Web accessibility and people with visual impairments

Perspectives and experiences

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Title
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Abstract
This thesis aims to explore the perspectives of people with visual impairments about the internet and web accessibility. How the current status of web accessibility is and how people with visual impairments use the internet are important topics in a society that is more and more digitalized.

Nine people with visual impairments were asked through semi-structured interviews. The questions covered what they do on the internet, what devices and assistive technologies they use, how web accessibility affects them and how they become digitally literate. This collected data from the interviews and literature, focused on digital disability divide, digital literacy and web accessibility, guided the analysis which was conducted following a qualitative approach.

This thesis shows that, while web accessibility allows for many online actions nowadays, much more is required. More focus on the users and their needs related to technical access is needed and digital literacy should be promoted. The study also concludes that technology, digital literacy and web experience are interconnected, which could provide a framework for future research.

Key words
Web Accessibility, Visual Impairments, Disability, Digital Literacy, Assistive Technologies, Internet Usage
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List of abbreviations

CDT   Critical Disability Theory
DAISY Digital Accessible Information System
JAWS  Job Access With Speech
NVDA  NonVisual Desktop Access
PVI   People With Visual Impairments
PWD   People With Disabilities
SRF   Synskadades Riksförbund (Swedish National Association of the Visually Impaired)
TTS   Text-To-Speech
W3C   World Wide Web Consortium
WHO   World Health Organization

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INTRODUCTION

This thesis investigates the internet usage by people with visual impairments (PVI) with the intent to elucidate how they learn to use and experience the internet.

The arrival of the internet came with a series of changes on many levels, from how we interact with others to how we perform certain activities like shopping. Globally, the internet has become a territory for socializing, learning, teaching, creating and consuming content, shopping and paying bills, etc. Its characteristics like globalization and quickness are attractive features that bring over more and more users and services. But sometimes, not all the users that would like to be present on the internet can manage to be so. When the internet is not accessible many people find themselves without options to participate in this way of communication and interaction that the current society offers. Web accessibility is the concept that refers to making the internet accessible for all. Web accessibility is important because it democratises the internet, but also because it can allow people to perform activities that were more complex before the internet. Therefore, this is a key concept concerning disability: web accessibility removes barriers that people with disabilities could encounter while using the internet.

This thesis reflects on the usage of the internet by people with visual impairments in Sweden. Sweden is the case that this research has taken as the scenario for, first, providing insight into how the situation in this country is and, second, reflecting on what people with visual impairments need to achieve satisfactory experiences using the internet. PVI represents about 5.4% of the Swedish population (Statistics Sweden, 2020a) and reports show that they use the internet less than people without disabilities. This is quite alarming because this country is clearly advancing towards the digitization of many services, like healthcare or communication with government agencies, strongly promoted by the government. However, as Johansson et al. (2021) criticise, the existing data is not enough to deeply explore how people with visual impairments use the internet, mainly because much research and statistics refer to people with disabilities (PWD) as one group instead of looking separately into different types of disabilities and their internet usage (Johansson, et al., 2021). Interpreting that as a research gap, this thesis focuses only on people with visual impairments, aiming to gain detailed knowledge about their experiences and situation in relation to the use of the internet.

To explore the usage of the internet by people with visual impairments, some topics appear relevant in the literature. The main topics of this thesis are assistive technologies, which allow for the access to technology; digital literacy, i.e., the series of abilities and skills that the user needs to be able to use the internet and related technologies; and the experience of the users, which can contribute exploring the current status of web accessibility as well as provide ideas for further improvement.
The theoretical framework of the thesis is a gathering of theories that encompasses disability and the internet. The Critical Disability Theory provides the social model of disability, i.e., the consideration of disability as a social construction. The relationship between disability and the internet is also explored from a theoretical perspective, delving into concepts like the digital divide, because it is clear now that the digital divide is not only a matter of material access but it also deals with digital literacy. Key frameworks are also provided, presenting reflections about assistance technologies, laws and standards that work towards web accessibility. Previous research focuses specifically on people with visual impairments, through selected texts that discuss web accessibility and user evaluation, the digital divide and literacy, the use of different devices and features, like touchscreen smartphones, or the roles of PVI on the Internet. This corpus of theory, key frameworks and previous research lays the foundations that allow this thesis to explore the experiences of people with visual impairments and their situation related to the internet usage.

This is a phenomenological and qualitative study, based on semi-structured interviews. Nine people from Sweden were interviewed about their habits on the internet, how they learnt to use it and the challenges that they face in every day’s life. The analysis of the transcriptions and the eclectic theoretical background provide a great foundation for reflecting on the Swedish case and for further discussion about digital accessibility.

Research questions

The research questions appear under the broader question issue that is “how do internet users with visual impairments experience the internet?”. The contribution of this thesis focuses on:

What are the steps that people with visual impairments need to take to become digitally literate?

What are the main facilitating features and main challenges nowadays for internet users with visual impairment?
STUDY CASE BACKGROUND

According to reports, in 2020 about 5.4% of the Swedish population had visual impairments (Statistics Sweden, 2020a). There are no exact numbers because of the definitions of visual impairment that different sources use, as well as the data collection. Some sources take data from the amount of people that are registered as PVI at some government agency for getting support or from statistics based on surveys, where the respondents declare if they have disabilities or not.

The report called Svenskarna och internet, (The Swedish Internet Foundation, 2021) or The Swedish and the internet in English shows that 90% of the Swedish population uses the internet daily, while in the category of people with disabilities, it is only 71% (although there is no data about people with different disabilities). This report analyses among others what devices people access the internet with, if they use public e-services, online banking and shopping or the consumption of online news. In the statistic Statistik om personer med funktionsnedsättning, tabeller 2018–2019 (Statistics Sweden, 2020b) or Statistics on people with disabilities, tables 2018-2019, Statistics Sweden asks about the living circumstances, allowing a comparison between data from people with and without different disabilities about different aspects of the daily life. This statistic differentiates between different disabilities. Related to the internet, it asks a total of eight questions about having internet at home, how frequently the citizens use it in their free time, and some concrete uses like pay bills, online shopping or usage of social networks. The questions were directed to one respondent (i.e., “Do you usually book, order or buy something on the internet?”) (2020b, sheet FT20), but there was one question that appeared particularly confusing because it asks also about a partner: “Do you or your partner [if you have a partner in the household] pay bills on the internet?” (2020b, sheet FT19). Therefore, I consider this to be orientation data to provide a background to my research, albeit as said, the results are never precise.

Johansson et al. (2021) make more exhaustive research on the topic. They conducted a survey about internet usage (access and use of devices), specific resources (online bank, shopping, social networks) and PWD’s perceptions about the use of the internet and if they felt excluded from the digital society. Background questions about economic income, gender, age, etc, were also included. Finally, of the thirty-five disability groups that they encountered, they just analysed twenty-eight because the authors considered that they needed to have at least twenty-five participants per group to obtain accurate data. This is a summary of their findings:

Overall, the results of this survey suggest that most people with disabilities are lagging behind the general population, in that:
• they have less access to devices;
• they use the internet to pay bills less;
• they use the internet for online shopping less;
• they use mobile bank ID for identification less;
• they feel less included in the digital society.

(Johansson, et al., 2021, p. 114)

They also claim that knowledge of the usage of the internet by people with disabilities lacks in the country, and my research aims to fill this gap in the specific case of people with visual impairments.

As stated previously, Sweden is on the path of digitalization. In 2017, research shows that Sweden led the race towards digitalization in Europe, with 96% of internet access at home among people without disabilities and 92% among people with disabilities (Scholz, et al., 2017, p. 5). The Swedish Internet Foundation (2021) points out that the internet is nowadays present in the life of the majority of the Swedish population for leisure, work, studies, shopping, contact with government agencies and transactions with the bank.

That has provided the scenario for many digital improvements, like the so-called public e-services, i.e., apps or websites provided by different public agencies for paperwork and bureaucracy. Some of them will be discussed in this research. Data shows that PWD use e-services less than average, with the exception of e-services for libraries (The Swedish Internet Foundation, 2021). Once again, there is no specific data about people with visual impairments. One of the e-services that will be mentioned in this thesis is BankID. BankID is a digital system to identify oneself through the smartphone or computer. It is linked to one’s bank account and it is the bank who provides it to the user. It is used to access accounts of many types (logging in to the internet bank, library account, health service, etc), and it works with the national identification number of the individual and a password that they have chosen, although sometimes it also works with the fingerprint or face recognition on the smartphone.

Related to it, there is Swish, a smartphone-based app that allows sending and receiving money way faster than with a traditional money transfer. It can be used between two private individuals or to pay for items in shops or restaurants, and in some cases also to pay invoices. To be able to send a payment with it, the user needs to have BankID to allow the action.

The healthcare service has also a presence online. The website for it, 1177.se, stands for the healthcare telephone number. This website offers information about several diseases and updates about health issues. It also allows the citizens to consult their medical journals, communicate with doctors, book vaccination dates, etc. Using 1177.se is an alternative as opposed to calling via telephone.

Accessing your economic information and being able to pay bills online, i.e., online banking, has become increasingly popular. It allows paying without needing to get the bills on paper, which is a promising improvement for people with visual impairments. Related to that, there is Kivra. As its website states, Kivra is a digital
mailbox for bills, receipts or letters from different agencies (Kivra n.d.). Connected to the bank account, it can be used to pay those invoices, and the user gets payslips, and because it is linked to your personal data, it allows the user to receive digital mail from government agencies.

Lastly, internet shopping is also on the rise, which became apparent during the pandemic. There is in Sweden an e-service called Klarna. Among its multiple services, Klarna allows the user to have their data stored so the user does not need to fill the textboxes every time they are going to pay an invoice, thus saving time.
THEORETICAL FRAMEWORK

This theoretical framework reviews important concepts for understanding the thesis. It collects elements from all the issues that would appear in the research and that the case study would bring to the surface (Faysse & Mustapha, 2017, p. 929), so it has a focus on disability and accessibility. The main topics in this theoretical approach are the digital society as an introduction to the digital divide, the disability and the internet, web accessibility and digital literacy.

Digital society and the digital divide

For more than twenty years ago, sociologists have been talking about the new model of society that the arrival of the internet potentiated. They pointed out how the so-called Network, Information or Digital society (Castells, 1997; Dillman, 2001; Lupton, 2014) was based on the transmission of information in the global world, connected by internet networks more than by physical structures. This movement of information seemed suddenly huge, and academics considered that it had the potential to change social structures in both positive and negative ways.

Strongly focused on the economic system that could come with this change of paradigm, Castells notes that this new society would link different communities and parts of the world as long as they can “add value to the value-making function of this economy” (Castells, 2000, p. 695). This economy, as said, is defined by the movement of information. Albeit the academics could not imagine the multiple forms that information could take (attention economy, data profiling, etc) to be valued in the economic market (Castells, 1997; Dillman, 2001), they were right about how this new society could influence society’s differences and inequity.

Twenty years later, some problems have not been solved. The weight of Neoliberalism, which transforms communities into groups of individuals and Capitalism, which focuses on the creation and accumulation of money by individuals more than by communities (Lupton, 2014; Rainie & Wellman, 2019), has slowed the democratic potential that the new society could have (Dillman, 2001). Current theorists talk about what the internet keeps needing or what defines the Digital Society now, such as the interaction between the supposed unrestricted movement on the internet and the struggle of those that suffer from digital inequities (Lupton, 2014). Bray and Cerf (2019) call for a more person-centered internet, which would need the collaboration of public and private organizations, encouraged by the pressure of the people.

Initiatives like that could also work against the digital divide. The idea of the digital divide, which was already drafted since the beginning of the internet,
predicted that the information society could bring a divide in society that would be characterised by computer access and internet skills, forming a hierarchy between information-rich and information-poor (Dillman, 2001; Castells, 1997).

Nowadays, the term digital divide “describes the uneven distribution of information and communication technologies (ICTs) in society.” (Britannica n.d.), This concept is used to criticize hierarchies in pre-computational society that have been transferred to dynamics in the network society (Castells, 1996; 1997). Authors say that there are two or three levels of the digital divide. The first one is the material access to the information. This refers to the possibility to access technologies, i.e., hardware, software, internet, and it is strongly linked to the economic situation of the users. The second level refers to the skills that one needs to use those technologies. Experts that consider that there is a third one, usually describe it as the ability to use them in a way that is beneficial for the user (Kim & Kim, 2001).

At the beginning of the internet, the first level of the digital divide was the most studied, i.e., the lack of access that many people suffered or suffer. When this began to be solved, by government help or the arrival of cheaper technologies, it was clear that the digital divide was still present. Having the skills to use it gained importance, adding complex characteristics to the digital divide because not having those skills and knowledge could mean that people are completely or partially left outside the digital society (Kleynhans & Fourie, 2014; Buckingham, 2009). For instance, digital skills are more and more a necessity to find work, deal with bureaucracy, etc. Other academics point out that when certain groups benefit less than others from the use of the internet, it could also be considered digital divide (Glencross & Katsikitis, 2021; Van Deursen & Helsper, 2015; Van Deursen & Van Dijk, 2014). All of this implies that the efforts for including outsiders in the digital world should increase and be continuous because the amount of needed knowledge is growing all the time (Lythreatis, et al., 2022).

In this research, the first level of the digital divide will be explored taking into consideration technologies that enable the access rather than talking from an economic point of view. Besides, I am particularly interested in the second level, i.e., to have the skills to use the internet. I consider that there is a lack of focus on specific skills and abilities that, in this case, PVI need in order to overcome that part of the digital divide.

Disability and the internet

Disability
As with other contested terms, it is difficult to define “disability”. Disability happens when people have one or more health conditions, of short or long duration, that in relationship with the environment hinder their daily life. For instance, the
World Health Organization (WHO) highlights the importance of the environment which surrounds people with disabilities, because it strongly influences the quality of life (World Health Organization n.d.). According to the Swedish authorities, there are two main nouns that must be described in this context: Funktionsnedsättning applies to physical, mental or intellectual impairment, while Funktionshinder is the more approximate word for “disability” in Swedish: “disability is the limitation that an impairment means for a person in relation to the environment” (Socialstyrelsen, 2022). Therefore, disability is a consequence of social ableism, that is discrimination from the society against people who have impairments (Ellis & Kent, 2010b).

Research shows that, in elderly societies, the number of people with disabilities increases. Physical and psychological impairments are sometimes consequence of ageing and the possible deterioration of health. When more and more people reach older ages, the percentage of people with disabilities seems to grow, although it is the economic status of the countries which largely affects the development of the illness or disability (United Nations, 2015, p. 97). Therefore, research on disability and accessibility could help not only people with visual impairments nowadays but also the future society.

Blindness and low vision are a type of disability that could be presented in different ways, with different levels of visual acuity and can be caused by several health problems such as uncorrected refractive errors, glaucoma, ageing, etc (World Health Organization, 2021). People with those disabilities are usually referred to as “people with visual impairments” or PVI (Kleyhans & Fourie, 2014).

Critical Disability Theory and the social model of disability

To approach disability, I will use the social model of disability, which arose from the Critical Disability Theory (CDT). Critical Disability Theory is a perspective that appeared in the second half of the 1970s (Hiranandani, 2019), strongly influenced by the Critical Race Theory and the Feminist Theory, theories that note that race and gender were immersed in social relationships of power more than just being indicators of identity that individuals have. Therefore, CDT points out that disability is a social construct like gender or ethnicity, and that it has been relegated to only medical studies or individual cases, being only theorizing from that point of view. The medical model defined disability as a “functional limitation” of the individual (Hiranandani, 2019, p. 3), and Adam and Kreps note “that locating disability in the individual as opposed to society is a political decision” (2006, p. 211). Some consequences of that decision are that disability was seen as a problem to be solved only medically and that PWD may have other life parameters or even rights. To take disability out of the medical model is what CDT began to do with the social model of disability, and to discuss disability as a social construct was its great break (Raske, 2005). This approach is what makes it possible to explore and try to solve
problems provoked by the tense encounter between society and disability (Rocco, 2005).

CDT insists on how PWD have common experiences and that, by adopting the social model of disability, they could be heard as a group, allowing changes at a socio-political level (Rocco, 2005; Hosking, 2008). Because the disability exists in interaction with the society and how it is formed, and not in the impairments of the own body as such, subjects could be able to not accept social conditions that hinder their life (Gibson, et al., 2021). It also puts focus on how social structures and policies could increase disability (Harpur, 2017 in Lundh, 2022).

However, the social model of disability has been very criticised as well. One of the most commented aspects of this is the presentation of PWD as a group. Without rejecting its relevance and positive contributions (to be a group allows for more joined voices, can have more agency, takes the responsibility to other places that just over the individual), it treats as homogeneous a group that is deeply heterogeneous. On the one hand, there are several different types of disabilities and impairments, that only share the umbrella term that “disability” is. Even inside each impairment, there are different causes, levels, etc. These people can have the same interests (such as not being discriminated against) but the way to achieve this could be really different from one to another (Danermark & Coniavitis Gellerstedt, 2004; Fraser, 2001).

Another critique that the social model has received is indeed a call for intersectionality. As a social construct, disability is inserted in the intersectionality axis. If a person is just defined by their disability, other factors of their identity are erased (Lewthwaite, 2014), such as age, social class, etc. In summary, the social model is useful for some analysis, like the one I present here, but the reader should keep in mind that it can be too simplistic to analyse all issues (Block, et al., 2016, p. 360).

Applying the social model of disability to digital issues, the first encountered issue is how disability was for a long time forgotten when academics spoke about the digital divide. The main indicators for the digital divide were class, gender, generation and region (Kim & Kim, 2001, p. 80), while disability came time after. This is a case of ableism that could be criticised precisely by the social model.

A social model account observes that disability and ability are ‘‘built-in’’ to technological networks as users with impairments are disadvantaged or locked-out of mainstream interactions by technical barriers, that produce them as ‘‘disabled’’.

(Lewthwaite, 2014, p. 1375)

Digital disability divide
Digital divide happens when technology disables bodies (Goggin & Newell, 2003; Ellis & Kent, 2010). Some authors consider that the digital divide affects people with disabilities in a particular way that should be studied as a topic itself that has been oblivious for too long (Adam & Kreps, 2006; Dobransky & Hargittai, 2006).
Literature about the use of the internet by PWD shows that it has both positive and negative aspects. On the positive part, the access to information is easier, with a possibility to interact with others with fewer barriers than the physical world has, and an increase in the sense of independence and self-confidence (Dobransky & Hargittai, 2006, p. 17). This third aspect will be mentioned at times during this research. It speaks not only about being able to do things by oneself and how that improves self-confidence, but also about the relationship with others and society. Rikki Chaplin (2016), blind and with hearing impairments, notes how having autonomy erases some discrimination that dependent people suffer, working toward equity, and it provides the possibility of contributing to the society.

Web Accessibility

Web accessibility refers to the ability of the users to use online services and products, and it tries to erase barriers that could hinder a full usage of the internet. Some authors make a distinction between accessibility and usability, where usability is the attribute of accessibility that defines that a product or service can be used by users to accomplish different actions with a satisfactory result (Kleynhans & Fourie, 2014, p. 370). As a note, in this research I will refer only to accessibility, keeping in mind its usability characteristic.

Web accessibility can be achieved in many ways. The most common is to adapt existing technologies, either with hardware or software, so users with disabilities can use them. This approach answers to the idea that designing is made for the norm, i.e., not disabled bodies, while there is a need to adapt it for other users (Adam & Kreps, 2009). The social model of disability critiques this idea because it reduces the issue of digital disability divide to a merely technical and measurable problem where some aids are added to make it function instead of looking to the question as a whole socio-technical issue (Adam & Kreps, 2006, p. 209).

To change this paradigm, some authors suggest creating instead of adapting, i.e., thinking about accessibility from the beginning instead of leaving that as a feature to adapt afterwards (Pietroni, 2019; Rocco, 2005). Inclusive design is a more complete and complex way of designing websites and apps that would be however more beneficial to users with disability. Furthermore, Goggin and Newell (2007) wonder about accessibility from the viewpoint of stakeholders and web design businesses. They argue that although more expensive, designing for all kinds of users translates into having more consumers, and in the case of PWD, it assures customers that usually get comfortable with technologies and brands that have proved efficient in making accessibility products. (National Council on Disability, 2004 in Goggin & Newell, 2007)

In addition, accessibility is a concept in constant movement. As Goggin and Newell point out,
any description or account of what is accessible is only provisional and relational, rather than a given attribute of technologies (behind this is the standpoint that technology is a product of social relations).

(Goggin & Newell, 2007, p. 160)

That means, working towards accessibility is a process that is always in motion because technologies evolve continuously, and accessibility should be constantly revised and up to date, keeping in mind that some accessibility problems come from the relationship between society and disability.

Digital literacy

Digital literacy is the series of skills and abilities that allow a person to understand and participate in the digital world. It is a complex concept because it encompasses many different conceptions about literacy and, thus, about what is needed to be digitally literate.

Just like literacy is not only writing and reading but being able to access information, be critical and interact with others, digital literacy is more than the use of devices, applications and software to access information (Alsalem, 2016; Eshet-Alkalai, 2004). Park and Nam (2014) take the idea of Buckingham (2009) to describe it as “skill, creative production and understanding” (2014, p. 405). The first one is the basic use of the Internet to complete activities and searches. Creative production refers to the “ability to generate contents, such as emailing, texting and playing games” (Park & Nam, 2014, p. 405). Lastly, understanding stands for the ability to be critical online. Hence, digital literacy includes not only the ability to use digital technologies, but also to be able to benefit from them and to produce into them while being critical of their use and the services or information obtained from them.

Nowadays, many authors point to digital literacy as the new prominent problem of the digital divide: simple access is not enough for using technologies, but people need to know how to use them (Jaeger, et al., 2012; Buckingham, 2009).

In the case of PWD, it translates into how to use technologies, how to use assistive technologies, and how to learn about it, adding the uncertainty of not knowing if the knowledge that you have will be enough the next time because of the rapid update of technologies and websites. Following this, Chaplin (2016) considers from his experience that for people with visual impairments there are three layers of occupation that he divides into a) adaptive learning, b) contributing and providing, and c) education and advocacy. The first two, while talking about digital skills, could be considered the digital literacy: adaptative learning refers to learning how to live and acquiring living skills while contributing and providing means for him to be able to function “as an active member of society”. (Chaplin, 2016, p. 320).
KEY FRAMEWORKS AND PREVIOUS RESEARCH

In this section, key concepts around the topic of web accessibility will be explained. Then, the results of previous research will be presented thematically.

Assistive technologies

In order to allow the access to technology, i.e., to overcome the first level of the digital divide, there are assistive technologies and adaptive strategies, which are defined as:

> techniques that people with disabilities use to improve interaction with the Web, such as increasing text size, reducing mouse speed, and turning on captions. Adaptive strategies include techniques with standard software, with mainstream web browsers, and with assistive technologies.

(W3C Web Accessibility Initiative WAI, 2017)

Assistive technologies are added tools that facilitate the usage of technologies (Khan & Khusro, 2021, p. 266). Authors like Adam and Kreps (2009) have noted that because disability has been seen as a limitation or deficit, the alternative that PWD receive is what is considered “adaptative technologies, adapted from a technology first designed for the able-bodied” (p. 1045). These technologies, normally called assistive technologies, try to adapt the usage of other technologies to the abilities of the users. They offer other ways to access digital information in several ways: visual, auditory, changing the size of the text, etc. Even if the usage of assistive technologies is not always enough, they are an important part of accessibility (Ellis & Kent, 2010a, p. 60). However, for the user that needs them, there could also exist a problem of access to them: these assistive technologies can be expensive and in some regions it is the user that need to buy them.

As said, assistive technologies mediate the use of other technologies. In this research, I am interested in assistive technologies for users with visual impairments. Therefore, this thesis will focus on technologies that magnify text or pictures, read aloud text, facilitate the introduction of text, help the navigation with just buttons or voice, etc.

There is not a unified classification of assistive technologies, but rather there are lists of the functions they fulfil or the perception they try to substitute (like the one from the World Wide Web Consortium (W3C Web Accessibility Initiative WAI, 2017). For this research, I suggest a classification based on their format, i.e., if they are software or hardware. Therefore, I consider that there are two main types
of assistive technologies for web accessibility. The first type could be called “in-tern”, i.e., they have no hardware, but they are installed into the device that the user chooses. They could be subdivided into built-in technologies and programs or software. The second type are the “external” ones. They have hardware and can be connected to other devices mainly through a wire or Bluetooth.

Internal and built-in assistive technologies
Although not assistive technologies themselves, I would begin talking about the most common devices that allow connection to the internet and their built-in technologies. The choice of a device and its brand usually has a component of accessibility among PVI. This choice is important because of the built-in technology that some devices have, which could be different between varied brands.

Research shows that the arrival of the smartphone enables new possibilities for PVI to use the internet. They interact with these devices “through direct exploration, text entry, gesture-based and multi-touch interaction” (Khan & Khusro, 2021, p. 266). The devices also provide information to the users, not only from the internet but from their physical surroundings, offering vision substitution solutions. They transmit information acoustically or with haptic feedback (2021, p. 273). Some of the features of smartphones are also presented in tablets.

The main ones are screen readers and Text-To-Speech (TTS) technologies. Those would be VoiceOver for Apple and Talkback for Android. Sometimes, their use is complemented with the use of a Voice Assistant such as Siri in Apple.

They offer other features as well, such as image description or the use of gestures on the screen. The former can work in combinations with different apps like Facebook or Instagram, describing what is depicted in the image, but it works also with the phone camera, so the user can hear what is in front of the camera. The latter refers to the possibility to make different gestures or movements with the fingers on the touch screen that function as shortcuts to make different actions.

There are also built-in and internal assistive technologies for the computer. Regarding screen readers, some of the most common are JAWS, NVDA (NonVisual Desktop Access) or SuperNova (Khan & Khusro, 2021), and each operative system usually has one embedded; in Windows is called Narrator, in Mac is once again VoiceOver and in Linux is Orca. They are used to navigate online, read books and newspapers, etc (Lundh, 2022; Yoon, et al., 2016).

In addition, these devices have keyboard shortcuts. The possibility of exploring websites’ and apps’ interfaces in different ways is an accessible feature. Keyboard shortcuts, talking mouses (that read what it is underneath it) or buttons like arrows are frequently used.

Another internal software is the screen magnifier, which allows users to zoom in and out of the screen, with various levels of magnification. It is targeted at people with low vision.
External assistive technologies

Besides software proposals, multiple hardware components help in the internet usage, covering diverse needs. This thesis will expose only some of all those that exist.

There are refreshable braille displays. With the assistance of a screen reader, the braille terminal displays the text in a refreshable line of dots that form braille letters, so the user can follow a text. It can be connected to the computer or smartphone via USB or Bluetooth, depending on the model. It usually has some buttons that help the user to interact with the device without needing a mouse or keyboard. In addition, it allows the introduction of text by the user.

Another tool is the reading machine. The user puts a written or printed paper into the machine, and it magnifies it on its screen (and can also display it with a set of contrast colours chosen by the user) or reads it aloud.

About external devices for concrete uses, there are two of them that I want to highlight for their connection with my case. First, the talking Digipass. BankID, as previously mentioned, allows the Swedish citizens to identify themselves to access different e-services. On the smartphone, BankID is an app that opens when some website asks the user for identification or that the user can open to scan a QR code on some websites and then identify themselves. For situations where this service does not work, the bank provides the users with a Digipass, which is a personal security device that generates random one-time codes (SEB n.d.). When the user has visual impairments, they can ask for a talking Digipass, which I consider an assistive technology as well.
Secondly, the Daisy player. There are two types of audiobooks: “talking books produced specifically for people with print disabilities; and commercially produced audiobooks” (Lundh, 2022, p. 177), and only people with print disabilities can access the first type. Daisy (D.A.I.S.Y. Digital Accessible Information System) is a special format of talking books that are targeted to people with visual impairments, and print disabilities like dyslexia (Wikipedia n.d.). In Sweden, it is Legimus (Myndigheten för tillgängliga medier n.d.) the digital library that provides them to the users. Legimus belongs to the Myndigheten för Tillgängliga Medier, the Swedish Agency for Accessible Media in English. There are two types of Daisy players, one that plays CDs and one that is connected to the internet so the user can download books and newspapers from Legimus. However, the use of the Daisy player seems to decay due to smartphones, because Legimus is now accessible to smartphones as an app.

![Daisy player](image)

*Figure 2. Daisy player. mace from Helsinki, Finland, CC BY-SA 2.0*

**Standards and laws**

Nowadays there are international and national efforts for ensuring accessibility, that take form as standards and guidelines. For instance, the European Union presented in 2018 their Inclusive and Accessible Communication Guidelines (Serrano, 2018). The most used standards are those provided by W3C Web Accessibility Initiative (WAI), called Web Content Accessibility Guidelines (WCAG). The last available version of these guidelines (WCAG 2.1) was published on the 5th June 2018, and
the draft of the next version is expected to be finalized by September 2022 (W3C Web Accessibility Initiative WAI, 2016).

WCAG is based on four principles. Websites must be: perceivable, operable, understandable and robust. “Perceivable” indicates that the information and user interface components should be presented in ways that the user can perceive them, so they should not be invisible to all the user’s senses; “Operable” refers to the possibility of the user to navigate within the interface in different ways (e.g. keyboard or mouse). That the user should understand how to access the information is the “understandable” principle; “robust” implies that the website can be interpreted using different user agents (such as assistive technologies) and that it must be maintained when the website updates (W3C Web Accessibility Initiative WAI, 2022).

In 2019 came the first Swedish law about web accessibility (Weilandar, 2019). The called DOS-lag (Digital Offentlig Service Lag or Law of Digital Public Service in English) applies to websites and mobile apps of public actors (at a national and municipal level) and private actors that get public funding for education and health. This law is based on the European standard EN 301 549 V3.2.1, which in turn is based on the WCAG 2.1. and its four principles. This law had three main dates: new websites should fulfil the accessibility requirements by the 23rd of September 2019; previously existing websites by the 23rd of September 2020; and apps by the 23rd of June 2021 (Myndigheten för digital förvaltning n.d.).

Standards and guidelines are useful at a practical level; they clarify some points of action for web developers and other professionals. The same happens with legislation about the topic. However, some voices note that those are sometimes a barrier to creating a more accessible and universal design (Goggin & Newell, 2007). The reason for this is that the existence of those standards leaves little space for developing new accessibility strategies (Lewthwaite, 2014). In addition, they also have the risk to become stamps of accessibility that blur the impetus to keep working towards accessibility (Adam & Kreps, 2006, p. 211).

One example of that is the generalized use of automatic check of accessibility features. There are software programs that can scan other webs and find accessibility problems. Although that is useful, research has shown “that automatic evaluation tools can only detect fewer than half of the barriers that real users with disabilities most likely face” (Yoon, et al., 2016, p. 252). Many authors recommend user evaluation to make the right evaluation (Seixas Pereira, et al., 2015, p. 84). This technique implies that real people test the product, i.e., the website or app, so more aspects about its use can be evaluated. That would increase the quality of the website, while it provides power to the users because their perspectives are needed and will be used to improve products that they could and would use.
Previous research about web accessibility and PVI

Over the last years, there has been research about how people with visual impairments engage with current technologies. Related to smartphones, Khan and Khusro (2021) research assistive solutions. Smartphones have transformed the access to the internet for all people. In the case of PVI, they have also been a revolution because of the assistive technologies that smartphones have in-built nowadays. Huang (2018) focuses on how PVI uses the touchscreen. The author conducted a task evaluation with a group of people with moderate visual impairment to explore how they perform activities with that kind of screen. Similar user evaluations have been made by Seixas Pereira et al. (2015) but they focused on the usage of the internet (on the computer) to identify the main challenges that PVI encounter, giving them the opportunity to explain and sort those problems. Lundh (2022) made a qualitative study based on interviews about the issue of reading. The participants of her research reflected on reading by listening and how they feel about it.

Regarding social networks, Ellis and Kent (2010) reviewed their power to create new forms of community and how they continued with disability discrimination at their beginning. In the case of Facebook, just four months after it was published, users with disabilities began to pressure the platform to make it more accessible because even the first access (register) was extremely difficult because of the captcha. Nowadays, research shows how Facebook is actively used by PVI, interacting with others and uploading content although some issues still exist (Seo & Jung, 2021). Seo and Jung also discuss the role of PVI as content creators online on YouTube.

Studies about web accessibility on specific websites are quite common in the field. Yoon et al. (2016) tested the accessibility of a public website for people accessing it with screen readers, i.e., with user evaluation. Another kind of research (Martins, et al., 2017) uses automatic evaluation, to sometimes check if the websites have changed between the first and the next evaluation. Their choice of websites was E-health services in Spain and Portugal.

In Sweden, similar studies that combine user evaluation and qualitative methods have been conducted. Andersson (2017) asked about the police’s and the Skatteverket’s websites (Skatteverket is the Swedish Tax Agency). Löfgren (2016) focuses on a university’s website. Both of them conducted usability tests and interviews. These studies, and some others (Seixas Pereira, et al., 2015; Huang, 2018) highlight the relevance of focusing on the people because it is in the practice of the users that some problems can arise.

Finally, there is research about web accessibility that put the focus on web developers and the available technology. On the one hand, from the web developers’ point of view (Byhlin, 2020), thinking about accessibility can be a challenge and

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1 Used in computing, a CAPTCHA is a test that determines if the user is human.
many of their clients are not interested because that also means an increase in the cost of the website. Goggin and Newell (2007) defy this and point out that investing in accessibility not only brings more users to the website but if they maintain the accessibility status, it would probably mean that those users would become loyal customers. On the other hand, research shows that the current technology can ensure web accessibility, so even if it could always be better, the current problem is more related to “lack of time, lack of training, lack of managerial support, lack of client support, inadequate software tools, and confusing accessibility guidelines” (Lazar, et al., 2004, p. 284), or even the idea that making an accessible web would affect badly their web design.
METHODOLOGY

Philosophical worldview
As stated in the theory section, I have decided to treat the disability as a human difference and not as a problem or limitation. Hence, this follows the idea that there are social constructions in how people and society understand the world and its phenomena and relations. This interpretative framework, following Creswell and Poth could be a mix of Social Constructivism and Critical and Disability Theories, where the disability appears “as a dimension of human difference” (Creswell & Poth, 2018, p. 32), which is likely to be interpreted by social worldviews, and that provides a specific way to interact with the current world.

Qualitative research approach
The qualitative approach of this thesis has been selected because it can provide the needed data to answer the research questions (Creswell & Poth, 2018, p. 43-44). First, supported by the existed literature, this approach helps getting a deeper understanding of the perspectives of PVI about web accessibility and how that affects the individuals in their everyday life. To provide the interviewees with the opportunity to talk about their circumstances, experiences and desires puts the focus on them, and their testimonies are analysed qualitatively. Second, a qualitative study offers the possibility to comprehend aspects that exist around data that has been previously collected in quantitative research (such as Statistics Sweden, 2020b) adding a layer of knowledge that lacks in order to understand the reality of the study group. In addition, it shows how the situation is nowadays for PVI that use the internet regularly.

This qualitative research uses a phenomenological approach. Phenomenological studies aim to define the common meaning that a phenomenon has to different individuals, exploring how they live and experience it (Creswell & Poth, 2018, p. 75) and providing space for discussing subjective matters. In my research, the phenomenon is the usage of the internet and how this phenomenon is experienced by people with visual impairments.

Data collection
First, I searched for quantitative data about Sweden and the use of the internet by people with and without visually impairments. Statistics Sweden, the Swedish state-
owned agency has data and reports about the use of the internet by the Swedish population. These reports, presented in the Study background section, helped me to develop an idea about what are the parameters for, for instance, quantifying the usage of the internet in the country. Overall, these reports served as inspiration on how I could design my interview guide.

**Interviews**
Second and mainly, data collection for the research was primarily conducted through interviews. The chosen method was semi-structured interviews: open-ended questions that were designed from the context-building process (Bevan, 2014), i.e., from previous research about the internet and PVI. Interviews are the main data source for phenomenological research because they allow having some topics on focus (through the questions) while the open-ended questions enable getting open answers, giving to the interviewees the opportunity to highlight those issues that they consider important.

The interviews were conducted in Swedish. All the citations, and the Interview Guide (see Appendix I), that appear in this thesis have been translated by me.

**Sample of data**
The criteria to choose interviewees were two: that they were visually impaired and that they use the internet, relating to the research questions. Because of the difficulties of finding interviewees, more requirements could have complicated the possibilities to find volunteers. Therefore, questions that could be considered relevant such as gender, work, type of visually impairment or duration of it were not asked either as a requirement or as a question during the interviews, although that information usually came up during the interviews. The only exception was their age, which was asked in order to have a generational context. Just having two requirements has been a positive aspect of the research, that allowed for an assorted sample of testimonies. I found people with different backgrounds (from pensioners to people that work with programming) and people who are born-blind or that have lost vision over the last few years, which provides different experiences, learning processes, etc.

My principal approach to recruiting interviewees was the *Synskadades Riksförbund* (SRF), Swedish National Association of the Visually Impaired in English, the non-for-profit organization that assembles PVI in the country. SRF is a politically and religiously independent organization. It is divided into three levels, with the headquarter placed in Stockholm, twenty-three districts and 129 local associations around the country (Synskadades Riksförbund, 2020).

I contacted the SRF head office via e-mail, but I did not get an answer, so I then wrote e-mails to several of their districts and local associations, which are listed on its webpage. These local associations either sent my e-mail to their members or
talked about it during one of their meetings. Through this, some members of the SRF contacted me or the local associations gave me their contact information. Via telephone or e-mail, we decided on a date to meet and conducted the interviews. One of the interviewees mentioned to me a Facebook group for visually impaired people in Sweden. I explained my interest when I joined the group and more people contacted me.

Regarding the number of interviews, Creswell and Poth mention that for a phenomenological study, the sample should be between three and fifteen individuals (Creswell & Poth, 2018, p. 76), which is supported by the opinion of other experts that place the right number of interviews between six and twelve (Edwards & Holland, 2013, p. 66). I have conducted nine interviews, eight of them via Zoom and one face-to-face. Seven of the interviewees reached me from SRF from different parts of the country and two of them contacted me through the Facebook group.

The interviews have been semi-transcribed. I listened to the interviews and took notes, while some parts of the interviews were directly transcribed, facilitating to have control over the time lapses for the second review of the interviews. This method was chosen because of the time-consuming aspect of transcribing interviews. oTranscribe.com was the online tool that I used to do this because it allowed me to have, in the same interface, the text document and the audio file, so I could easily play and pause the audio with the keyboard shortcuts. Finally, after two reviews of the interviews, I obtained a text document for each interview. Each document was read closely, searching for common topics and highlighting them with different colours to facilitate the analysis.

Table #1 shows information about the interviews. The shortest interview was 28:41:00 and the longest had a duration of 48:47:00. The interviewees have an average age of 55.3 years, where the youngest participant is 31 years old and the oldest is 72 years old.

Table 1. List of the participants and interviews

<table>
<thead>
<tr>
<th></th>
<th>Pseudonym</th>
<th>Age</th>
<th>Duration</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paula</td>
<td>64</td>
<td>41:40:00</td>
<td>Zoom</td>
</tr>
<tr>
<td>2</td>
<td>Ana</td>
<td>58</td>
<td>32:35:00</td>
<td>Face to face</td>
</tr>
<tr>
<td>3</td>
<td>Nicolás</td>
<td>51</td>
<td>39:57:00</td>
<td>Zoom</td>
</tr>
<tr>
<td>4</td>
<td>Jose</td>
<td>72</td>
<td>48:47:00</td>
<td>Zoom</td>
</tr>
<tr>
<td>5</td>
<td>Carlos</td>
<td>57</td>
<td>39:55:00</td>
<td>Zoom</td>
</tr>
<tr>
<td>6</td>
<td>Carmen</td>
<td>40</td>
<td>28:41:00</td>
<td>Zoom</td>
</tr>
<tr>
<td>7</td>
<td>Fran</td>
<td>31</td>
<td>35:37:00</td>
<td>Zoom</td>
</tr>
<tr>
<td>8</td>
<td>Pedro</td>
<td>59</td>
<td>43:03:00</td>
<td>Zoom</td>
</tr>
<tr>
<td>9</td>
<td>Laura</td>
<td>66</td>
<td>45:03:00</td>
<td>Zoom</td>
</tr>
</tbody>
</table>
Interview Guide

The interview guide (see Appendix I) has two different items. On the one hand, there are worded questions, that were asked to the interviewees; on the other hand, in some of the questions are also a list of items that the interviewer should ask if the interviewee does not mention them because they a) help to understand the question, b) provide examples to what they might mention and, c) work as a reminder for the interviewer about concrete issues that should be asked.

The order of the interview guide tries to go from the usage of the internet to issues that are directly related to web accessibility. As it was considered by the researcher and was shown in the interviews, all the topics were deeply connected, so for instance it was usual that mentions of assistive technology were done during the first question. That is common in qualitative interviewing, and the proposed order of the interview is less important than allowing the dialogue to explore the context and experiences of the interviewees (Edwards & Holland, 2013, p. 29).

Questions about internet usage are in Sections #1 and #2. Section #1 asks about what they consume from the internet and how they find the content and consume it. For example, there is interest about if and how they listen to podcasts, newspapers or books, about searching for information, etc. Section #2, on the other hand, addresses questions about what they do as content creators on the internet at different levels. So, I asked if they own a website or blog, or if they produce or are a part of some podcast, and also about publishing on social networks as individual users.

Connecting with the previous section, in Section #3 the interviewee is questioned specifically about social networking, focusing more on how they keep in contact with others. It asks about using the internet for communication, so it also includes platforms for messaging and video-conferring.

The next section focuses on management online. It applies to an international context (for instance, digital calendar) and a national context (bill payment, BankID, Swish, 1177.se). For the former there are questions about digital calendar and shopping, although it revealed to be relevant for both contexts: to shop from Swedish supermarkets and to buy from, for example, clothing shops based in other countries. The latter tries to put a focus on the Swedish situation, asking about bill payments and specific apps and websites that are used in Sweden such as BankID, Swish, or the web-based interface of the Swedish healthcare, 1177.se.

Section #5 explores how the use of the internet is. It asks about how the experience of surfing is, with concrete questions about issues that the literature has proved possibly problematic for PVI such as Captcha or text box. Questions about assistive technologies (both external devices and in-built options for accessibility in different devices) and which device they prefer to use are asked. Also, here there is a question about how they learnt to use the internet.
Finally, Section #6 asks about more general and abstract issues. They focus on the consequences of bad web accessibility, how that makes them feel and what options are available to complain.

Ethical considerations

Data considerations
The ethical data considerations cover the relationship with the subjects and the treatment of information provided by them.

After scheduling a date for the interview, I sent an email with the link to the Zoom meeting (or a reminder of the date for the face-to-face one) and information about the informed consent. Said consent was also recorded at the beginning of each interview, although the interviewee was informed about its content in the email and before the recording. The informed consent was read by me and confirmed by the subject.

The interviews were recorded. The voice of the participants was recorded by this provided feature in Zoom, which made that sometimes their image was also recorded because they decided to turn on the camera or not. However, the recording with video was instantly erased, and only the audio was used to transcribe and analyse the interviews.

The immediate or future harm of storing data was protected by the anonymity principle. The recordings of the interviews were only available to the researcher at every stage of the process and were deleted once the documents with transcriptions and notes were produced. Those files were stored by me on an external hard drive, as well as any information that could identify the subjects. All of this will be deleted after the publishing of this study. The names and other forms of data that could enable the identification of the individuals were removed from those documents and, in this thesis, the names have been changed to pseudonyms. The decision of using pseudonyms instead of numbers or other codes comes from the reflection that using names does not allow the reader to forget that the data come from real people, avoiding the error of treating the subjects as pure data sources.

The relationship with the interviewees was based on respect and reciprocity. They were informed that they could leave the study anytime, and that I was available to answer their questions about it. In addition, after being published, I will send them a copy of the report and a summary of the conclusions that will be translated into Swedish because some of them declared feeling more comfortable reading it in their language.
Considerations of nomenclature
First, when I refer to regular use of the internet by regular users, I refer to the frequent use of the internet by people that want to use it. That refers to using it on daily basis, not only limited to concrete aspects like work or education but activities that can be done on the internet or available online services. In the case of the interviewees, they were the ones that decided that they use the internet regularly.

The second one is “visually impairment”. Above I have pointed out the definition of visual impairment of the WHO. However, I consider that the subjects have agency and can define themselves, which makes “disability” and “impairment” contested terms once again. For instance, one informant wondered, before the interview, if they could participate on the basis that they use assistive technology, even though they retain some vision. Yet, there was no tension between the researcher and the interviewees related to this topic. However, dealing with topics such as disability or visual impairments requires special care because it is a concept that, while theoretical, has real consequences for the interviewees and other people. This research was conducted and written keeping in mind that it could deal with intimate or sensitive issues.

Limitations of my study
The main limitation of this study was that, because of my relatively limited time in this country, I did not have acquaintances in Sweden that could help me to enter this field as gatekeepers. This meant that I needed to search for interviewees by myself, without the support that could have been given to me by someone having the knowledge of the field. Therefore, availability and accessibility became relevant characteristics of the data collection and analysis (Edwards & Holland, 2013, p. 7).

This is also related to the available time to perform the research. More time would have allowed to make more interviews and have a larger sample, maybe adjusting the requirements for interviewees. The possibility of doing longer interviews or more than one per person was restrained by the available time.

The double method of interviewing (online or face-to-face) was defined by the circumstances. The process and the questions were the same, and there were no significant differences in content or duration between the face-to-face interview and the online ones. In the online interviews, it was the subject’s decision if they wanted to have the camera on or off. As some of them declared, they were not concerned because they could not see me, although several decided to turn it on so I could see them. Therefore, I consider that while it did not affect the interviews because the important data was their speeches and not the body language, it could have an effect on me because I found it difficult not to have visual confirmation about if they were thinking or reflecting about the question.
Related to online interviews, the chosen videotelephony software could also have been a limitation. I used Zoom, the medium provided by the university. Many of the subjects did not have familiarity with it, needing to download or configure it before the interview. Some of them declared that they would have preferred other software.

Finally, about the sample, I must acknowledge that even broad, my sample lacks those with visual impairments that do not use the Internet (Johansson, et al., 2021, p. 117). Their reasons should be explored in future research, especially if it is because of negative experiences with the internet, as Goggin and Newell suggest (2007). To know what fails they have encountered while accessing the internet would be very helpful for continuing to work towards accessibility.
Through the analysis of the interviews, there are three main topics around the issue of web accessibility and people with visual impairments: assistive technologies and access, digital literacy and web accessibility. The decision of dividing the analysis is the result of, on the one hand, the review of the interviews. On the other hand, it also responds to the idea, presented in the literature, that before experiencing the internet some previous steps are needed. Those would be the assistive technologies and the education and digital literacy. Once these two aspects have been covered, it is possible to start talking about what use the internet has and what functional features work or do not work.

In Table #2, the reader can see the structure of the analysis. These topics are connected and built from a necessary first level to the actual experiences on the Internet. Therefore, the analysis starts with necessary technologies and devices that enable the internet access, allowing practical access to the internet. It continues by exploring the skills that PVI need to have and how they learn them in Sweden, and how all of that mediate the Internet usage. Finally, some testimonies, examples and observations of the informants are presented once they have real access to the internet in both practical and skilful ways.

<table>
<thead>
<tr>
<th>Analytical categories</th>
<th>Level of analysis</th>
<th>Main topics</th>
<th>Related to Research Questions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistive technologies</td>
<td>Material Access</td>
<td>Devices. Internal and external assistive technologies.</td>
<td>Related to RQ#1: Technology that allows them to access the internet in a practical sense.</td>
</tr>
<tr>
<td>Digital literacy</td>
<td>Skill Access</td>
<td>Educational support. Other learnings</td>
<td>Related to RQ#1: How they acquire the skills and know-how about using the internet.</td>
</tr>
<tr>
<td>Experiencing Internet</td>
<td>Life experience</td>
<td>Testimonies and opinions.</td>
<td>Related to RQ#2:</td>
</tr>
</tbody>
</table>

Table 2. Structure of the analysis.
In the first section, the use of different assistive technologies is explored. It includes external devices such as a braille terminal, software like screen readers and in-build technology like VoiceOver in Apple devices. These technologies are presented on both mobile (or tablet computer) and computer. By asking the participants about which assistive technologies they use and for what, it is possible to get a picture of how these necessary technologies define the internet experience.

About digital literacy, two subtopics are explored. To begin with, the role of Syncentralen or the Vision Unit of the Swedish healthcare system, one in every Swedish municipality, that has the responsibility of teaching how to live with disabilities, which includes also digital literacy. The overall experience of the informants is that more education is needed. Some information about how this institution and also Arbetsförmedlingen, the Swedish Public Employment Service, is shown because they provide some assistive technologies to those that are inscribed as visually impaired. The second subtopic focuses on the individual willpower of the interviewees when they encounter a new website, app, or update and how they confront this scenario.

Lastly, the third topic explores accessibility when it functions and when it does not. Positive and negative examples are provided, without forgetting that they come from personal experience and sometimes these are not the same for all the users. This topic has some subtopics as well: on the one hand, it contemplates problems that occur when surfing on the internet; on the other hand, some websites and apps are highlighted following some activities both in an international context (for instance, social networks) and in a more Swedish context (to pay invoices online).

Of course, all these topics are related to each other. Not only because of the order already mentioned but because problems that can appear while accessing the internet can be mediated by assistive technologies. In addition, because of the constant new arrival of technologies, actualizations and programs, the user needs to know how to interact with them, they need to be able to identify problems and what their reasons could be, etc. For instance, because it is through assistive technologies that visually impaired people can access the Internet, they also have an effect on what does or does not work on some web pages. Some examples are that sometimes the screen reader does not read some websites or that because some people need a
screen reader, the time that they need to explore one website is longer than the time people without disabilities spend, which is a usual problem when one tries to achieve something in a lapsus of time given by the website (e.g., to pay something). The user usually gets logged out and needs to begin over again.

Assistive technologies

Internal and built-in assistive technologies
Among the participants, iPhone is the most used smartphone, with eight of nine interviewees using it. Some of them declare that it is because Apple has a great perspective about accessibility, with multiple accessibility features built-in the device, albeit currently the majority of the smartphones have also that. The main accessibility feature that they use is VoiceOver, Apple’s Text-To-Speech assistive technology. Jose says that since he is still learning how to use that device, he uses only Siri and has not tried VoiceOver yet. About the uses of Siri, Ana explains that she utilises it to dictate when she wants to write, and it usually functions although sometimes she needs to check what is written and maybe correct it.

Paula comments that she wants to begin to make more photos thanks to the image description of the smartphone. This feature helps as well within social networks, to upload or to interpret pictures.

All the informants use computers, either at home, at work or both. Those are mostly Windows, although one of them has a Mac too and two also have computers with Linux. These operative systems have also built-in screen readers and TTS. Some of the informants use or have tested those.

In addition, these devices have keyboard shortcuts that are usually used by the interviewees. To use them, it is particularly important to know how the computer is installed (Paula, 2022). At least five of the interviewees use these devices on their computers for tasks like surfing the internet or with different programs. Pedro says that the shortcuts can be different from one program to another. For instance, he says that he has learnt the shortcuts that he considers more useful in Gmail, but that now he is testing Apple Mail, which uses fewer shortcuts, and that makes it clearer although it has fewer functions too. The use of shortcuts is usually related to the non-use of a mouse, and some of the interviewees say that they do not use one.

Having and using a tablet is not so common among the participants, compared with the other devices. Four of nine use it, concretely an iPad. Of those four, three of them have low vision, and one of them says that he uses it because the screen is larger and their eyes struggle a little bit less than with the smartphone, although one of the interviewees that has low vision says that she had one but now she prefers the computer precisely because of the size of the screen. Because these tablets tend to belong to the same brand as the smartphone, they share the same operative system.
and the users are used to it, which makes them easier to use than a laptop in some cases. One the informant says that she does not use a tablet because it has no benefits since the difference in the screen size is not important for her being blind and it could even be problematic because with more surface there is more complicated to find things at the touch screen.

In addition to the built-in assistive technologies, there are many other software that fulfil similar needs. They can be free or pay software.

Talking about screen readers, four of the informants declare to use Job Access With Speech (JAWS) on their Windows computers. The next one more common is NVDA, although it seems that its usage has been more a test or not so common to use alone. For instance, Nicolás says that he uses it as a complement to Narrator. This is a free software, while Jaws is paid. One of the informants, Carlos, uses another one, InfoVox. He says that the problem comes when it tries to read tables:

and a disadvantage when you read documents with numbers are the tables, you have to stop and try to read them with your eyes because otherwise it does not work, it does not work with tables and assistive technologies.

Carlos

Three of the informants, who have low vision, use screen magnifying software. All of them use ZoomText Magnifier on the computer. Carlos uses it together with InfoVox, so he has the screen read and can magnify the screen at the same time. However, he has had some problems with that, because sometimes the screen is too large, and he cannot find what he is after. For instance, the first times that he wanted to log in to his bank electronic account, he needed to turn off the magnifier, search for the button with his eyes, and then turn it on. Ana uses it with the mouse, so the program says what is under the mouse at any time.

In addition, other configurations can be made to the device. For example, Ana says that the screen of his computer usually shows a black background and white characters, which improves her possibility to read.

External assistive technologies
Eight participants state using a braille display. At least four of them declare that they use it mostly to check their spelling. Pedro adds that he also uses it to learn how some places and names of famous people are spelt. It does not seem that they use it for leisure reading: Nicolás says that although he did it before, now he uses the braille display more to read work-related text, and voice (both synthetic and natural voice) for leisure reading. He adds that, because the display can be connected via USB to different devices, he sometimes uses it to read the text or comments during presentations. Fran says that he uses the braille display also to read text in English because he considers that way easier to understand. However, they do not usually write on the braille display. Some dictate the text or write with a
normal keyboard that either they have memorized and/or has specific features like larger keys and letters/numbers that facilitate seeing the characters.

Related to accessibility hardware, some informants say to have a reading machine, similar to a scanner. Nicolás tells that back in the 90s he used to scan books that were not accessible with a scanner with OCR recognition and read them via TTS or braille display. Nowadays, there are different models of reading machines, although the use is similar. Ana has two different machines: one only magnifies the paper and applies contrast to the screen that the machine has. Because of her needs, she has it configured to show white as black and the black ink of the paper as yellow. Her other one reads aloud the text. Jose has a talking one as well, and he reports that the only times that it does not work well is while reading tables, because of how the machine interprets the text.

Finally, many of the informants use BankID without problems, and they consider it easy, once they learnt how to use it or because they retain some vision and can use the app. However, when that is not the case, like other clients they get a Digipass from the bank and they usually ask for a talking Digipass, so they can understand what it is on the screen, and what numbers they need to introduce in the designed place. At least one of the informants uses it, and another explained that he used it before, until he learnt how to use BankID on the smartphone and it becomes easier that way.

Digital literacy

Here the study will explore the ways to learn that PVI have in Sweden related to technology and the internet. It covers educational support by government agents, but also other education and self-learning. In the conclusion, I consider it relevant to talk about what happens once the users consider themselves ready enough to use the internet.

Educational support

To be able to benefit from the internet its services, PVI need more than assistive software and hardware. They need to learn how it works with their disabilities, what alternatives they have, how the assistive technologies work and how different devices but also websites and apps function in conjunction with said assistive technologies.

In Sweden, there is a concrete part of the Healthcare Service dedicated to visual impairments. That is Syncentralen (the Vision Unit) and there is one in each municipality. PVI can register in this medical unit and get information and assistance related to their disabilities. Syncentralen provides also assistive technologies,
related or not to web accessibility, so the users can ask them for, for instance, a new white cane.

The services and education that *Syncentralen* offers have changed a lot during the last 30 years, due to the reduction of resources, according to the informants. Two of the informants tell that, before, *Syncentralen* was able to provide deeper education. They say that before there was an eight weeks-course, and in that time the students lived together in some boarding school and learn everything, such as cooking, being independent, looking for a job or using the available technology.

However, today there is a different system. Now the users need to ask about what they want to learn. Some of the informants are significantly concerned about this system, for two main reasons. The first one is the duration of this assistance. If you need a technician to come home and help you, it is usually a two-hours assistance, which seems insufficient. The other one is that because the responsibility lies over the user, they cannot always know what is available or even possible for them:

> You have to tell yourself what you want to learn (...). If I do not know anything, if I am quite zeroed, I cannot say “I want to learn... I want to use google, I want to search, I want to be able to search for this and that and that, I want to be able to book my tickets to a cultural event, I want to be able to pay my bills, I want to be able to swish, I want ...” So, there are quite large demands on people with visual impairment because you are the one that must talk about what you want to learn.

  

Paula

Nicolás expresses similar worries, saying that probably a large group of people cannot say what they need and would need more help. He goes even a little further, pointing out that the knowledge and information that the technicians from *Syncentralen* have should be updated:

> Or even worse, that *Syncentralen*'s staff only teach what they know, which is a smaller part of what is really available, and then it is not even possible to choose from what is available.

  

Nicolás

It is important to consider the relevance of knowing how to use assistive technology as well, and people need the education to be able to do that because that is the gateway to keep learning. Nicolás summarizes it well:

> But that's it, if you were to learn an assistive technology, you must be able to read electronically with another assistive technology before as well, in order to be able to read the manual and stuff.

  

Nicolás

He went to courses at *Syncentralen* at the end of the 80s and 90s, that he considers were good, and that allowed him to have great ground to then learn by himself. Other informants share this opinion.

About the current process of assisting by *Syncentralen*, two informants explain more. Jose says that the instructor can go to his house and help him, or they can
have the training via telephone, because his screen is shared with the instructor so they can see his movements and actions and help him.

Laura adds that sometimes the assistance can occur via email:

> Then I can get help with various programs so I can get help from Syncentralen. And I can also reach him who is the IT technician via email and ask if it would be something special that I do not think works or that is new and so, so we can just take it by email or by phone.

Laura

Of the interviewees, two recalled receiving education when they were at school. Fran started his learning at the school when he was twelve years old because the other kids were also starting with computers. The school contacted Syncentralen and he was able to learn how to use a keyboard and some assistive technologies, like keyboard shortcuts with JAWS. Likewise, Carmen explains that she “got help with the computer and the Zoom program [the screen magnifier] and stuff.”.

As said, another function that Syncentralen has is to give assistive technologies to their clients. For instance, Jose got a new computer with SuperNova software, and his reading machine. Although this depends on each municipality, it is quite common that many assistive technologies are free because they are loans that then the user should return. Some of the assistive technologies have a loan fee (1177 Vårdguide n.d.).

However, Syncentralen covers just needs that are not related to work. Arbetsförmedlingen (Swedish Public Employment Service) handles that. Arbetsförmedlingen provides support to the citizens with the search for work and related issues. Therefore, it also assists people with disabilities. On the part of its website that is directed to people with disabilities, they offer different services: Work-integrating training places, Grant for a personal assistant, Assistive technologies in the workplace, Individual pedagogical support in education and Protected work with a public employer and Special support person for introduction and follow-up support, among others. So, in addition to providing help studying, they also make the workplace accessible and can offer a personal assistant depending on the circumstances. They also provide economical support to the individual and the employer if assistive technologies are needed, albeit they only have the authority to do that under the first year at the workplace, being Försäkringskassan, the Swedish Social Insurance Agency, the one that would keep providing them (Arbetsförmedlingen n.d.). For instance, Fran received a braille display from Arbetsförmedlingen.

In addition, some of the interviewees went to curses organized by this authority but this does not seem so common anymore.

Other educations

However, most of the informants do not ask for technical education from Syncentralen anymore. They just contact it if they need assistance with punctual issues,
such as the installation of a new program or an update in their assistive technologies. Only one of them, who lost his vision about five years ago, asks frequently Syncentralen.

There are other alternatives to learning nowadays. Fran highlights the connections in the community, he indicates that he is in diverse groups formed by PVI where they ask and give recommendations. Also, Nicolás mentions some Facebook groups where they can talk about news and problems about living with visual impairments.

Two of the interviewees explain that they sometimes go to meetings or curses about updates or new features available for them:

   And then I'm in some different rooms and then there are different companies that have courses: "what news we have", a room where you talk about digital things, how to use GPS apps, how to use "find my iPhone".

Laura

Some strategies for this are reading and searching online. Ana says that sometimes the iPhone is useful because it provides much information to the user.

Nonetheless, all the informants strongly affirm that they learn a lot by themselves, trying repeatedly. For that, the principal requirement is to be very stubborn.

   But then, as I said, you have to be very stubborn, you have to be.

Ana

   I'm pretty stubborn too so I probably will not give up in the first place and I think that it can probably be a thing that is good for my part (...). I realize that I get so much back if I put energy into this. And that's one reason it works as well as it does for me, because I immediately see that "yes, but can I fix this? then I'll get this one back". And I am as stubborn as a mule, there is probably a reason.

Pedro

This personal willingness is a characteristic which they show on all the occasions where they need to do something new. By something new, I refer to a broad umbrella of actions, such as learning how to use modern technologies (assistive or not), updates on an app that they have previously used, or accessing information from a web page they have never visited before.

**After-education**

There is not an after-education moment for these users. As I drafted above, the users confront new challenges every time. As Paula states:

   You always need instructions; it is not auto ... it is not possible to have automation because you need some training but as soon as you get started you dare to do more and more too.

Paula
Even before beginning to use the internet in all its forms, the user needs to know how the used device is configured. It is different to have a computer that already opens the screen reader at the beginning of the session, or where the user how to do it efficiently than having to search for it. Sometimes, the user also needs to know what keyboard shortcuts they can use and for what actions. Ana says that she needs to know in the first instance what would be the best and easier way to use it.

The most highlighted factor for using the internet that the informants point out is time. Almost all of them say that doing things online usually needs more time for them than for people without disabilities -or even compared when they could see, in some cases- and that they also spend time in preparation.

It's like not ... it is not just sitting down and saying: "now I'm going to do this in five minutes” but more like “now I'm going to learn". But once you do it, when you sit here and try for half an hour or so. “Oh my! Now I'm happy with that ".

Pedro

This kind of statements is repeated by other interviewees. They need to, first, know that they have time to be able to probe and learn how to use and move on different websites and apps, to then explore it calmly. In addition, and coming back to stubbornness, some of them talk about the importance of not giving up. They tell about how they just leave the enterprise for a while (minutes, hours, days) to then keep trying.

Admittedly, there is an element of practice in accessing websites and apps. Being familiar with a site is a crucial factor for a satisfying experience. They say that once one knows how specific websites work, it becomes much easier, albeit it can require much practice. To have practice facilitates the performance on the internet and saves the users from feelings of helplessness or sadness. Nicolás says that he feels irritated and limited.

Sometimes you can feel a little helpless with certain things because you miss a certain form of information that you would like to take part in. It depends a bit on your mood but sometimes you can get a little sad, you feel... but sometimes it's like that... sometimes I'm just going to accept how it is, I cannot do much about it. So, these are the different feelings I usually have.

Carmen

So, in daily life, they usually prefer to use those apps and websites that they are used to. In this, there is an element of willingness as well. How interested one is in accessing certain platforms or learning more is the driving force for daring to try.

Finally, if they have not been able to solve and perform by themselves, they can turn to someone who sees and ask for help. For many of them, this person or people are relatives or friends. For instance, Paula declares:

To have a relative who can help, I feel I have needed that.

Paula
That is not contrary however to the ideal to achieve self-independence, and as Ana explains:

You get annoyed, you get frustrated, that you cannot and then it goes out over the one who is closest at home [laughs] then he has to do it, and it is very much up to him and you get the feeling that you cannot by yourself, that’s it.

Ana

So sometimes it is necessary to ask for help to achieve something that has proved impossible to solve by oneself or if they are in a hurry. Sometimes, this also requires time. As Jose says, when he asks his relatives, he also tries to get them to explain the process that they followed to solve it. That is not always possible, especially if at the moment they do not have time for that.

Web accessibility

In this section, the usage of the internet will be explored. That will encompass what they usually do on the internet (not related to work or education), if they use Swedish e-services, what challenges they face and what their opinions are.

Content

To engage with content online, there is a main difference between consumption and production. About consumption and access to information, Google is the principal source. Some of the interviewees use Google frequently, to search for information. The experiences with Google are normally positive. It usually works well with assistive technologies, such as Siri or JAWS. It is common for them to search and go in the first result that Google suggests, or search for websites that they already know. Google can also facilitate access to information and surfing. Nicolás says that he sometimes writes in the Google search box the concrete information that he wants to find on a website instead of trying to search on the website’s menu.

Now I will talk about specific types of content: podcasts, books and newspapers. Regarding podcasts and books, they seem to be popular. Ana says that she listens to podcasts or books every day, and that she reads more varied now:

I have read a lot of books that I would never have read if I could see because you just click on them and then you listen for a while and hear if they are good and, in that way, I have listened to very strange books that I would never have done otherwise.

Ana

She reads via an app called StoryTel. That is a paid subscription app that offers audiobooks. Three different participants at least mentioned this app, with positive opinions, although the app sometimes changes and they have to adjust to it.
Like StoryTel, some apps were mentioned several times. Almost all of them have one or more preferred apps or platforms, to either find new podcasts or subscribe to podcasts and books. For instance, YouTube, SVTplay, Google Podcast or Apple Podcast seem to work well for the participants, not showing problems with assistive technologies.

Legimus is also very used, for reading both books and newspapers. Legimus was before only available via Daisy Player, but now it is also available as a smartphone app, and at least three of the participants use only the mobile version, although they had also the Daisy Player before. Laura uses both Daisy Player and the mobile version, while Paula uses more Daisy Player.

About newspapers, some of them are subscribed to newspapers via Legimus. These newspapers can be talking newspapers, i.e., there is a person that reads the news and they are target to people with print disabilities, or normal ones, read by synthetic speech. For example, both Paula and Carlos are subscribed to talking newspapers via Legimus.

Paula mentions also Readly as an app that the uses to access newspapers, and although she considers that it is difficult to orient there and find newspapers, once the newspaper is open, it becomes easy. Other informants prefer the radio to listen to the news.

About reading news on the newspapers’ websites, most of the informants do not consider that a good method. This kind of webs has much advertising that difficult the work of the assistive technologies, so those that visit these sites prefer to use the smartphone for that, as Laura explains:

> Newspapers' websites contain a lot of ads and advertisements and so on and it becomes very crazy to read on those pages. Sometimes newspapers actually are easier to read in an app on the phone rather than on the computer. So I do not read many newspapers online.

Laura

Talking about the production of content, aside from social media, one of the participants has a podcast with other two men with visual impairments, that they record online via Skype and he edits it and edits the sound. Another one has her own webpage for information related to her work. Sometimes she asks for help to make the website good-looking with the colours and photos. Also, another one has webpages and servers.

Social networks
Except for one of the interviewees who personally chose not to have social networks, all the informants have at least one of them.

As Nicolás says, social media platforms "are quite rarely they fail, it happens that new features are not available but it gets worse quite rarely". Of the informants, for instance, no one has problems with Facebook, despite Jose, who is still learning
and for now just uses Siri and not VoiceOver on his iPhone. It can happen however that the main way to use them is with pictures, like Instagram or Snapchat, and that makes them not so comfortable to PVI.

The most common social network is Facebook, that some of them use daily. The principal reason for using Facebook is that relatives and friends are also on that social network, so they can stay connected. The informants use to comment, share links or watch what other people have uploaded. Some of them use Facebook with image description, both to see others’ pictures or for uploading their own, although this feature is not perfectly accurate and sometimes they need to ask if the description is correct. Social media platforms are mostly used on the smartphone. Ana says that, for instance, she already knows where the “Like” button is on the mobile’s app, so it is easier. Pedro says that he uses it with the smartphone because it uses to be nearer than the computer. Because they do not usually write long comments on this platform, they usually manage with just Speech-To-Text methods, like dictating to Siri what they want to write. About using Facebook on the computer, Laura only uses it if she is going to paste text to a publication.

Four of the interviewees have or had an account on Instagram as well. Despite the image description and alt-text (alternative text that the user writes when uploading a picture, which can be read by screen readers), it is not a platform targeted to them, and those that have an account do not use it much. The essence of the app, i.e., to share photos makes it difficult to use:

I also used it, and I also removed it and it was more because Instagram requires a photo to be able to publish your post and it does not work for me to take a photo so then I removed that service.

Pedro

Fran declares that this app is annoying for him, so he deleted it, and Laura says that she is not even interested in it. Only Carmen, who has low vision, uses it sometimes.

About other popular apps, only Pedro uses Twitter, a platform that he considers great to read articles or posts from politicians and other renowned people. Furthermore, Fran tested Snapchat, with negative results. It did not function well with his assistive technologies, and the fact that there are a lot of pictures made the app unwelcome. However, he uses TikTok sometimes:

TikTok works as long as they talk and have music and that, but I cannot see what they do in the video. But Facebook, it’s text and pictures. I think Facebook is a little better, there I can make posts and comments myself.

Fran

Apps that have the possibility to also make videocalls are also worthy to mention here. Some of the interviewees use Messenger to write to others and also to have online meetings. Fran explains that he usually has only the sound on, with his camera off. Laura also writes via Messenger, useful for groups of people, but she prefers
WhatsApp if she is going to call with video; actually, she thinks that she has blocked Facetime to avoid calling someone with video by error. Ana also uses WhatsApp or Facetime, mainly to speak with her grandchildren: they can see her although she cannot, and they use it because it is free.

Now, there are some comments on some videotelephony software, such as Teams or Zoom. Nicolás says that he has been using them for ten or nine years because of his work. He summarises problems that can happen:

Sometimes it may have just been saying “sound” on the microphone button and you do not know if it is “sound off” or “sound on” for example and such mistakes have happened. It may have only said “button” and you did not know if it was the camera or the video or sound or the microphone so you tried.

Nicolás

He comments that for the last two or three years they have worked well, and that those software are fast to improving on accessibility. Carlos shares this opinion, at least speaking about the Microsoft’s one.

Of the sample, all but one use these platforms. Only one of them prefers Zoom over Teams, and that may be due to that she is used to it, because that is the platform used by universities in Sweden, and she uses to work with that. She explains that she has to pay attention to the configuration of sound sources:

With the synthetic speech, I sometimes have to fight with it... Well, I do not want the synthetic speech to go out during the Zoom meeting, but usually I have to use a special speaker or special cable and share the sound, the sound of what I say and so. (…) It just seems easier to actually do it on the phone so most of the time I'm in meetings on the phone.

Laura

All the others prefer Teams. Many times, it is because they are more used to it. For instance, Paula knows its keyboard shortcuts to for example mute and unmute the microphone. Fran shares this opinion. He used Zoom before at work but now they use Teams, which he thinks has improved a lot during the last year. He can use the mobile app but likes more to use the computer version because it is quicker to turn off the microphone, for example, and now it works well with his assistive technologies. Carlos, who has tested four software (Teams, Zoom, Skype and WebEx) and has them still on his smartphone, also prefers Teams, the one they use at work, which he uses with ZoomText (magnifier software).

The negative opinion towards Zoom may be due to a lack of experience. Three of the interviewees had used it zero or just one time before, and it took time to start with it. Another one says that he could use Zoom, but it would take time for him, for instance, to find the “raise hand” option, which according to him goes faster in Teams.

Finally, to communicate with others, it is pretty common to use e-mail. They use email on the smartphone, mostly if they only need to read, but they prefer the
computer if they are going to write, because it can be easier with a keyboard (normal or braille one).

Other uses
Before focusing on uses and services that are more present in a Swedish context, I want to mention that they also use those devices to have control over their schedule. It is common to use the smartphone’s own calendar, i.e., iPhone’s calendar, which they have usually linked with the one on the tablet because they share the operative system. Another alternative is to link it to Google Calendar, so it is easy to share with relatives and friends. Laura, for instance, uses Outlook Calendar mostly for work and at the computer, although she thinks that this one is a bit more complicated.

BankID and Swish
All of the informants use BankID, which they use along with assistive technologies without problems. Some of them have also the Digipass.

They have Swish too and use it regularly without difficulties. Ana declares that it was a little bit complicated at the beginning because not everything is read aloud, or she cannot see all the text/screen with her magnifier program, but now she has learnt how to use it. Nicolás highlights the importance of Swish:

Card payment usually works well but sometimes it is embedded in platforms that are not so accessible and then I have Swish, which is easier, I would say.

Nicolás

1177.se
About this e-service, opinions are divided. Two of them use it without problem once they learn how. Others use it just for some things, such as searching for information, or looking at their medical journals. Nicolás mentions that he can do several things there, but not when he has to deal with the calendar (like booking a date for vaccination) because it usually does not work (he mentions that it does not seem to be accessible anywhere). The main problem with 1177.se is that it is too crowded and it is really difficult that the users could orient themselves, so sometimes it is less frustrating to just call 1177.

No, I'm not in that. I always ask my husband and go in if I need it.
[Interviewer]: Why?
Because it's too crowded. There are too many steps, it's too messy, there's too much to choose from, and too messy, I cannot find where I am going.

Ana
**Paying bills**

Almost all of the informants pay bills online. The arrival of the online bank some years ago and Kivra now has facilitated this action a lot. Here, Pedro compares the before and after of paying bills for him:

> It's so simple today, it's just ticking the boxes, so I like it. It has become a lot easier and that's probably the biggest thing. Before, you had to run all the paper bills in one scanner. So that took sixty seconds and then it would read aloud and it rarely happened that it was right every time. So it was like that in the beginning of 2005, I think, then you could say "uh, Wednesday night, now I read the post". It could take a couple of hours to get this to work with all OCR numbers and that. Today you go into your [online] bank and then you click in them, tick these boxes and it just works. That's great, that's great.

  

Pedro

The current way saves time and breaks down barriers that simple papers could not do. To access bills online allows in most cases the use of assistive technologies, so the users can access their data and bills without asking for help to read them, for example.

Carlos, who pays bills at the computer, also says that that’s better. Problems that he could have seems to be due more to the experience of surfing than the action of paying. He explains that the first times it was very difficult to do it at home without help because with his magnifier software he can see just an extremely small part of the screen and to find the “Log in” button took much time. Finally, he turned off the magnification program and with the low vision that he has, he located the button and turned in the magnifier again. But again, he affirms that next time it should be easy.

About this, there is one e-service that has become truly relevant: Kivra. Five of the interviewees mention Kivra with satisfaction. Nicolás highlights how it improves his life quality.

> And this Kivra has been very good with digital mailboxes. It has, like, increased independence enormously because now you can actually read much more of your mail yourself.

  

Nicolás

To have all the bills and post from different authorities altogether seems to be great progress. They are happy with it, and when there are problems, it seems to be more related to the post itself, i.e., to the format that a certain authority has used than to Kivra. For instance, Pedro says that he had a problem with Skatteverket’s post because it was written in a way that was not easy to read with his screen reader, but he called them, asked, solved it, and now he knows how they do it for future occasions. Laura adds that sometimes she needs to download the post instead to read it online, because, once again, the assistive technology does not read it well.
Shopping online
Not all of the participants buy online, and those that do it usually shop from websites they already know, or they do not do it alone.

Talking about Swedish grocery stores, Paula points out that not all the stores that allow online shopping are accessible to PVI. The most common to use among the informants is MatHem. They say that not only its website works almost all the time, but that they quickly change any inaccessible update that they could have done and have a very dedicated customer service. Only Pedro says to use ICA to do online shopping, although he knows that other people with visual impairments do not like it because it is messy and the user needs to get used to it.

They also buy items according to their personal interests. As said, they usually use the same websites where they feel comfortable and where can find what they desire. Fran mentions that he also uses the apps Foodora and UberEats, i.e., food delivery apps. The former is a little bit difficult to use because sometimes he needs to try several times to select the right thing.

Nicolás, who began shopping online in the 90s, explains the most common problems:

Then quite often unfortunately the stores are almost accessible, it may be that it is possible to make an order but then you cannot click on the pay button, you know? Or you can place an order and you pay and then you cannot go in and change and monitor it because the store has changed that section (...). So it's a little more insecure but... a lot of stores have worked quite well, I think. Then they have become almost more difficult over the years because they have many more dynamic presentations and videos that spin and some things that blur and ruin the screen reader.

Nicolás

Another issue while shopping online is the time limit to pay. Sometimes, there is a time limit to introduce your information to purchase online, and it can be too short while using assistive technologies. Also, the website may perceive you to be inactive and closes the session, just because it does not understand that the user is reading and scrolling with the assistive technologies. For this kind of issues, the informants recommend saving the session if that is possible, so the user does not need to begin again or to have the information already saved. Klarna seems to have covered this last action, and two of the participants say that they use it frequently because it helps a lot and speeds the action.

Usage of the internet and other accessibility problems

Accessibility issues
During the previous subsections, the study has explored the uses and activities that the informants do on the Internet, as well as some issues that can hinder the experience. Several more will be added here.
The problem with advertising has been already mentioned. Although they do not make the website inaccessible by themselves, having many ads is annoying for the user that has to skip all of them with the keyboard to get to coherent text. That seems to be a problem quite common on newspapers’ websites. Almost the same happens with the notification of cookies. Paula explains that although occasionally she can read the page without clicking on cookies, other times she starts to press TAB to find the “Accept cookies” button, which takes time. Ana shares this opinion.

Another problem comes with Captcha. Pedro describes it as his worst enemy, and many of them try to avoid it. Captchas usually appear when the user is subscribing to some online service, so they are easy to avoid as long as that is nothing important. Sometimes, there is an audio captcha as an alternative to the image, but it can be perturbed by the assistive technology that does not allow the user to introduce the code. On other occasions, the captcha is a simple mathematical operation, which usually works. Nicolás explains clearly why captchas are such a problem:

Basically, it's difficult because captcha is about separating people from computers and then, unfortunately, it often happens that we, humans who need computer assistive technologies to help us, get into trouble because it is a computer that interprets.

Nicolás

Also, textboxes can be a problem sometimes. Carmen considers that they work half the time, and her problem may be due to the magnifier software. Carlos usually asks for help. According to the informants, in order to do questions or online surveys, Microsoft Forms and Google Forms are the most accessible platforms.

Carmen and Jose, who retain some vision, speak also about the colours and contrast of the websites.

If I look at websites that individuals have done and such, it depends on the lighting for me. Because there are some websites that I have visited that have a very bright text and light background, then I have a very hard time seeing it. (...) I'm not completely comfortable on all websites.

Carmen

Another problem comes when there is not enough information on the name of the links. Fran says that this issue has improved a lot in the last 20 years, but Laura declares that when it happens, it is exceedingly difficult to get somewhere because of the lack of information.

I'm in some pages like this (...), they are sometimes hopelessly inaccessible, it just says “Link, link, link, link ...” and I don’t know what the different links are for and so on.

Laura

It is also inaccessible when the reader software cannot read something on a website. It does not only difficult the experience because it is impossible, for instance, to
find the “Pay” button while shopping, but sometimes the users do not even realize that they are not accessing all of it.

If I go to a website and read something and there are passages that the synthetic speech does not read then I do not know. Like for example as I applied for my tax declaration then they had done like a small box about when you get tax back, and then the [synthetic] speech did not read it out, but I cannot know so I search and search and search in the whole document and so I said to my husband “hey, I cannot keep doing it, where can I find it somewhere?” and then when I read or swipe my fingers like this it just skips that line of text but I do not know that it skips a piece of line, so sometimes I do not understand that it is inaccessible until someone says “but don’t you read it? Can’t you read it right?”.

Laura

She also points out that sometimes she loses her patience because she does not know if the website is loading or not. When she uses the smartphone, sometimes the screen reader says “wait, wait”, “the page is opening” or "loading, loading", but not at the computer, where she thinks that maybe there is a little wheel that spins but she does not receive that information.

Finally, updates also difficult the experience. When some app updates, they do not know if it going to be accessible, or if they need to learn again how to use it. The same happens with websites: the user never knows if that website would work next time with the assistive technologies. Paula summarises that well:

There are updates all the time and I usually say: “leave my computer alone, I do not want the updates”. That is not possible, you have to... but when you have got an update, it is not sure that it is better for me. But then it has happened that it makes it change so then there is a requirement for me to have to start again and find ... oh, a new path, a new way.

Paula

Some of the participants wonder if the developers really think about their users when they come up with updates that do not always work.

Options for the user
This section aims to explore how the people of the sample react when the website or app is inaccessible, beyond asking for help. I asked them about the possibility to complain or report.

The more commented alternative is to send feedback about accessibility problems to the owners of the website or app. They can either explain what they need from the service and ask to solve it via telephone or email, or comment on the failures of the site regarding accessibility. As an example of the first type, Pedro talks about the time that he contacted Sveriges Television because he could not create an account for the Melodifestival app:

So, Sveriges Television App... It was so inaccessible, it was impossible to register in this Melodifestival app, it refused and then I wrote to them and they actually made sure that I was registered, the other things worked.

Pedro
They did not change the web but sent him a link to make the registration. It is relevant to mention that he felt confident when he decided to ask for assistance because he considered this a serious corporation.

So, there is a component about whom are you complaining to. The informants use to complain more to authority agencies, like Arbetsförmedlingen or Skatteverket, probably because those are service that they need to have access to, and accessing those should be ensured by the government, while other companies like H&M or ICA seems to pay less attention to the complains, that can be more general complains about what does or does not work.

Laura is especially angry about this topic. Years ago, she used to complain to some government agencies, being extremely detailed and offering their contact to show them what the problems were, but they either did not answer or answered politely but did not change those issues:

So I actually stopped doing it because I get so tired and it just takes a lot of energy from me and I get no feedback. And sometimes you can get feedback and then they describe how it works and stuff. So, it takes time from me, if you may, and many authorities think that you should participate and do long contributions.

Laura

She adds that to help them is like a job that should be paid, instead to wait for the users to complain, because it is the responsibility of the authorities to create accessible websites.

Other than complaining, the second possibility seems to be to report to Diskrimineringsombudsmannen, the Equality Ombudsman. It can receive reports about discrimination against people with disabilities, but in general the interviewees are not so convinced that this agency would help them:

You can report things to the Diskrimineringsombudsmannen but I think it's quite (...). So it should be that you, like, are not allowed, so that I would try to shop somewhere and it says “no, visually impaired people are not allowed to shop here”, then you are discriminated against but I am allowed shop there but I cannot, so then it is my own fault. I do not think it helps to reach out to them but it is something you can do if you feel discriminated against.

Paula

However, one of them has actually reported their municipality for discrimination, because of a new digital system that is not accessible. Currently, the report is under investigation.

Final opinions of the participants
The most repeated comment about accessing the Internet is that there are so many steps to do everything, even when the website in question is theoretically accessible because it fulfils the standards. As Nicolás states: “the simpler, the better”.

About the increase of digital features, the informants are not negative, as long as new websites and apps are made with accessibility in mind.
Now that there is so much good technology, everything should be much better and that’s probably the case, that a lot is going much better technically now than before, but there are also new things that were not an obstacle before that will be an obstacle now… If people start taking more pictures because it’s so easy to take pictures with their mobile phone and send out a photo that says something via social media instead of before when people wrote a text, then there will be a new obstacle as well. If there are new popular programs that do not have time to be accessible while they are popular, it will be a new obstacle, while at the same time maybe there is quite a lot of basic stuff that has become a lot better (…) So it is both better and worse.

Nicolás

Others pay attention to education and individual efforts. They require more education to dare to do things, which also gives them the opportunity to react when something does not work.

One of the informants thinks also about older people that choose not to use digital technologies because they do not have easy access, and highlights that everyone should be able to use it if that is their decision.
DISCUSSION

Cycle of usage of the internet

Through the analysis of the data in relation to previous theories and research, the reader has seen how the process of accessing the web has many elements and all of them are interconnected. This process will never have an end as long as technologies keep improving and websites keep appearing, impacting the society and therefore the society’s need for the internet and for being able to use it. Taking this into account, I propose what I call the cycle of internet usage for people with disabilities (see Figure 3), which takes three previously analysed topics into consideration. This cycle could easily apply to other groups to explain how they access the internet, but in this case, there is an emphasis on assistive technologies and how the learning process should be more supported.

As a cycle, it does not really have a beginning. However, this thesis will start talking about assistive technologies because that’s where the access of internet starts. Assistive technologies mediate the relationship between the user and the internet, transforming the ways of interaction with it.

Figure 3. Cycle of usage of the internet. Created by the author.
Then, questions about learning arise. On the one hand, the user needs to know how to use those assistive technologies. Later, they need to learn about the internet and how the internet is for people with visual impairments. This is a very delicate subject because it unifies issues about societal support and individual willingness and interest.

The third item of the cycle is the sphere of experience, i.e., what happens when the user is on the internet and becomes a regular user. It explores issues that the user can experience on the internet, both positives and negatives and how they face them. This is also the item that makes the cycle begin again because it is with regular usage when the user identifies problems with their assistive technologies, can experience barriers accessing the internet even knowing how to surf online, or could be interested in new e-services that they need to learn. In addition, the cycle continues when the assistive technologies improve and the users will need to keep learning and they will encounter new challenges.

Over this diagram I will discuss the data and theory, selecting problems that maybe are more related to one cycle’s item. Finally, a brief discussion about more general topics will be provided.

Assistive technologies
Different devices have built-in assistive technologies. That influences the experience of using the internet, so the choice of devices is relevant. On the one hand, there is the choice of the brand. Almost all the participants of this study have an iPhone and those that have tablets are also Apple. That has created a great loyalty to Apple from PVI, as Goggin and Newell (2007) suggested. There is a relationship of trust between users and this brand, which has an economic result for the brand.

On the other hand, users prefer to access some apps and websites on the smartphone or computer because it is more accessible that way or depending on the use (reading vs. writing) it is more convenient. Obviously, the fact that they sometimes have the smartphone at hand helps, but they are conscious that it is better to do some activities with one or the other device.

This table is a summary of what devices the informants prefer to use depending on what they are going to do. I took just information about smartphones and computers because all the participants use them, not being the same case with tablets.

Table 3. Use of devices.

<table>
<thead>
<tr>
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<th>iPhone</th>
<th>Computer</th>
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<tbody>
<tr>
<td>Search information / Google</td>
<td>x</td>
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<tr>
<td>Podcast / Books</td>
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As seen, the smartphone is the most used device. Khan and Khusro (2021) notice that its use has increased a lot and that it enables many actions because of the different ways of using it and the strategies that the touchscreen allows (Huang, 2018) as well as the built-in assistive technologies that join access in just one small device. TTS and voice assistance like Siri allow the user to communicate with the device and get the desired information. The only exceptions are related to writing, so when one is going to write a lot, it is quite complicated to dictate all of it and review the text. About interaction with text, i.e., not only getting it but saving, copying or pasting it, it seems easier to use the computer as well.

The use of the smartphone for surfing on the internet has also some benefits. The amount of advertising on some websites such as newspapers’ is sometimes a problem with assistive technologies on the computer, because of how the TTS reads the website. This seems to be a little bit more comfortable on the smartphone. Also, in the case of accessing some apps that have computer and smartphone versions, it seems that the users prefer the smartphone one. Facebook could be an example of that, being the interface seems more friendly and less crowded, and the user can easily remember the position of some features.

Needing just one device for many actions, i.e., how smartphones have facilitated the access, is a signal that the first type of digital divide, the material access is being overcome: the user needs one device, which also can alleviate the economic weight of the digital divide (Kim & Kim, 2001, p. 84).

In addition, in the Sweden case, there are official agencies that provide assistive technologies to the users. They could be hardware (refreshable braille display) or software (ZoomText Magnifier). The purpose of use decides which official agency will provide it.
Digital literacy

In the Theory framework section, the social model of disability is presented. Although it does have an important power of decision, in Sweden the assistance that people with disabilities can get does not just belong to the medical sector. Much of the work that government or local agencies make regarding PWD is related to rehabilitation, but there are also attempts to adapt their surroundings so they can be independent. In the private sector, Syncentralen is the one in charge; in the work environment, it is Arbetsförmedlingen who inspects the work conditions in the case that some person should need specific kinds of training or assistive technologies and can cover the costs of that. All of this is important because it reflects an aim for inclusion, although the results are not contemplated in this study. However, because of the material assistance, I consider that in this country the first digital divide, i.e., the lack of economic and/or material access, is largely outgrown.

As stated previously, digital literacy is about owning the skills and abilities to use the internet for achieving the desired outcomes. These outcomes could be everything from googling a recipe to talking with a friend, to uploading a video on YouTube. Being digitally literate, thus, covers an infinite set of abilities, and it is a key topic while discussing the digital divide. It affects not only those that are not digitally literate but to those that do not have the skills to benefit from the internet as they would desire. Society cannot talk about digital inclusion if there are people that, although interested in it, cannot access the internet because they do not know how or do not even know what they can find on the internet (Jaeger, et al., 2012; Buckingham, 2009).

Learning is a continuous process. To be digitally literate does not have an end. However, the first steps are commonly the most important. As some of the informants say, having basic knowledge is the beginning to then be able to start investigating other things. In this case, they need to know as well about assistive technologies to then access the internet. In addition, as Nicolás highlighted, it is necessary to be able to use some assistive technologies to learn how to use others. So, how can the user achieve this ground knowledge?

In the case of PVI, it rests mostly on the shoulders of the users. That is at least the current situation, because the informants discussed how it was twenty or thirty years ago (they lived together for a month and a half to learn all the necessary and available things that they would need in their lives, including digital knowledge). This has changed and the main theory of the informants is that there is not enough funding and resources for offering good education for PVI. This study will not discuss political issues, but it would be interesting if future research looks into that. Nowadays the user needs to contact Syncentralen to get training. This means that the user needs to know what they want to do, when maybe they do not know how they could benefit from being in the digital world. They need to have had previous contact with the internet and different e-services to decide if they are interested to
learn about them, because learning is a quite time-consuming activity and it is in most cases supported by individual interests and, as many of the informants say, personal willingness. It seems that more support and promotion by the government agencies would be needed to achieve digital inclusion. In addition, one informant is questioning the level of expertise that technicians from Syncentralen have because they are the official intermediate between users and the educational support from the agencies.

So, there is great pressure on the individual. It is the user that must ask for training, or must search for courses, or the one that sits alone trying to access some e-service. However, there is also an important community sense in the learning process and in how PVI experience the internet. As one of the informants stated: “To have a relative who can help, I feel I needed that” (Paula). People around PVI have the role to help them sometimes. This can be to solve something they could not do by themselves or by teaching them. But, especially teaching is an activity that consumes time and sighted people cannot have the experience and knowledge to explain how to perform online activities to PVI, who access it differently.

An example of a community is the Synskadades Riksförbund. They assemble PVI in Sweden and provide support on many issues. They talk about current topics that affect people with visual impairments and organise activities for them. There are other less organised groups and initiatives. Blogs and podcasts about, for instance, visual impairment and technology does exist. Facebook groups where people ask and recommend are also available to PVI. All of this is supported by a sense of community based on the disability.

Sweden is leading the way forward towards digitalization in Europe (Scholz, et al., 2017). It has a bearing on the population as they are required to have more and more digital knowledge. Therefore, an important question arises here: who bears the responsibility for being digitally literate?

Experience
Here the thesis will explore issues that happen once the user has the needed knowledge to be on the internet, and after a while, they consider that they use it regularly. However, even when the usage is regular, sometimes it is not an easy experience. First, the insecurity. The user is maybe not insecure about their own abilities, but about if the digital environment has turned hostile. For instance, visiting new websites is often challenging: they do not necessarily work at the end of the process (e.g. buying something online and the screen reader cannot find the button “Pay”). Updates on known websites and apps can mean that they are no longer usable with assistive technologies, or that the user needs to learn new ways to use them, consuming time and possibly arousing negative feelings like sadness or annoyance.
Regarding the time, it seems to be a key characteristic about experiencing the internet with low vision or blindness. Having time to prepare and perform different online activities is important. It also influences the capacity to improvise online: for instance, some of the interviewees declared that if they were going to need a specific app or website later, they would try to become familiar with it before.

Interacting with the internet seems to have a great impact on the self-image of PVI users. They declare to be very stubborn, to try a lot when they want to learn new things, and not give up. This kind of pride is, in my opinion, influenced by the previously mentioned individualism: if learning largely depends on the individual asking for help and facing problems alone, it makes sense that they need to be stubborn and adaptable. However, other feelings arise as well. Pedro talks about the happiness of achieving something, while Carmen remarks on feelings of sadness and helplessness when something seems impossible. She even explains that those sensations come when she feels outside, when she cannot access the information that she would like to get. So, for her, it creates a sense of being left out, a feeling of exclusion.

If something does not work, there are not many alternatives for the PVI user. When inaccessible updates come, sometimes the user tries to reach the developer or owner of the website to explain the failure, but they are not sure that they will answer them or if they will fix the bug. For this, some websites build more confidence than others: those that have responded positively before and those that the user perceive as serious or that should cover their rights, like websites of government agencies. In addition, leaving feedback or contacting the website’s owners depends a lot on how interested the user is, or if accessing that online place and using it is really necessary for them.

The study has discussed who has the responsibility of being digitally literate. Related to that, who has the responsibility for web accessibility? Even with existing legal frameworks and guidelines, accessibility is not always met, and that affects the user, who is at the end of the chain. Should the user be encouraged to leave feedback and share their knowledge in order to raise awareness about accessibility on specific websites? Laura discusses this from her experience: in the past, she used to complain and leave feedback, leaving her contact information in case they would try to delve into the accessibility problems. She explains with a tone of irritation that they seldomly would solve it. Laura reflects on the time that she would spend trying to describe the problems. It should not be up to the end user to spend time trying to identify and describe the problems and share their knowledge and experience for free, especially when the answer from the website owner is often so deficiently. So, who has the responsibility for guaranteeing web accessibility and what dynamics are around the topic? Globally, academics point out that our current society is digital (Lupton, 2014), so being present on the internet is relevant. In the case of Sweden, with digitalization being promoted by the government, it seems
even more important because, for instance, communication and procedures with authority agencies are becoming more and more digital. Ensuring accessibility as a continuum should rely on people who are trained and paid for their work, instead of depending on the claims of users when they discovered a bug in the web page.

Another alternative for the PVI to be heard is to report to the Diskrimineringssombudsmannen. In general, the informants are not convinced if it could help them. Probably here the question is related to what discrimination is, how it is experienced by the user and how to demonstrate that it is in fact discrimination. As Paula states it, she is not prohibited from using certain websites but sometimes she just cannot because it does not work. Only one of the informants shows trust in the Diskrimineringssombudsmannen.

Related to the malfunction of the internet for PVI, other issues arise. On the one hand, there are problems like too crowded websites that make the experience unpleasant, or like apps or websites that are directly inaccessible. That has been researched before. Yet, all of it is noticed by the user, who knows that something is wrong. But sometimes that is not the case: for instance, screen readers sometimes cannot read all the text, and the user cannot know it without the help of sighted people.

Another question is towards whom websites and apps are directed. Maybe the easiest example is about social networks based on pictures or videos, like Instagram and Snapchat. To connect with the others only through images is a hinder for PVI, although there are more and more alternatives to overcome this, such as the image description or the alt-text. The former depends on the device that has it built-in; the latter, i.e., alt-text, relies upon other users of the app, that can decide if they want to write that description. Thus, two main issues arise here: one asks about who the target is and who should it be, and the second focuses on the society’s awareness about accessibility and inclusion, because there are the other users that have to provide alt-text.

Despite the problems and negative experience, this study confirms that the internet has a lot to offer to PVI. The internet in conjunction with assistive technologies has the power to facilitate daily activities (Dobransky & Hargittai, 2006). Probably the most important is the transfer of paper-based activities to digital, which TTS easily allows. That has transformed everyday activities such as reading the official post or paying bills, facilitating it and shortening the time that all these actions required before, as Pedro notices when he says that before he could spend around two hours reading the OCR numbers on the bills and now the process is much faster. Related to that, Sweden offers three important apps. First, Swish, which allows paying with the smartphone instead of using cash money or a credit card. Klarna stores data so the user does not need to introduce their data by spending time on it. Finally, Kivra promotes the use of digital post instead of paper, so PVI
can just read the post and bills on the smartphone directly, without spending a lot of time or needing sighted people to read aloud.

The internet also enables entertainment. Podcasts or books are examples, as well as newspapers. For instance, the possibility of using Legimus on the smartphone and not just on the Daisy player allows the user to have it at the device and not needing additional hardware, and it provides the audio files easily without having to wait for a CD-ROM to play them.

Last but not least, the internet allows interaction with others. It has had an impact not only economically (as Ana highlights about WhatsApp or Facetime), but also personally and professionally, with emails and videoconferences.

Finally, all of this provides independence to the user and a feeling of self-confidence. When accessibility works, it can offer independence, which was more difficult to get before and, as Chaplin (2016) states, autonomy can decrease discrimination. It also increases the desire to keep learning. Returning to a previously asked question, how can a future user discover all the facilitating features that the internet offers, if they are almost alone when it comes to the internet?

General considerations

In addition to the issues covered in the cycle of usage, other ideas will be discussed in this section. To begin with, the idea that all the needed technology to make the digital world completely accessible already exists is quite interesting. One informant affirms it and that is supported by the literature. Thus, there is a discussion about why it is not accessible in reality. Academics put the focus on issues about time, training of web developers, not understanding the accessibility guides, etc, and even personal decisions (accessibility would mess with design) in some cases (Lazar, et al., 2004).

One of the concerns of the informants is if web developers think about them. This question shows a ground problem. Thinking about accessibility is thinking about an abstract concept while thinking about who would benefit from accessibility is thinking about how people access it and what are the barriers they face that could be removed. In this difference, there is the trap of using automatic checks that many authors have criticized. Adam and Kreps (2006) talk about automatic check as a way to just fulfil the standards, getting the stamp of accessibility and not researching further on the matter. Besides, accessibility laws are currently based on standards and guidelines, although Lewthwaite and James notice that new regulations on web accessibility are beginning to allow “reasonable adjustments” (Equality Act, 2010, cited in Lewthwaite & James, 2020, p. 1361), taking the new regulation in the UK as an example. Weilandner (2019) agrees with them when she exposes the Swedish web accessibility law in public and government websites, that on the one hand has specific requirements and on the other hand leaves many accessibility
requirements for interpretation by the web developers. She uses the example of decorative pictures, which do not need alt-text, but the Swedish web accessibility law does not explain what could be considered decorative. This kind of ambiguities, although useful because they allow more research on accessibility, also complicates the application of the guidelines, which could explain why currently many interviewees express problems with websites of Swedish agencies such as Skatteverket or Arbetsförmedlingen.

Guaranteeing web accessibility is not a simple matter because it needs to ensure that all people, with their different and transversal life conditions, can access the internet, so from the point of view of developers it consumes time, resources and ideas. Also, some aspects are more difficult to control than others. When the informants complain about one website being too crowded, it does not necessarily collide with accessibility standards, but it actually hinders the online experience. Therefore, user testing is always recommended, so the web developers can really test their product and how users with disabilities interact with them.

About user testing, there are many examples in the literature and they serve as good examples for showing the practical effect of web accessibility. One observation I have made from the interviews is that sometimes test results can be biased. The reason is that the level of familiarity with the product among the testers vary. Some of the testers possess a higher level of familiarity than others and some understands better and quicker the technology what shall be tested and what are the tasks. For instance, Seixas Pereira et al. (2015) actually declare that the testers / participants in their research were familiar with it. Therefore, I call for more research about familiarity and what the impacts are when the user accesses one site for the first time.
CONCLUSIONS

This thesis has explored the topic of web accessibility, putting the focus on the perspective of people with visual impairments who use the internet. Through the analysis of previous theories and research and, mainly, of the interviews, three main topic areas came to the surface: assistive technologies and access, digital literacy and web experiences.

With the support of the methods and data analysis, it is possible to answer the research questions.

*What are the steps that people with visual impairments need to take in order to become digitally literate?*

The most important characteristic of digital literacy is that it is a continuous process: as the updating and improvement of technologies around the internet are constant, so is the learning process. Therefore, the user could never be totally digitally literate.

However, some steps enable acquiring knowledge. In Sweden, the first issue of the digital divide, i.e., materially accessing the internet, is to a large extent overcome thanks to government agencies that aim to provide hardware and software to the users for use at home and work. Other expenses such as buying a smartphone are not different from those of people without visual impairments. When this is covered, the user can begin to learn. Because assistive technologies mediate the use of the internet, as a first step the user needs to learn how they operate and then to use them with different devices, websites and apps. The process of learning is a combination of educational support by government agencies, which seems to be present mostly at the beginning of the learning, and the willingness of the individual, which grows once they have the basic knowledge. Usually, there is also a support network both physical (friends and/or relatives) and online (e.g., Facebook groups).

*What are the main facilitating features and main challenges nowadays for internet users with visual impairment?*

There are positive and negative features of using the internet for people with visual impairments. On the positive side, the internet facilitates several activities such as those that were paper-based in the past, that now can be resolved online and easily interpreted with TTS and other digital assistive technologies. The internet allows for contact with others, and access to information and leisure activities like reading or listening to a podcast. In addition, improvements on technology make not only assistive technologies better, but also hardware and software more accessible and capable: smartphones are the best example here.
On the other hand, the internet presents some hinders for the users with visual impairments. There are issues at a technical level, i.e., accessibility problems that sometimes are not solved, although literature shows they could easily be resolved. These problems, from Captchas to no-named links or limited pay-time, create a sense of insecurity in the user, who not always is encouraged to claim or report because they do not see the benefits of that.

In addition to answering the research questions, this thesis concludes that it is necessary to put a greater focus on the user. This call for attention works on three aspects. First, when it comes to web accessibility the attention should be drawn to the user highlighting that their needs are relevant when designing websites and apps. As stated previously, accessibility is highly difficult to achieve, and learning from the users could benefit this process. Therefore, user evaluation is strongly recommended. The focus on the user also applies to research. From the analysis of the interviews, it is evident that being familiar with a specific website or e-service is an important aspect to be considered to ensure its proper performance. Future research should take this into account to provide more useful results. Finally, the user should also be the centre of attention in the process of digital literacy. This thesis shows that education should be better promoted because it is not enough to answer and help the users when they have internet-related questions or concerns, but also more institutional initiatives towards education could benefit the users. It could provide not only knowledge but provide information about the benefits of the internet and reduce the pressure that the individuals feel if they want to learn.

There are some observations I would like to highlight for future research drawn from this study. First, it is worthwhile questioning how this research could have been with intersectionality in mind. Because of the social model of disability, selected as a framework for this thesis, some issues related to intersectionality are not present. With more time and resources, questions such as gender, social class or ethnology could present new challenges or ideas, and they could depict the users as not just people with visual impairments but show their identities in a more complex and therefore complete way. That would just enrich the production of knowledge and provide more perspectives about the topic.

In addition, I would like to highlight two important questions. They are both very relevant for further research and should play an important role at the political level: who has the responsibility for guaranteeing web accessibility? And, who bears the responsibility for being digital literate? Reflecting on these could provide a roadmap for future actions towards web accessibility.

Finally, this thesis follows other investigations with the aim of raising awareness about the importance of achieving and working continuously with web accessibility. The contribution of this thesis is that it works as a checkpoint of the current status of web accessibility for users with visual impairments, by gathering their experiences and opinions. Because of that, the thesis can have relevance for web developers from both private and public bodies; for government agencies that deal
with web accessibility and digital literacy; and for users with visual impairments that could find their perspectives about the situation academically supported.
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APPENDIX I: INTERVIEW GUIDE

1. Consumption of content:
   - How do you access it?
     - Cultural activities
     - Access to information
     - Food receipts
     - Podcast / Books
     - Newspapers

2. Content production:
   - Do you produce content online? On which platforms?
   - Does availability affect your choice of publishing platforms? How?
     - Facebook
     - Twitter
     - Instagram
     - Blog / own website
     - Own podcast

3. Social Networks:
   - Are you active on social media? On which?
   - How is the availability of those you use?
     - Facebook
     - Facetime
     - Video calls (Zoom, Teams, Skype, etc.).

4. Management:
   - Do you have a Bank ID? Regarding bill payment, do you usually do it online? What are the challenges you have met? Do you use Swish?
   - If we talk about health, do you use 1177.se?
   - Do you usually shop online? Why not? Do you prefer one or any other particular store just because of its web accessibility?
   - Do you use a digital calendar?

5. Regarding the use of internet:
   - What is it like for you to orientate yourself on different websites? What are the current challenges?
     - Cookies / cookies
     - Updates
     - Pay time limit
     - Contrast
     - Text box
     - Captcha
Which device do you prefer to use (computer, mobile phone, tablet)? Why? Do you use them for different things?

Can you briefly tell me what assistive technologies you use?

How did you learn to surf the net? Did or do you get some kind of education for it?

6. Others:

When you find poor or incomplete accessibility, how does it affect you (in your everyday life)?

What do you do when you cannot access the service you need or want to find? How do you handle it? Is it possible to report it?

Is there anything else you want to add? Is there anything important you think we have missed?