이 대응하는 경우를 경험하지 못했다고 한다.	
AD28	시각장애인은 앱 업데이트 이후 접근성이 막히는 경우가 많아 업데이트를 두려워한다.	
AD29	네이버, 쿠팡에서 쇼핑을 하고 검색은 유투브를 즐겨하는 시각장애인이 있다.	
AD30	시각장애인에게 세상이 어떻게 변하고 있는지를 알려주는 것이 매우 중요하다고 한다. 잘 모르는 경우가 많기 때문에.	
AD31	시각장애인이 교육을 받고 복지관 밖 세상으로 나와야 더 좋은 것을 즐길 수 있다	

	고 생각하는 시각장애인이 있다.	
AD32	정부에서 제작하는 시각장애인용TV가 아니더라도 스마트TV를 사용하면 더 나은 접근성과 서비스를 누릴 수 있는 방법이 있지만 당사자들은 잘 모르는 경우가 많다고 한다.	
AD33	스마트폰을 사용하는 시각장애인이 많아질수록 접근성은 더 나아질 것이라고 생각하는 시각장애인이 있다.	
AD34	시각장애인이 장애인인식교육을 나가면 아직도 많은 사람들이 시각장애인에 대해서 잘 모른다고 느낀다고 한다.	
AD35	스크린리더가 필요이상의 정보를 읽어주도록 제작된 어플리케이션은 시각장애인이 오히려 원하는 정보를 얻기 어렵다고 한다.	
AD36	앱의 버튼에 대체택스트를 입력하는 경우, 정보를 먼저 읽어주고 행위를 유도하는 단계로 만들어져야 한다.	
AD37	복지관을 통해 어플리케이션 제작에 참여권유를 받은 시각장애인이 있다.	
AD38	접근성에 대해 전문적인 지식이 없는 시각장애인의 경우에 테스트 또는 의견은 제시할 수 있지만 한계가 있다고한다.	
AD39	일부 시각장애인은 앱을 만드는 것도 중요하지만 얼마나 유지할 수 있는지가 더 중요하다고 생각한다.	
AD40	보통 협회의 경우 예산이 많지 않기 때문에 대규모 업데이트가 이루어지면 접근성이 따라오지 못하는 상황이 있다고 한다.	
AD41	시각장애인이 선택할 수 있는 직업이 많지 않은데 그 중 안마사의 일이 보수가 가장 높기 때문에 다른 능력이 있음에도 안마일을 하는 경우가 많다고 한다.	
AD42	시각장애인이 서비스 기획단계에서 의견을 제시할 수 있는 기회가 있다면 더 나은 접근성을 기대할 수 있을 것이라고 생각하는 시각장애인이 있다.	

Expert Interview (2020.12.10 Code AE)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AE01	접근성 컨설턴트 팀의 목표는 모든 사람들의 사용성을 개선시키는 것이 목적이다.	
AE02	접근성 컨설턴트 팀은 웹,앱 인증마크에 대한 실무부터 뱡향성에 관한 연구까지 넓은 접근성 분야를 다루고 있다.	
AE03	컨설팅은 기존 서비스에 대한 분석과 front-end 와 back-end 의 구조를 파악하고 진단하는 과정으로 시작된다.	
AE04	컨설팅 과정에서 분석과 진단과정이 끝나면 실무자를 대상으로 접근성 교육을 진행한다.	
AE05	컨설턴트가 교육을 진행하지 않고 개선안을 제공할 경우 실무자 측에서 불만을 제기하는 경우가 있다고 한다.	
AE06	컨설턴트가 실무자를 대상으로 사전에 정보취약계층이 겪는 불편함과 모든 사람들의 접근성이 높아질 수 있다는 점을 설명하면 접근성에 대해 쉽게 이해한다고 한다.	
AE07	컨설팅은 시작할 때 정해둔 KPR 수준에 도달했는지 검사를 한 뒤 마무리된다고 한다.	
AE08	정부기관 사이트의 경우 한명의 운영 담당자가 있을 경우도 있지만 항목마다 담당자가 다른 경우도 있다고 한다.	
AE09	정부기관에 접근성 담당자가 있는 경우도 있지만 이분들은 대부분 프로세스를 보는 분들이다.	프로세스를 본다는 것이 무슨 뜻일까?
AE10	정부기관은 대부분 유지보수 업체와 협업을 하기 때문에 컨설팅을 할 때는 계약된 유지보수 업체들(에이전시)과 일하는 경우가 많다고 한다.	
AE11	정부기관을 대상으로 컨설팅을 진행할 때 교육을 유지보수 업체의 실무진을 대상으로 한다.	기관 담당자 상대로 교육을 하지 않는 이유는?
AE12	컨설팅에 들어가는 교육은 중요하지만 횟수와 기간에 따라 비용과 시간이 소요되는 문제가 있어 컨설턴트가 원하는만큼 진행하기 어렵다고 한다.	
AE13	컨설팅 업체에서 생각하는 이상적인 교육 시간은 2-3 가지 과정을 하루정도의 시간을 할애하여 교육을 받는 것이라고 한다.	
AE14	실제로 컨설팅 교육은 1-2 시간정도 진행되는 것이 일반적인 타협점이고 특수한 사례로는 프로젝트 처음과 마지막 각각 한번씩 진행하는 사례도 있다.	

AE15	컨설팅의 구체적인 정도는 업체마다 정해진 규칙없이 다르다.	
AE16	일부 컨설턴트는 대체 텍스트부터 동적인 코드를 수정하는 작업까지 도움을 준다고 한다.	
AE17	컨설팅은 주로 유선통화와 이메일로 진행되며 필요하다면 회사에 직접 방문하여 코드를 수정하는 상황도 있다고 한다.	
AE18	일부 컨설팅 업체는 코드를 읽을 줄 모르면 더 나은 개선안을 찾을 수 없기 때문에 구축팀과 UX 팀 모두 코드를 볼 수 있다고 한다.	
AE19	일부 컨설팅 업체는 10 명의 팀원 중 2 명의 비율로 시각장애인 팀원이 있다고 한다.	
AE20	컨설팅 업체의 시각장애인 팀원은 접근성 공부나 업무를 하다가 오신분들이 많다고 한다.	
AE21	컨설팅 업체의 시각장애인 팀원은 접근성 프로젝트의 속도를 높이는데 중요한 역할을 한다고 한다.	
AE22	웹 접근성이 필수로 들어가야하는 항목이기 때문에 1 년에 많게는 3-4 번 함께 작업하는 에이전시도 있다고 한다.	
AE23	공공기관은 1 년에 정기적으로 받아야하는 접근성 교육이 있다고 한다.	어떤 교육이 이루어지는가
AE24	Ebay korea 경우 1 년에 2 번식 접근성 오프라인 교육을 진행하고 있으며 지속적으로 vendor 가 볼 수 있도록 영상을 제작하자는 제안이 있었다고 한다.	
AE25	컨설팅 의뢰는 대부분 웹접근성 마크를 받기 위함이며 법적효력은 없지만 노력의 증빙자료로 사용이 되기에 유용하다고 한다.	
AE26	접근성에 더 집중하기 위해 웹접근성 마크를 부여받지 않고 진행하는 특수한 경우도 있다.	
AE27	국내는 해외보다 접근성을 자발적으로 참여하는 분위기가 조금 뒤쳐진다고 느끼는 컨설턴트가 있다.	
AE28	컨설팅에서 가장 어려운 점은 실무자들의 거부감이다.	
AE29	실무자, 결정권자들이 생각하는 실용성과 접근성이 충돌하면 접근성 개선이 어려워진다.	
AE30	일부 기업은 소송의 비용과 접근성 컨설팅 비용을 비교하여 선택적으로 사용하는 경우도 있다.	

AE31	일부 개발경력이 오래된 실무자의 경우 접근성의 일이 많은 시간과 노력을 할애해야한다고 생각하며 강하게 거부하는 사례가 있다고 한다.	
AE32	발전된 기술들로 인해 과거에 비해 접근성을 반영하는 일이 더 쉬워졌다.	
AE33	민원이 접수되는 경우, 컨설턴트는 단기적으로 해결될 수 있는 방안과 단계별로 나누어 장기적으로 진행될 수 있는 제안을 함께 한다고 한다.	
AE34	개인 민원과 인권위원회의 권고안이 있는데 모두 즉각적으로 시행해야 하는 것이 아니기에 1,2,3 차 계획을 세우지만 1 차 이후로 진행되는 것은 담당자 또는 기업문화에 따라 굉장히 다르다고 한다.	
AE35	컨설턴트는 접근성의 개선을 위해서 무엇보다 실무자의 인식이 매우 중요하다고 느낀다.	
AE36	컨설턴트는 의뢰 서비스의 유형에 따라 자료를 맞춤형으로 제공한다.	
AE37	기업에서 가장 좋아하는 컨설팅 개선안은 수익을 고려한 비지니스식 제안이다.	
AE38	기업은 접근성을 개선하면 향후 얼마나 비용과 시간이 절약되고 홍보효과가 좋은지에 관심이 많다.	
AE39	정부와 지자체는 컨설팅으로 실무적인 접근성 보다는 자문 또는 방향성 연구로 의뢰가 많이 들어온다고 한다.	
AE40	공공기관은 짧게는 3-4 개월로 기간이 제한적이기 때문에 작업 속도를 맞추는 것이 매우 중요하다고 한다.	
AE41	기관과 프로젝트를 진행할 때는 그들이 원하는 방향성을 파악하는 것이 가장 어렵고 오랜 시간이 걸린다고 한다.	
AE42	다양한 수행항목이 적혀있는 제안요청서에서 어떤 항목에 집중할 것인지 명확히 이야기하는 기관이 드물다고 한다.	
AE43	컨설팅 업체는 자체적으로 확실한 비젼이 정해져있어야 의뢰업체가 원하는 결과물과 타협점을 찾고 진행할 수 있다고 한다.	
AE44	컨설턴트는 일반적으로 주간단위로 진행상황을 보고한다.	
AE45	일부 컨설턴트는 주간단위 보고서에는 의뢰자의 요구사항과 컨설턴트의 비전이 함께 있어야 한다고 생각한다.	
AE46	전자정부 가이드라인은 기존의 공급자 중심의 자료에서 사용자 중심으로 변경하기 위해 진행된 과정이다.	
AE47	과거 접근성 가이드라인은 해외 자료를 번역하는 정도였기에 국내의 맥락과 다른 경우가 있었다고 한다.	

AE48	중기부, 예탁결제원, 기재부 홈페이지 등에 접근성 가이드라인이 사용되었다.	
AE49	전자정부 가이드라인이 활성화되기 위해 RFP(제안요청서)에 추가되어 점검표를 작성하게끔 유도하고 있다.	
AE50	기관에서는 프로젝트 진단결과 검수에서도 전자정부 가이드라인을 활요하고 있다고 한다.	
AE51	가이드라인에 명시된 접근성 컨텐츠의 예시를 보고 한가지의 방법만 정답이라고 생각하는 고착화된 문화가 단점이라고 한다.	
AE52	모바일 어플리케이션의 경우 html markup 을 활용해 하이브리드로 제작하면 접근성에 문제가 많이 없다고 한다.	
AE53	모바일 어플리케이션을 native 로 개발할 때는 각각의 OS 를 고려해야해서 접근성을 고려하기 더 어려워진다.	
AE54	웹마크와 다르게 모바일은 국가기준 인증마크가 없어서 필요성에 의문을 가지는 경우가 많다.	
AE55	OS 는 자체 스크린리더 기능이 업데이트 시기마다 충돌하는 경우가 있다.	
AE56	OS 의 자체적인 업데이트가 필요할 시 컬설팅 업체에서는 개선을 요구하며 기다려야 한다.	
AE57	일부 컨설턴트는 강한 행정력보다는 자발적인 접근성 고려와 인식개선이 필요하다고 생각한다.	
AE58	접근성 시스템을 잘 갖춘 회사는 개발 초기단계부터 접근성 담당자가 디자이너와 개발자의 작업물에 피드백을 제공한다.	
AE59	프로젝트 초기에 접근성 피드백이 원활하게 진행된다면 장기적으로 불필요한 소모를 줄일 수 있다.	
AE60	구글 머터리얼 라이브러리와 같이 표준적인 접근성 UI 가 만들어져야 한다.	

Civil servant Interview (2020.12.12 Code AG)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AG01	부르미 앱은 2019년 9월에 제작이 완료되었고 여러 수정을 거쳐 20년도에 본격적	

	으로 활성화 되었다.	
AG02	초기 서비스에는 명칭, 주소 입력방식에 대한 선택이 모호하여 여러 시행착오를 거치고 사용자의 민원을 받아 개선이 되었다고 한다.	
AG03	사용자들은 타지역의 서비스와 비교하여 피드백을 많이 주었다고 한다.	
AG04	장애인 유저들은 초기개발단계에 참여하여 의견을 제시하고 싶어한다.	
AG05	기관 담당자는 사전에 사용자들의 의견을 받는 것에 대해 구현에 대한 확실한 지식과 정보가 없기 때문에 부정적인 의견이다.	
AG06	타 지자체에서도 개발 단계에서 사용자의 의견을 반영하는 사례가 없었다고 한다.	
AG07	부르미 앱이 만들어지기 전에는 유선통화로 예약이 진행되었다고 한다.	
AG08	예약이 집중되는 시간에는 유선통화로 30분동안 대기를 해야하는 경우가 생겨 발생하는 민원을 해소하고자 앱을 만들게 되었다.	
AG09	관제 시스템을 제작해주었던 '리라소프트' IT 업체에서 모바일 어플리케이션 개발을 담당해주었다.	
AG10	기관 담당자는 IT 업체에게 타 도시에 제작한 앱을 참고해서 만들어달라는 요청을 했다.	
AG11	이동지원차량을 이용한 목적과 유형등에 대한 정보를 매년 연말에 국토부에 제출해야한다.	
AG12	사용자에게 가입당시에 서비스 이용방식에 대해 설명을 하지만 이해를 잘 하지 못하거나 주의깊게 듣지 못한 경우에는 서비스에 대한 불편함으로 이야기한다.	
AG13	전체 이용건은 하루에 1000명정도로 지원되는 차량에 비해 이용자가 절대적으로 많다.	
AG14	앱 예약은 전체의 20-30% 차지하고 예약콜은 70%를 앱을 통해서 진행된다.	
AG15	전화 예약과 앱 예약에 할당되는 배차 시스템을 설정하여 앱 사용이 불편한 사용자	

	를 고려했다.	
AG16	관제시스템과 앱은 긴밀한 연동이 필요하여 지역에 가까운 업체와 연속적으로 작업을 진행하였다.	
AG17	앱 런칭 이후로 10번 넘는 업데이트가 있었고 리라소프트는 '이정도면 새로운 서비스를 만드는 정도'였다고 한다.	
AG18	이동지원 서비스는 탑승객 뿐만 아니라 운전기사의 의견도 반영해야했다.	
AG19	2년에 한번씩 특광역시 이동지원 협의회가 모여 사업에 관련된 지식, 팁과 현황을 공유한다.	
AG20	초기 앱을 제작한 뒤 회원들을 대상으로 전체 문자와 차량 안내문에 연락처를 기입하여 건의사항을 받았다고 한다.	
AG21	민원은 기관 담당자가 추합하여 IT업체에 전달하여 수정여부를 논의한다.	
AG22	서비스가 업데이트되면 기관 담당자가 직접 테스트를 해보는 경우가 있다.	
AG23	소통은 기관 담당자 - IT 기획자 - IT 개발자 순서로 진행되었다.	
AG24	소통과정은 기관 담당자가 아주 간단한 글로 정리해서 보관하는 경우가 있다.	
AG25	대부분 기관 담당자는 모바일 서비스 개발에 관련된 지식 없는 상태로 업무가 시작된다.	
AG26	장애인과 접점이 많은 기관 담당자의 경우 모든 서비스를 복잡하게 만들지 않게 노력한다.	
AG27	부르미 앱 서비스는 기존에 있는 서비스를 바탕으로 제작하였고 필요한 기능을 추가하고 삭제하는 방식으로 발전시켜나갔다.	
AG28	업체와 계약은 업데이트 횟수가 아닌 기한으로 계약을 하여 업데이트때 금전적인 부담은 없었다.	
AG29	탑승객이 모바일 서비스 민원을 제기했을 때 기관 담당자가 답할 수 없는 내용은	

	IT 업체 기획자와 직접 통화를 할 수 있도록 연결해주었다.	
AG30	기관 담당자는 보편타당한 기획을 하는 것이 가장 힘들었다고 한다.	

Civil servant Interview (2021.01.06 Code AH)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AH01	기관 담당자는 서비스에 관련된 운영과 정책을 담당하고 IT 업체 담당자는 서비스 기획을 담당한다.	
AH02	부르미 앱 서비스의 경우, 주요 기능을 선택할 때 어떤 장애 유형이 소외되지 않을지 고민하는 것이 가장 어려웠다고 한다.	
AH03	부르미 앱은 운전기사의 서비스를 편리하게 해야 탑승자에게 더 좋은 서비스로 돌아갈 수 있기 때문에 탑승객과 운전기사 양쪽을 다 고려해서 개발해야했다.	
AH04	유지보수기간에는 많게는 매일 기관 담당자와 만나 의견을 듣고 서비스에 반영하는 단계를 거쳤다고 한다.	
AH05	기관에 방문할 때면 기관 담당자가 민원을 모아서 전달해주는 경우도 있다.	
AH06	민원이 직접적으로 전달되는 현장에 개발자가 오지 않는 것이 IT업체의 암묵적인 규칙이라고 한다.	
AH07	탑승객은 앱이 만들어진 이후로 이동중에 무전기로 기사와 관리센터가 예약위치를 주고받는 소음이 없어져서 매우 만족했다고 한다.	
AH08	운전기사는 초기에 사용하던 무전기배차 시스템에서 앱으로 넘어오면서 변경된 위치를 반영한 배차시스템으로 넘어오는 것에 대한 반발심이 많았다고 한다.	
AH09	전화로 대화가 오갈때는 상담원에 대한 신뢰가 있었는데 앱 서비스가 도입된 후에는 일방적으로 정보를 제공받는 방식이다보니 소통에 어려움을 겪는 사용자가 있다.	

AH10	앱은 개발되고 1년의 시간이 흐르면 사용자들은 편리한 점은 익숙해지고 새로운 불편한 점이 생기는 것이 일반적이다.	
AH11	서비스 시스템이 발전하더라도 운영 정책이 바꾸지 않으면 한계점이 생긴다.	
AH12	운영 정책은 담당 기관만 담당하기 때문에 IT 업체에서 관여할 수 없다.	
AH13	지자체마다 이동지원차량 서비스가 연계될 수 없는 가장 큰 이유는 운영과 정책 방식이 지자체마다 다르기 때문이라고 한다.	
AH14	기관과 협력하는 서비스는 담당자의 인사이동으로 인해 프로젝트가 원점으로 되돌아가는 상황도 있다고 한다.	
AH15	서비스를 이상적으로 만들기 위해서는 기관과 정부의 운영 정책에 관한 협조가 필요하다.	
AH16	서비스 운영 정책이 바뀌면 서비스를 다시 제작해야하는 일도 발생한다.	
AH17	초기에 시각장애인 탑승객의 screen reader 관련 민원이 많이 들어왔다.	
AH18	IT 업체 입장에서 가장 힘든점은 보편타당한 민원인지 단순한 개인 선호도에 대한 불편함인지를 구분하는 것이다.	
AH19	서비스 업데이트 이후 민원과 민원이 서로 충돌하는 상황이 발생하면 어떤 것이 더 합리적인지 판단하기 어렵다고 한다.	
AH20	IT 업체는 기획단계에서 장애유형을 대표하는 사용자들이 참여하여 반복될 민원을 사전에 제시해주는 것이 좋다고 한다. (민원이 다른 미원을 막아주는 구조)	
AH21	복지를 담당하는 협회 및 기관은 사용자의 의견을 더 잘 반영하고자 하지만 상대적으로 교통과 전체를 담당하는 공단 또는 기관은 편의를 제공하는 태도로 접근한다.	
AH22	모바일 앱은 개발 3개월, 유지보수 1개월을 하는 것이 일반적이다.	
AH23	기획단계에서는 이상적인 방향을 선택하지 못하는 경우가 있기 때문에 외부인과 미팅을 함께 하지 않는다.	

Civil servant Interview (2021.01.14 Code AI)

코드	인터뷰 통찰 (혹은) 두꺼운 기술	Follow-up question
AI01	디지털 정보는 이미지, 영상, 글 등의 시각자료로 구성되어 있어 시각장애인들이 정보를 얻기 어려운 형태이다.	
AI02	복지관에서는 시각장애인들이 정보를 이해할 수 있도록 점자, 화면확대, 전자문서 변환 등을 지원하고 디지털 기기를 사용할 수 있도록 교육을 진행한다.	
AI03	시각장애인들은 정보를 얻기 위해서 비시각장애인들보다 더 많은 단계를 거쳐야한다.	
AI04	시각장애인들은 정보의 '정확성' 과 '신속성'이 충족되기 어렵다.	
AI05	시각장애인들은 지인에게 정보를 읽고 녹음해달라는 부탁을 하곤 한다.	
AI06	말로 표현하지 못하는 정보(도형, 수식 등)는 시각장애인에게 전달되기 어렵다.	
AI07	시각장애인은 디지털 기기를 활용하여 '검색'을 하고싶어한다.	
AI08	시각장애인은 '맛집'을 검색해도 필요한 정보를 얻기까지 시간이 오래걸려 필요한 시간내에 정보를 얻지 못하거나 흥미가 떨어지게 된다.	
AI09	시각장애인들은 모바일에서 특정 위치(왼쪽 위)에서 포커스를 맞춰서 원하는 정보가 나올 때까지 이동하는 방식으로 정보를 찾는다.	
AI10	정보가 많은 앱일 경우에는 시각장애인이 어떤 정보에 중점을 둬야하는지 알기 어렵다.	
AI11	최소한 스크린리더로 읽어줄 수 있는 정보를 제공해줘야 시각장애인은 접근이 가능하다.	
AI12	불편함이 익숙해져버린 시각장애인들은 '어짜피 안될꺼야' 라는 생각을 하게된다.	
AI13	시각장애인에게는 서비스를 처음 접해보고 느낀 접근성의 수준이 크게 작용된다.	

AI14	스마트폰의 설정에서 접근성의 단계를 줄이거나 맞춤형 설정이 일부 가능하다.	
AI15	앱의 시작화면에서 접근이 막히면 시각장애인은 앱 자체의 오류 또는 자신의 잘못으로 착각하는 경우가 있다.	
AI16	시각장애인 전용 앱은 매우 간단한 사용성으로 설계되어진다.	
AI17	시각장애인은 오타를 입력하는 것에 대한 두려움이 있다.	
AI18	시각장애인에게 좋은 접근성이란, 서비스를 켜고 입력하고 출력하고 끄는 방식이 온전히 이루어지는 경우를 뜻한다.	
AI19	모든 서비스를 시각장애인에게 맞출 수 없기 때문에 한계점을 인지하고 해결할 수 있는 영역을 찾는 것이 중요하다.	
AI20	시각장애인에 대한 이해가 있는 강사의 경우에는 자신이 가져온 시각자료를 최대한 풀어서 설명해주려고 한다.	
AI21	보이는 라디오가 도입되면서 시각장애인들에게 또다른 장벽이 생기고 있다.	
AI22	시각장애인은 뉴스에서 하단 자막으로 나오는 속보를 인지하지 못한다.	
AI23	게시판 제목에서 내용의 정보를 일부 표현해준다면, 시각장애인은 정보를 더 정확하고 빠른시간에 찾을 수 있을 것이다.	
AI24	OCR 기술이 도입되어도 내가 원하는 정보만 선별해서 변환해주는 것이 아니기 때문에 한계가 있다.	
AI25	서비스가 업데이트될 때 기능은 동일하지만 접근방식이 달라지면 시각장애인에게는 매번 새로운 앱을 배우는 느낌을 받게된다.	
AI26	접근성이 더 보편화되기 위해서는 강한 법 제정이 필요하다.	
AI27	법 제정으로 인해 해결된 예시로는 선거 홍보물 장수 제한이 있다. (점자를 사용하면 장수가 늘어나야하지만 법으로 홍보물 장수를 제한해두어 시각장애인은 더 부족한 정보를 받았어야했다.)	

AI28	온라인 커뮤니티에서 최신 디지털 기기의 동향을 파악하는 용도로 스마트폰을 사용하는 시각장애인이 있다.	

Civil servant, User Interview (2021.02.10 Code AJ)

AJ01	시각장애인도 컴퓨터보다 스마트폰을 더 친숙하게 사용한다.	
AJ02	시각장애인은 시각장애인용 앱 사용성 테스트에 참여하여 피드백을 주는 활동을 하는 경우도 있다.	
AJ03	시각장애인은 앱 사용에 불편함을 겪으면 활동지원사의 도움을 받는다.	
AJ04	입력된 단어에 대한 피드백이 없으면 시각장애인은 검색에 어려움을 느낀다.	
AJ05	시각장애인에 대한 이해가 있는 기관 담당자일 경우, 시각장애인의 민원을 이해하고 협력 IT 업체에 관련된 내용을 전달해준다.	
AJ06	공공앱에 불편함을 느낄 때 민원을 이야기할 수 있는 명확한 창구를 시각장애인이 알 수 있어야 한다.	
AJ07	앱 서비스의 접근성 문제가 해결되기 위해서는 시각장애인의 적극적인 민원도 함께 진행되어야 한다.	
AJ08	스크린리더에 대한 지식이 부족한 고객센터 상담사에게 민원을 이해시키는 것은 매우 힘들다.	
AJ09	일부 지자체에서는 공공앱 서비스 개편이 있을 때 다양한 유형의 장애인을 대상으로 공청회 자리를 마련하여 의견을 듣는 경우가 있다.	
AJ10	접근성 문제는 직접 스크린리더 기능을 켜서 설명을 하는 것이 가장 전달력이 좋다.	
AJ11	앱 접근성 문제는 사진으로 의견을 전달하기에 한계가 있다.	

현장관찰 내용

AK01	시각장애인마다 자신의 기호에 맞게 터치에 따른 접근성 설정을 개인화하여 사용한다.	
AK02	대략적인 키보드 거리를 감으로 익혀서 사용하시는 시각장애인이 있다.	
AK03	인증코드를 키보드에 자동으로 띄워주는 기능은 시각장애인도 매우 편리하게 사용한다.	
AK04	암호 입력시, 키보드 배열이 랜덤하게 변경되면 시각장애인들은 더 많은 시간을 소요해서 암호를 지정해야한다.	
AK05	버튼에 대한 설명이 없을 때는 해당 버튼을 눌러봐야지 내용을 더 알 수 있지만 원하는 정보가 나오지 않을 것에 대한 두려움이 있다.	
AK06	결제하기 버튼은 쉽게 찾았지만 QR카드를 인식해야하는 부분은 시각장애인이 독립적으로 할 수 없다.	
AK07	카드발급을 받을 수 있다는 정보는 앱에서 모든 버튼을 들어가보지 않는 이상 알 수 없는 정보이다.	
AK08	민원을 넣기 위해서는 일반적으로 앱 내의 설정메뉴에서 고객센터 번호를 찾는다.	
AK09	울산페이 앱은 홈화면과 설정에서 고객센터 번호를 명시하고 있지만 대체텍스트를 읽어주지 않아서 찾지 못했다.	
AK10	앱에서 고객센터 번호를 찾지 못한다면, 웹에서 검색해서 번호를 찾아내는 경우도 있다.	
AK11	고객센터에 전화를 해서 고객센터 번호를 읽어주지 않고 대체 텍스트가 제공되지 않는 점을 이야기해보겠지만 '위에 전달해두겠습니다' 와 같은 답변을 예상했다.	
AK12	시각장애인은 활동지원사 선생님의 도움을 받아서 앱에서 겪는 어려움을 해결하는 경우도 있다.	
AK13	고객센터 상담사는 바로 시정이 될 수 없다는 답변을 주었다.	
AK14	고객센터 상담사는 특정 기능에 불편을 느끼는지, 앱 전체의 사용성에 불편을 느끼	

	는지에 관한 질문을 하였다.	
AK15	고객센터 상담사는 시각장애인 접근성 관련 문의를 상위 기관에 전달하겠다고 하였지만 바로 시정되지 않을 것이라는 답변을 주었다.	
AK16	고객센터 상담사는 시각장애인이 어려움을 겪고 있다는 대체 텍스트에 관하여 정확히 알고 있지 못하여 정확한 내용이 전달되지 못했다.	
AK17	관련된 민원을 넣은 경험은 있었으나 대부분 시정되지 않았던 경험 탓에 민원을 잘 넣지 않게된다.	
AK18	시각장애인은 앱의 접근성 수준이 낮아질수록 타인에게 의존해야하는 상황이 많아진다.	
AK19	서울은 사람이 많고 젊은층이 높은 비율을 차지하고 있기 때문에 상대적으로 민원이 활발하게 이루어진다고 한다.	
AK20	민원을 가장 적극적으로 받아서 반영하는 곳은 apple korea이며 관련 접근성 이슈를 상세히 적거나 원격으로 화면을 기록해가는 경우도 있다.	
AK21	시각장애인은 기관에서 접근성 이슈를 다룰 수 있는 전문가가 민원을 응대해줬으면 하는 기대가 있다.	

User Interview (2021.02.14 Code AL)

AL01	중도시각장애인이 되면 휴대폰을 고르는 기준에 접근성 지원 수준이 중요하게 포함된다.	
AL02	문자가 왔다는 정보도 중요하지만 문자 내용을 스크린리더 기술이 읽어주는 것도 매우 중요하다.	
AL03	시각장애인은 시각장애인 지인으로부터 스마트폰을 더 잘 쓸 수 있는 팁을 전해듣는 경우가 많다.	
AL04	시각장애인은 자연어 처리 기능(siri)과 스크린리더 기술(voice over)이 가장 중요하다.	

AL05	시각장애인은 이동이 자유롭지 않다보니 스마트폰으로 자신의 취미활동을 즐기는 시간이 매우 길며, 8시간 이상 사용한 적도 있다.	
AL06	시각장애인의 삶을 아이폰을 구매하기 전과 후로 나눌만큼 매우 큰 변화를 주었다.	
AL07	카카오톡, 페이스북, 유튜브와 같이 소통이 가능한 서비스들은 시각장애인의 삶에 큰 위안이 된다.	
AL08	시각장애인들 사이에는 접근성이 편리한 앱이 있으면 주변 시각장애인들에게 추천을 하거나 공유하는 문화가 있다.	
AL09	많은 사람들이 사용하는 앱일수록 접근성 수준이 더 높다고 느낀다고 한다.	
AL10	시각장애인은 앱 내부에 있는 고객센터 연락처와 이메일을 활용하여 궁금증을 해결하거나 민원을 요청한다.	
AL11	고객센터 상담사가 접근성 기능을 알고 있다는 것만으로도 시각장애인은 많은 위안을 얻는다고 한다.	
AL12	상담사가 접근성을 이해하는 것과 접근성이 개선되는 것은 다른 문제이다.	
AL13	시각장애인은 고객센터에 자신의 접근성 문제를 명확히 전달되는 것만으로도 위안을 얻을 때가 있다.	
AL14	고객센터에 접근성 민원을 제기하더라도 피드백이 오거나 진행사항을 전달받지는 못한다.	
AL15	시각장애인은 다음 업데이트에 자신의 민원이 반영되었는지 기대하고 실망하는 과정을 반복한다.	
AL16	접근성 개선이 되더라도 본인의 민원이 영향을 준 것인지에 대한 정보는 알 수 없다.	
AL17	시각장애인은 본인이 넣은 민원사항이 개선되었을 때 큰 성취감을 느낀다.	
AL18	접근성 보조기술에 대한 이해가 높은 애플 고객센터의 상담사는 시각장애인의 불편함을 이해하고 민원을 접수한다.	

AL19	애플 고객센터는 도움이 필요한 민원인은 기기에 접근할 수 있도록 원격시스템을 갖추고 있다.	
AL20	시각장애인이 동일한 접근성 문제로 민원 전화를 할 때, 동일한 고객상담사를 마주하는 것을 불편해한다.	
AL21	해당 서비스의 결정권자가 시각장애인이거나 접근성에 대한 지식이 있어야 접근성 민원시스템이 개선될 것이라고 생각하는 시각장애인이 있다.	

현장관찰 내용

AM01	앱에서 본인이 사용하는 필수적인 기능의 접근성이 괜찮다면 큰 불편함을 못느끼는 경우도 있다.	
AM02	시각장애인은 궁금한 점이 생기면 고객센터에 전화하여 필요한 기능이나 서비스를 구두로 요청하고 안내를 받는다.	
AM03	시각장애인은 QR코드를 사용해야하는 상황을 마주하면 정안인에게 대신 인식을 시켜달라고 도움을 요청한다.	
AM04	입력한 단어를 스크린리더가 읽어주지 않으면 시각장애인은 입력이 되지 않았다고 인지한다.	
AM05	시각장애인이 민원을 넣을 때 말로 설명하는 것에 한계를 느껴서 화면녹화를 해서 보내는 경우도 있다.	
AM06	시각장애인은 처음 접해보는 앱일 경우, 어떤 기능이 지원되는지 어떤 목적으로 사용해야하는지 설명을 들어야 사용을 해볼 수 있다.	
AM07	고객센터에 전화를 하기 위해서 앱 내부에서 번호를 찾거나 네이버에 관련 기관을 검색해서 전화번호를 찾는다.	
AM08	시각장애인은 고객센터에서 voice over 기능에 대한 이해가 있다면 소통이 더 편리할 것이라고 생각한다.	

Civil servant Interview (2021.03.05 Code AN)

AN01	모바일 앱 접근성에 관련된 법조항은 지능정보화기본법 (2020년 6월 9일 전면개정)과 장애인차별금지법(2016년 2월3일 개정)이 있다.	
AN02	접근성 관련 법 조항은 키오스크, 앱, 웹을 모두 포함하고 있다.	
AN03	지능정보화기본법에는 벌칙조항이 없어 실효성이 약하다.	
AN04	장애인차별금지법은 벌칙조항이 포함되어 있어 소송과 권리구제에 실효성이 있는 도움이 된다.	
AN05	웹은 상대적으로 접근성 위배에 관련된 진정접수와 판례가 발생하는 편이다.	
AN06	웹접근성인증마크 제도가 시행되면서 공공기관에서는 웹 접근성인증마크를 받아야 과업이 종료될 수 있도록 규정이 마련되었다.	
AN07	정보화진흥원에서 매년 웹 접근성 실태조사를 시행하고 공개하고 있다.	
AN08	앱과 키오스크는 국가에서 아직 통계를 공식공개할 만큼 파악된 상태가 아니다.	
AN09	앱의 경우에는 등록절차가 구글 플레이스토어와 애플 앱스토어에 있다보니 해당 측에서 정보를 공개해주지 않는 이상 구체적인 정보나 분석이 어렵다고 한다.	
AN10	권리구제는 복잡한 절차와 시간을 소요해야하며 고의성, 지속/반복성, 보복성 등이 입증되어야 한다.	
AN11	지방자체단체나 규모가 크지않은 회사의 경우에는 자체적으로 접근성을 반영하거나 고도화하기 힘들다는 현실적인 한계가 있다.	
AN12	정보화진흥원에서는 웹 접근성 지원사업을 시행하여 접근성 향상에 도움을 주고 있다.	

User Interview (2021.03.08 Code AO)

AO01	울산에 시각장애인이 5천명 정도 있는데 그 중 3천2백명이 문자 판독이 가능한 6급 시각장애인이다.	

AO02	한쪽은 보이지 않고 한쪽의 시력이 1.0정도인 6급 시각장애인은 운전도 가능하다.	
AO03	6급 시각장애인은 돋보기와 같은 보조기술의 도움을 받으면 글을 읽을 수 있기 때문에 점자이용을 하지 않는다.	
AO04	선천성 시각장애인 비율은 줄고, 중도 시각장애인의 비율은 증가하고 있다.	
AO05	고령자의 경우 점자를 인지하는 감각이 떨어져서 힘들어한다.	
AO06	점자를 읽기 어려워하시는 분들에게는 물체에 스티커를 붙여서 구별하는 방법으로 대체한다. 특히 스크린 터치가 많은 제품 (인덕션, 냉장고)에 자주 활용한다.	
AO07	디지털 기기가 도입되면서 보조기술 덕분에 시각장애인의 접근성이 많이 향상되었다.	
AO08	점자의 활용이 높지 않아 큰 비중을 두지 않지만 읽을 수 있을 정도의 교육은 지속적으로 진행한다.	
AO09	사회적으로 불이익을 당할까봐 시각장애가 외관상으로 보이지 않으면 숨기는 시각장애인이 많다.	
AO10	색약 또는 색맹은 통계가 없을 뿐더러 법적 인정 기준에 포함되지 않는다.	
AO11	한국의 시각장애 법적 기준은 시력과 시야로만 구분된다.	
AO12	시각장애인전맹축구대회가 있고, 유투브를 통해서 볼 수 있다.	
AO13	공이 굴러가면서 내부에 있는 쇠고리가 마찰소리를 내기 때문에 위치를 알 수 있다.	
AO14	시각장애인 축구경기에서 지시를 해주는 감독을 가이드라고 하며, 선수에게 위치를 대신 설명해주는 역할을 한다.	
AO15	스마트폰을 10년이상 사용하였고 피처폰을 사용할 때는 기능을 외워서 사용했다.	
AO16	스마트폰을 사용하면서 접근성 문제를 겪은 경우는 수도없이 많았다.	

AO17	시각장애인은 정안인보다 휴대폰 사용에 더 많은 시간이 소요되기 때문에 가끔 사용하는 어플리케이션 또는 회원가입 절차는 정안인의 도움을 받는다.	
AO18	금융앱에서 주식을 구매하는 일이나 쇼핑을 하는 일에 많은 시간이 소요되는게 아깝다고 느끼는 시각장애인이 있다.	
AO19	독거 시각장애인은 정안인의 도움을 받기 어렵기 때문에 독립적으로 사용하는 경우가 더 많다.	
AO20	접근성 메뉴얼을 지켜서 홈페이지를 만들어도 복잡도가 높으면 시각장애인이 사용하기 어렵다.	
AO21	홈페이지나 어플리케이션이 서로 다른 구조를 가지고 있는 경우가 많아서 접근하기 어렵다.	
AO22	최소한 관공서의 홈페이지나 어플리케이션은 고정된 양식 또는 구조로 만들어지기를 희망한다.	
AO23	PC의 접근성이 많이 발전했다고 느끼지만 여전히 구조의 차이로 인해 어려움을 느끼고 있다.	
AO24	스크린리더를 사용해도 대체택스트가 없는 이미지는 의미없는 숫자나 기호로 읽힌다.	
AO25	최근 네이버 어플리케이션의 전체 구조가 개편되면서 많은 시각장애인이 어려움을 느끼고 있다.	
AO26	아이폰 접근성 문제를 겪는 모습을 영상으로 촬영하여 애플 고객센터에 전달한 경험이 있다.	
AO27	진동임에도 불구하고 보이스오버가 번호를 읽어주는 문제로 인해 민원을 제기했었다.	
AO28	공무원의 잦은 인사이동으로 인해 교육이 무의미해지는 경우가 많다.	
AO29	협업을 진행했던 기관의 담당자가 1년에 4번 바뀌는 경우도 있었다.	

AO30	기존의 접근성 지침서들은 구조의 통일화에 대한 언급이 없다.	
AO31	타 장애의 경우에는 글을 공통적으로 사용하지만, 시각장애는 글을 사용하지 못하기 때문에 접근의 방식이 달라야 한다.	
AO32	시각장애에 대한 경험을 해봐야 이해를 할 수 있기 때문에 신입담당자가 오면 시각장애 체험 교육을 진행한다.	
AO33	신입 담당자 교육에서 본인 스마트폰을 사용하여 스크린리더 기능을 사용하게끔 한다.	

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Ulsan, Korea, 18 Jun 2021

Sungwon Jang

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Beyond Mere Listening: A User Experience Record Manual to Improve Accessibility of Public Mobile Applications for the Visually Impaired

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This book is based on my Master Graduation Project, but *not* an official publication.

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User Experience
Record Manual

To appropriately document the experience of visually impaired users in using the mobile application

The Ministry of the Interior and Safety provide a guide book called 'Civil Servants Respond Manual (2019)' dealing with how civil servants can respond to customers, but there is only one page dedicated to helping users with visual impairment.

This is not sufficient to appropriately responding to complaints such users have in using public mobile applications. Failure to understand and record the user's difficulties reduces the possibility of service improvements.

This user experience record manual helps understand and adequately record the complaints of visually impaired users who have difficulties in using public mobile applications.

01

How does the visually impaired experience public mobile app that does not comply with accessibility principles?

The story of Jaewon and Yuri wrote based on interviews with 10 visually impaired users

On the next page,
Yuri and Jaewon are fictional characters created based on the 10 visually impaired user field studies, including interviews, observations, and contextual inquiry I met through the project. They are prepared in the form of narrations so that anyone can easily empathize with the users' experiences.

The story of Jawon with blindness

“I use a smartphone with assistive technology that reads information on the screen by voice. But it often doesn't work with public mobile applications”

Despite his blindness, Jaewon can use a smartphone because he can listen to the information by using assistive technology pre-installed in smartphone. It takes more time but just being able to listen to information on a smartphone is an opportunity for Jawon. However, not all mobile applications are well prepared for assistive technology. Many apps don't consider accessibility in the app contents which leads to situation where can nothing is readable even if assistive technology access the contents.

Jaewon sends a complaint to the customer center to request improved accessibility, but nobody understands what assistive technology is and what is required for accessibility. Inevitably, Jaewon receives help from others, but he does not want to share personal information such as the password and ID to other people all the time.

The story of Yuri with low vision

“I am always afraid of updates to the mobile applications. Because when there is a change in the structure, it takes a long time for me to become familiar with it”

Every morning, Yuri has booked a disability support taxi service using a mobile application provided by the local social welfare center. She is satisfied with the app service, which orders a taxi to her location faster and more accurately than a call reservation. However, today Yuri heard the updated news of the mobile application. She is unhappy because users with visual impairments require much repetitive practice to use the application.

Yuri inevitably has to turn on the updated mobile application, listen to every step, and re-grasp the structure. Unfortunately, it is difficult to access because there is much new contents that can not be read by assistive technology. Yuri feels like facing a new application every time when there is an update.

02

What kinds of considerations are needed to understand the visually impaired experience?

Needs for better communication with visually impaired users

On the next page,
there are two suggestions based on the field studies from the visually impaired user and service provider communication process. This is the suggestion of an attempt to help reduce the frustration of users with visual impairment complaints experience.

It takes a long time for visually impaired users to find and understand information

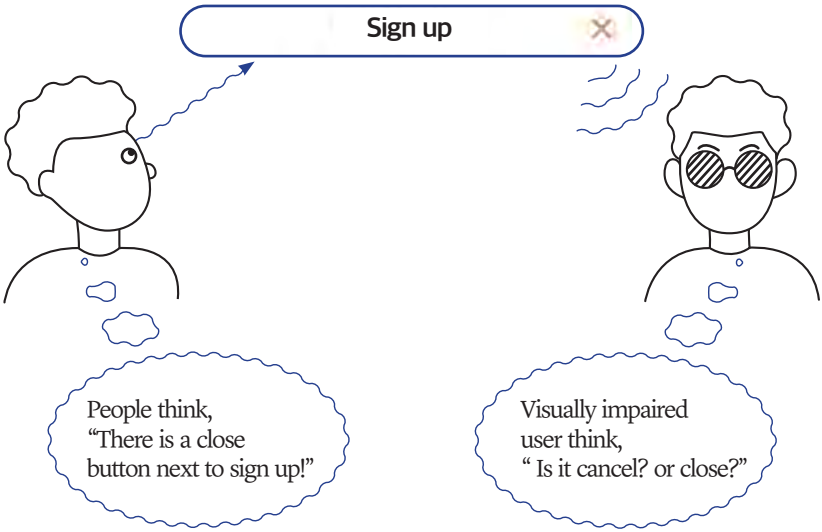
The screen reader reads all elements of the screen aloud, moving the focus from the top left to the bottom right of the mobile screen. In the mobile screen below, people know that 'Sign up' element is located in number 4, but visually impaired users hear all the information from number 1 to number 4 and find it.

Screen reader reading order

1. ID input, text field.
2. Login, button.
3. Password input, text field.
4. Sign up, button.
5. Service call center, button.
6. Find ID, button.

Visually impaired users rely on a screen reader's representation

In the figure below, people can find and understand sign up component with ×mark as a visual. However, if the screen reader reads ×mark mean as delete or cancel rather than close, the visually impaired will understand that expression.



03

Trying to experience smartphone as a visually impaired user

How to start a screen reader and how to use common gestures

If you use Apple's iOS, **Setting > Accessibility > VoiceOver**

If you use Google's Android, **Setting > Accessibility > TalkBack**

Screen reader common gestures

One finger Single-tap

Select and Speak

One finger Double-tap

Activate

One finger Swipe left

Move to previous focus

One finger Swipe Right

Move to next focus

04

How to record the visually impaired users' experience of the public mobile app?

Quick manual and examples to record the visually impaired user experience

Empathize with the users

A visually impaired user attempted to charge (empathize) money in the Ulsan Pay mobile app, but he did not receive voice information.

Narrow down the problem stage

The user accessed Menu > Charge > Selection (stage) in the mobile app, but all voice information provided only with the 'button' after 'please select the amount' voice message.

Record mobile OS and app version

The user was using VoiceOver on iPhone 12 (mobile OS), and the Ulsan Pay mobile app (version) is 01.00.26 as of the App Store.

1 Empathize with the users' experiences

Ask the users what they feel and experience. You can more clearly understand the case of issues and record the context of the users' experiences.

! If you don't empathize

You will only partially understand the user experience. According to field studies, service providers often didn't understand or empathize with the visually impaired users' challenges. If you don't empathize with the user's intentions, you can't record appropriate ways.

Example qeuestion

Did you have any difficulties using the application?

In what situations did you struggle?

What function were you trying to use?

2 Narrow down the problem stage

Ask specific stage the user had challenges in using the mobile application. If you record the specific page or location where the challenging issue occurs in as much detail as possible, anyone reading your rocord can quickly identify the issue.

! If you don't specify

It takes a long time and resource to find the issues in the entire component of the mobile application. If there are not enough experts, it may take a long time to reflect an update that includes improvements to the problem.

Example qeuestion

Describe the specific stage you had challenges
What voice information did you hear?

3 Reconfirm the recorded users' experience

Organize the complaints and explain them to users. If you record user comments adequately, it can lead to improving accessibility in the mobile application.

! If you don't reconfirm

You might record users' feedback inappropriately. In the field studies of this project, visually impaired users send a complaint to the customer center to request improved accessibility, but in 3 cases out of 6 times, service providers didn't understand what the user said.

Example qeuestion

Are you sure you want to complain about this?

Are there any other problems or issues?

4 Record users' mobile OS and app version

Record the user's smartphone os and figure out the version of the mobile application. Accessibility reviews are based on those users' data.

! If you don't records

The accessibility issues may differ depending on the mobile OS, even if the mobile application is the same. According to the field studies, iPhone users and Galaxy Phone users experienced different accessibility issues in the same mobile application.

Example qeuestion

What kind of smartphone do you use?

Check the version of the installed app in the Google Play or App Store.

This booklet is part of the outcome of the master's graduation project of Sungwon Jang, who belongs to the New Design Studio at Ulsan National Institute of Science and Technology. This project finds out why digital public services are designed without following accessibility principles and helps provide a solution to this problem, however small. The whole project report can be found at the link below.

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Designed by Sungwon Jang

서비스 사용 경험
기록 지침서

시각장애를 가진 사용자의 모바일 앱 사용 경험을 제대로 기록할 수 있는

한국의 '공직자 민원응대 메뉴얼'은
40 페이지, 그 중 시각장애인 응대
메뉴얼은 1 페이지에 불과합니다.

이는 다양한 어려움에 직면하는
시각장애인의 경험을 이해하기에
충분하지 않습니다.

사용자의 경험이 제대로 기록되어
서비스의 개선으로 이어질 수 있는
시스템이 필요한 시점입니다.

본 메뉴얼은
어떻게 하면 공공 앱 사용에
어려움을 겪는 시각장애인의
경험을 올바르게 기록할 수
있는지에 관하여 제안합니다.

01

접근성을 지키지 않은 공공 모바일 앱 서비스, 시각장애인은 어떻게 경험하고 있을까?

시각장애를 가진 사용자 10인의 인터뷰를 바탕으로 쓰여진 지현과 재원의 이야기

다음 페이지에 나오는 재원과 지현의 이야기는,
본 프로젝트에서 만나본 10인의 시각장애인 인터뷰 및 관찰을 통해 얻은 실제 경험을 바탕으로 만들어진 가상의 인물입니다.
시각장애인이 모바일 앱 서비스를 사용하며 겪는 다양한 어려움을 누구나 쉽게 공감할 수 있도록 이야기 형태로 제공합니다.

전맹 시각장애인 재원의 이야기

“저는 화면의 정보를 음성으로 읽어주는 기능을 써서 스마트폰을 사용해요. 하지만 모바일 앱에서 올바른 음성 정보를 제공해 주지 않으면 화면의 정보를 이해할 수 없어요”

재원은 스마트폰 사용이 익숙한 전맹 시각장애인이다. 화면의 모든 구성 요소를 차례로 하나씩 음성으로 읽어주는 스크린 리더 기능 덕분에 가능해진 일이다. 물론 이 기능을 사용한다고 재원이 모든 모바일 앱 서비스를 사용할 수 있는 것은 아니다. 시각장애를 가진 사용자를 고려하지 않고 개발되는 모바일 앱이 많기 때문이다. 이러한 앱은 재원이 스크린 리더를 사용하더라도 음성 정보를 제공받지 못한다.

재원은 앱이 올바르게 업데이트 되기를 기대하며 앱 서비스 고객센터에 자신의 경험을 매번 전달하지만 아직까지 별다른 변화는 없다. 종종 재원의 이야기를 전혀 공감하지 못하거나 이해하지 못하는 상담사를 만나면 의견 전달이 되지 않기도 한다. 재원은 어쩔 수 없이 정안인에게 도움을 받지만, 개인정보를 공유해야하는 상황은 괜시리 찝찝하고 불안하다.

저시력 시각장애인 지현의 이야기

“사용하던 모바일 앱 서비스의 업데이트 소식은 항상 두려워요. 앱의 구조에 변화가 생기면 익숙하게 사용하기까지 오랜 시간이 걸리기 때문이죠.”

지현은 매일 아침 지역 사회복지관에서 시각장애인에게 제공하는 택시 서비스를 모바일 앱으로 예약해왔다. 전화예약보다 빠르고 정확하게 지현이 원하는 위치와 시간에 택시를 배차해주는 덕분에 모바일 앱을 더 선호하게 되었다. 하지만 최근에 모바일 앱 서비스가 자주 업데이트를 하면서 지현은 매번 어려움을 겪고 있다.

지현은 음성 정보를 듣고 화면의 구조를 머리속에 반복적으로 그려나가게 되는데, 업데이트 때 마다 새로운 화면의 구조를 파악하고 새롭게 그려야한다. 익숙하게 사용하던 모바일 앱은 대략적인 버튼의 위치와 음성 정보의 순서를 기억하지만, 업데이트된 앱은 지현에게는 새로운 앱과 마찬가지이다. 예상하지 못한 업데이트를 마주할 때마다 지현은 다시 반복적인 구조 파악을 해야한다는 사실에 머리가 아프다.

02

시각장애를 가진 사용자와 원활하게 소통하기 위해 어떤한 점을 고려해야할까?

시각장애를 가진 사용자의 이야기를 들을 때 고려해야할 2가지 주의사항

다음 페이지에 나오는 2가지 규칙은,
시각장애인의 고객센터 상담(6회)을 관찰하고 소통의 어려움이 발생하는 지점을 파악하여 정리한 내용을 바탕으로 제안합니다.
음성으로 진행되는 고객센터 문의과정의 특성을 고려하여 사용자의 겪는 어려움을 올바르게 이해할 수 있는 방법입니다.

시각장애를 가진 사용자는 정보를 얻기 위해 훨씬 더 큰 시간과 노력이 필요합니다.

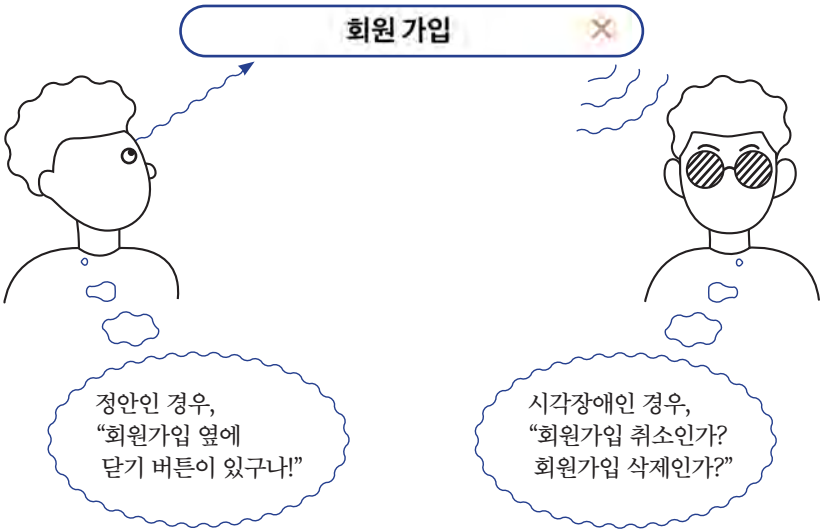
스크린 리더는 화면의 왼쪽 위부터 오른쪽 아래까지 포커스를 이동하며 화면의 모든 요소를 음성으로 읽어줍니다. 아래의 앱 화면에서, 정안인은 '회원가입'이 4번에 위치한다고 알지만, 시각장애인은 1번부터 4번까지의 모든 정보를 듣고 '회원가입' 버튼을 찾을 수 있습니다.

스크린 리더가 읽어주는 정보와 순서

1. 아이디 입력 텍스트 필드 입니다.
2. 로그인 버튼 입니다.
3. 비밀번호 입력 텍스트 필드 입니다.
4. 회원가입 버튼 입니다.
5. 콜센터 연결 버튼 입니다.
6. 아이디 찾기 버튼 입니다.

시각장애를 가진 사용자는 화면을 읽어주는 스크린 리더의 표현에 의지합니다.

아래의 그림을 보면, 정안인은 회원가입과 ✕표시를 보고 닫기 기능으로 이해할 수 있습니다. 하지만 시각장애인은 스크린 리더가 ✕표시를 닫기가 아닌 삭제 또는 취소 라고 읽어준다면 그 표현으로 이해하고 구성요소를 이해하게 됩니다.



03

시각장애를 가진 사용자의 방식으로 스마트폰 사용해보기

스크린 리더 사용 방법 및 공통 제스처 설명

아이폰을 사용하신다면, **설정 > 손쉬운 사용 > VoiceOver**

삼성폰을 사용하신다면, **설정 > 접근성 > 톡백 (TalkBack)**

스크린 리더 공통의 화면 제스처

한 손가락, 한번 탭

선택 및 음성 제공

한 손가락, 두번 탭

선택 활성화

한 손가락, 왼쪽 쓸기

이전 포커스로 이동

한 손가락, 오른쪽 쓸기

다음 포커스로 이동

04

어떻게 하면 시각장애를 가진 사용자의 이야기를 올바르게 기록할까요?

시각장애를 가진 사용자의 경험을 올바르게 듣고 기록해야할 3가지 항목 과 기록 사례

사용자 경험 공감

시각장애를 가진 사용자가 스크린리더 기능을 사용하여 울산페이 모바일 앱에서 금액 충전(공감)을 시도했지만, 음성 정보를 제공받지 못했습니다.

문제가 발생한 단계

사용자는 모바일 앱 메뉴> 충전하기> 금액선택(단계)로 접근을 했으나, “충전하실 금액을 선택해주세요” 다음으로 제공된 모든 음성정보가 “버튼”으로 들리는 어려움이 있었습니다.

모바일 환경/앱 버전

사용자는 아이폰 12(모바일 환경)에서 보이스 오버를 사용하고 있었으며 , 해당 울산페이 모바일 앱의 버전은 앱 스토어 기준, 01.00.26 입니다.

1 사용자가 전달하는 불편함에 공감해보세요.

사용자가 어떤 상황에서 어려움을 겪었는지 물어보세요.
사용자가 경험한 불편함을 더 명확하게 이해할 수 있으며,
표현의 의도와 맥락을 이해하여 기록할 수 있습니다.

! 공감하지 못하면,

사용자가 전달하는 의도를 단편적으로 이해하게 됩니다.
실험에 따르면, 대부분의 서비스 공급자는 시각장애를 가진 사용자가 어떠한 어려움을 겪는지에 대해 이해하지 못하였습니다. 사용자의 의도에 공감하지 못한다면 올바른 기록으로 이러질 수 없습니다.

사용자에게 건낼 예시 질문

어플리케이션 사용에 어떤 어려움이 있었나요?
어떤 상황에서 어려움을 겪으셨나요?
어떤 기능을 사용하려고 하셨나요?

2 어떠한 단계에서 문제를 겪는지 범위를 좁히세요.

사용자가 어려움을 겪는 단계를 구체적으로 물어보세요. 어려움이 발생한 페이지 또는 위치를 최대한 구제척으로 기록해둔다면, 협력부서에 빠르게 문제를 파악할 수 있습니다.

! 범위를 좁히지 못하면,

어플리케이션 전체 페이지를 대상으로 사용자가 경험한 문제를 찾아야 하므로 많은 시간과 자원이 소요됩니다. 전문인력이 부족한 경우에는 문제가 발생한 위치를 찾지 못하거나 업데이트 반영까지 오랜 시간이 소요될 수 있습니다.

사용자에게 건낼 예시 질문

어려움을 겪은 단계를 구체적으로 설명해주세요.
어떤 음성 정보를 들으셨나요?

❸ 사용자에게 이해한 내용을 재확인하세요.

민원의 문제를 정리하여 사용자에게 설명해보세요.
사용자가 전달하고 싶었던 내용과 본인이 이해한 내용이 일치한다면, 올바른 접근성 개선으로 이어질 수 있습니다.

❗ 재확인하지 않으면,

사용자의 경험한 내용과 다른 정보가 관련부서로 전달될 수 있습니다. 고객센터에 사용자 경험을 전달하는 6번의 실험 중 3번의 사례에서 직원이 시각장애인이 전달한 내용과 다른 의미로 이해하는 경우를 발견했습니다.

사용자에게 건낼 예시 질문

제가 올바르게 이해했는지 확인해주실래요?
다른 어려움 점은 없으셨나요?

4 사용자의 모바일 환경과 앱 버전을 기록하세요.

사용자가 어떤 스마트폰을 사용하여 어플리케이션을 실행하였는지 구체적으로 기록하고, 모바일 앱의 버전을 파악하세요. 기록된 스마트폰의 운영체제과 앱 버전을 기준으로 접근성 검토가 이루어지게 됩니다.

! 기록하지 않는다면,

동일한 모바일 앱 서비스지만, 휴대폰 종류에 따라 서로 다른 접근성 문제가 발생할 수 있습니다. 사용자 관찰 실험에 따르면, 아이폰을 가진 사용자와 갤럭시폰을 가진 사용자는 서로 다른 접근성 문제를 겪고 있었습니다. 또한 어떠한 앱 버전에서 발생하는 문제인지 파악할 수 없습니다.

사용자에게 건낼 예시 질문

어떠한 스마트폰을 사용하시나요?

구글 플레이 또는 앱 스토어에서 설치되어 있는 앱의 버전을 확인해주세요.

본 책자는 울산과학기술원 뉴디자인 스튜디오 소속 장성원 학생의 석사졸업 프로젝트의 결과물 중 일부입니다. 본 프로젝트는 시각장애인이 정부 및 지자체에서 제공하는 공공 모바일 어플리케이션 사용에 어려움이 있음을 인지하고, 그 원인을 찾고 해결안을 제시하기 위해 시작되었습니다. 자세한 내용을 담은 프로젝트 보고서는 하단 링크에서 확인하실 수 있습니다.

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