“Request to speak, button”
Accessibility for visually impaired VoiceOver users on social live audio chat platforms

Author: Charlotte Bern
Author: Linda Liljeström
Supervisor: Morgan Rydbrink
Examiner: Patrik Elm
Term: Spring 2021
Subject: Informatics
Level: Bachelor
Course code: 2IK50E
Abstract

Social media has become an inevitable part of everyday life. With the focus to a large extent being on image and video sharing, accessibility for the visually impaired is not always granted. However, new types of social platforms with live audio chats at their core have shown potential to stand out as particularly inclusive of visually impaired users. Taking a standpoint in the Technology-to-Performance Chain model, the study aimed to create a better understanding of the subjective user experience of visually impaired users of social live audio chat platforms by identifying what influences accessibility, especially when it comes to taking part of and creating audio content.

The topic was approached in the form of a case study. Qualitative data collection was conducted with a combination of observations and product assessment, expert interviews as well as user interviews. The aim was to create a better understanding of the subjective user experience of visually impaired users.

The results suggest audio-based platforms have the potential to fit the visually impaired users well. A limited scope of the platform, having voice-based communication at the core and a limited number of visual elements all influence accessibility. A sufficient amount of adjustable VoiceOver adds to the accessibility of the platform. Furthermore, the results indicate being aware of user behaviour and the inaccessibility it might lead to is of importance. Concludingly, applying a UX perspective is deemed as of importance as the results indicate it often is the intangible, subjective user perspective which can highlight what influences accessibility.

Keywords

Accessibility, Social media, Visual impairment, VoiceOver, UX
Acknowledgments

First and foremost, we want to thank our supervisor Morgan Rydbrink for his quick and mind-tickling thinking. Without the support from him, this thesis would not have taken the form it has today. We also want to show our appreciation to the peer-reviewers during the writing process as well as our friends and family who have put up with us throughout the spring. Last but not least, a big thank you goes out to the Swedish visually impaired community on Clubhouse. The warmth, inclusion, and excitement we have been welcomed with has been hard to grasp. From the bottom of our hearts, we wish this thesis adds to knowledge regarding visually impaired users as well as paves way for more inclusive and accessible design.

The 9th of May 2021

Charlotte Bern, Stockholm

Linda Liljeström, Helsingfors
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1 Introduction

Worldwide the amount of active social media users has been growing yearly, the users constituting 54% of the total population (Kemp 2021a). In Sweden, which this thesis limits itself to, the percentage of social media users is as high as 82% (Kemp, 2021b). During the Covid-19 pandemic, which has raged since the end of 2019, social distancing has forced socialising to move online to a larger extent: In May 2020, 42% of the social media users stated they were spending more time on social media like Facebook and Instagram (GlobalWebIndex 2020a) while 43% expressed they were spending more time also on messaging services like WhatsApp and Messenger (ibid.). Furthermore, video conferencing tools like Zoom and Teams have grown exponentially during the pandemic (Narcisi & Alspach 2020). The pandemic also seems to have changed the way social media is being used, since the social media platforms yet again have become a place for connection, after years of increasingly being used for consumption and entertainment (GlobalWebIndex 2020b).

With the connecting and social interaction taking place online, accessibility is of importance, as it is a matter of everyone’s right to participate in society on equal terms (UN 1948; UN 2006). Making the question of online accessibility particularly timely is the Directive 2016/2102 of the European Parliament and of the Council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies, currently being applied on mobile applications of public sector bodies. Although the Web Accessibility Directive only applies to public sector bodies, it brings up the question of accessibility in general. Thus, private companies, including social media companies, might also be encouraged to act. Apart from nobler reasons, an incentive to adapt for accessibility is gaining a competitive advantage (Persson et al. 2015; Begnum et al. 2019).

One group of individuals for whom social media is less accessible than others are the visually impaired users (Carey 2007; Babu 2014; Whitney & Kolar 2020; Wu & Adamic 2014). One reason for this is web 2.0 technologies being sight-centred (Babu 2014). Globally WHO (2010) states there are 286 million visually impaired individuals, whose eyesight cannot be corrected with the help of glasses. In Sweden the visually impaired are 100.000–120.000 individuals (Synskadades riksförbund 2021), making up around 1% of the population (Synskadades stiftelse 2021). Thus, the visually impaired are a significant user group, which should be taken into account when designing social media. Evidently, this is not always the case, but despite accessibility issues, visually impaired individuals use social media as much as sighted (Della Líbera & Jurber 2017). Facebook has been the most used social media platform amongst visually impaired users (Della Líbera & Jurber 2017), which also is reflected in Facebook, in general, being the biggest social media, reaching 59% of all social media users (von Abrams 2020). However, the visually impaired students in the study
by Della Libera and Jurber (2017) state Facebook to be “gone” and “boring”, echoing the statistics telling the growth of Facebook has stalled in the US (von Abrams 2020). Instead, social media platforms like Instagram and Snapchat are growing more rapidly (ibid.). Indeed, there is a trend of live-streamed content being popular, while text-based content is on the losing end (GlobalWebIndex 2020b). This rhymes well with how voice messaging during the past four-five years have to some extent started to replace text messaging on, for example, WhatsApp and Messenger (Stokel-Walker 2018).

Audio is also what recently emerged social media platforms are based on. With a core format of live audio chatting, the platforms have the potential to stand out as highly accessible for visually impaired users. Ironically enough, Clubhouse launched in April 2020 was initially criticised by the visually impaired community for its inaccessible design (Aquino 2021; Mosen 2021a; Lall 2021). However, the platform has lately been praised for the rapid responses on making the application more accessible (Mosen 2021b). Having more than 10 million weekly users less than one year after the release (Dean 2021), the platform has established itself on the market. Since the release of Clubhouse, other actors have also released their versions of audio chat-based platforms, for instance, Spaces by Twitter and Voice Chats 2.0 by Telegram. Facebook is also planning on releasing a platform of their own (Mosen 2021b).

When designing for accessibility, guidelines are a common starting point (Aizpurua, Harper & Vigo 2016), the Web Content Accessibility Guidelines (WCAG) being the most popular standard for web accessibility (Bigham, Lin and Savage 2017; Begnum et al 2019). Some issues with accessibility and usability are related to design not meeting the standards of WCAG (Babu 2014). Power et al. (2012, cited in Aizpurua, Harper & Vigo 2016), however, argue WCAG only covers about half of all the issues visually impaired users encounter online.

Thus, Aizpurua, Harper and Vigo (2016) suggest accessibility should not only be assessed from a normative point of view, which the WCAG offers, focusing on the structure and characteristics of the web pages. Instead, also users’ subjective point of view should be included. Begnam et al. (2019) echoes that knowledge of, and empathy for, the end-users is of importance when designing for the visually impaired. Moreover, a deep understanding of the end-users and how they will use the products is especially important when designing a complex artefact like a social media platform (Aizpurua, Harper & Vigo 2016). This is where User Experience (UX) comes into the picture. UX focuses on the features of a product in a context: does the product do what it is expected to do, creating a successful experience for the user? (Garrett 2011). Arvola (2014) suggests that depending on the perspective the users’ experience of a situation can differ. Arvola (2014) defines a prism of usability consisting of six aspects: technical, practical, communicative, organisational,
aesthetic and ethical. The different aspects allow for individually highlighting the usability aspects related to that very perspective. The importance of accessible and UX based social media platforms is further illuminated when turning to the Technology-to-Performance Chain (TPC) model by Goodhue and Thompson (1995) as the model both stresses the importance of technology fitting the user as well as aspects of attitudes and behaviour (ibid.).

1.1 Problematisation
The study positions itself in a time of heightened and transitioned social media use (GlobalWebIndex 2020b), with a new audio chat platform, Clubhouse, skyrocketing in popularity (Dean 2021) and several other actors releasing their own versions of voice-based platforms (Mosen 2021b). Furthermore, the Web Accessibility Directive makes the question of accessibility timely. Previous studies acknowledge visually impaired users in combination with the accessibility of social media in particular and the Internet in general, as an unexplored field of study (Wu & Adamic 2014). Aizpurua, Harper and Vigo (2016) state that there specifically is a lack of studies focusing on the subjective experience of blind users interacting with the web, echoed by Nogueira and Ferreira (2018) who highlights the lack of a UX perspective. Therefore, emergence of a new social media format in combination with the lack of holistic, user-centred studies on visually impaired individuals’ usage of social media in general and of audio-based chat platforms in particular create a need for a user-experience focus for the accessibility and usability issues at hand (Aizpurua, Harper and Vigo 2016; Wu & Adamic 2014; Della Libera & Jurberg 2017). Thus, this study places itself among the first handful of studies focusing on the new and upcoming social audio chat platforms and is presumably the first study having accessibility and visually impaired users at the centre of it.

1.2 Aim
This study aims to create a better understanding of the subjective user experience of visually impaired users of social live audio chat platforms by identifying what influences accessibility, especially when it comes to taking part of and creating audio content.

The following research question is proposed:

*What influences the accessibility for visually impaired VoiceOver users to successfully partake in discussions on social live audio chat platforms?*

1.3 Disposition
In chapter 2, Theoretical framework, the theoretical model and literature relevant for the study is presented. Chapter 3 on Methodology starts off by presenting the research approach after which the data collection and analysis are displayed. Concludingly reliability and validity as well as the ethical aspects are discussed. In chapter 4,
Results, the results from the three data collection points are presented. In chapter 5, Analysis, the combined result for all three data collection points is analysed. In chapter 6, Discussion, the result and methodology are discussed in relation to the problematisation and background of the study. In chapter 7, Conclusion, the outcomes of the study are established, culminating in suggestions for future research.

1.4 Limitations
This study is limited to assessing the accessibility and usability of Clubhouse for visually impaired users. Since the Clubhouse application at the beginning of the study was available only on iPhones, the study is limited to mobile devices, and more specifically Apple Inc. products. Furthermore, all users taking part in the study have defined themselves as visually impaired. Additionally, the users all need screen readers to be able to access their mobile phones. The study is limited to users in Sweden. In addition to Clubhouse users, the study also consulted four experts on visual impairment and accessibility. The experts interviewed were all visually impaired and located in Sweden. Their expertise on the issues at hand was based on their professional engagements in the area of accessibility.
2 Theoretical framework

To start off, the Technology-to-Performance Chain, is presented. Next visual impairment is defined, followed by a discussion on assistive technology. Thereafter shortcomings in accessibility are presented. Concludingly designing for accessibility highlights universal design, WCAG as well as user experience and usability.

2.1 The Technology-to-Performance Chain

The Technology-to-Performance chain (TPC, Figure 1) is a theoretical model illuminating the relation between the technology and the user. According to TPC: if a technology (1) is utilised and (2) supports the user in doing the task at hand, the performance is affected in a positive way. (Goodhue & Thompson 1995)

2.1.1 Background

The Technology-to-Performance Chain (TPC) model was developed by Goodhue and Thompson (1995) by combining the task-technology fit model (TTF) with theories of attitudes and behaviour. TTF is used for assessing how well the technology is supporting the user in the tasks the user is performing. The better the technology supports the user in performing the task at hand, the higher the task-technology fit (ibid.). Alongside previous models, TPC highlights the importance of TTF. Moreover, as the TFF model assumes that the user is using the technology and does not concern itself with complex questions of if, how and why the technology is used, TTF was paired with theories of attitudes and behaviour to also encompass the aspects of utilisation. (Goodhue & Thompson 1995)

Figure 1. The Technology-to-Performance Chain (adopted from Goodhue & Thompson 1995)
2.1.2 The Technology-to-Performance Chain explained

TPC consists of the TTF model, also called theories of fit, in combination with the theories of attitudes and behaviour. Three characteristics are affecting the task-technology fit, while the task-technology fit affects the expected consequences of the utilisation of the technology, which in combination with other precursors of utilisation affect the utilisation itself. This is followed by both the task-technology fit and the utilisation of the technology impacting the performance. The performance feeds back to both the TTF part of the model and the attitudes and behaviours, affecting future usage. (Goodhue and Thompson 1995)

In the TPC model, the initial characteristics affecting the task-technology fit are task characteristics, technology characteristics and individual characteristics (Goodhue and Thompson 1995). The tasks are “the actions carried out by individuals in turning inputs into outputs” (ibid., p. 216). Spies, Grobbelaar and Botha (2020) further elaborate for the tasks to be the sum of both the physical and the cognitive processes and actions by the user. Drawing upon the study by Goodhue and Thompson (1995) they (Spies, Grobbelaar and Botha 2020) continue by pointing out that the task characteristics “are considered specifically in relation to the technology that supports the tasks and are broken down to different levels of detail, depending on the complexity”. Therefore, the task characteristics vary, depending on which technology is being assessed (ibid.).

The technology is the tool being used by the individual, for example, a system or a program. As Goodhue and Thompson (1995) explain, the TTF model is designed to be applicable both on a single system (for example on a software) as well as on sets of systems (for example as provided by a department in an organisation).

The individuals are the ones using the technologies to perform their tasks. The individual affects the task-technology fit model, since the individual is the one using the technologies and performing the tasks. Furthermore, both the individual’s motivation and experience affect the usage. The individual might learn how to use the technology better, which might lead to improving the individual-technology fit, and therefore also impact the TTF in general. (Goodhue & Thompson 1995)

Taking the task, the technology and the individual into account, as well as their interplay, one will get the task-technology fit (Goodhue & Thompson 1995). Goodhue and Thompson (1995, p. 218) state that as “the gap between the requirements of a task and the functionalities of a technology widens, TTF is reduced”. When the TTF is reduced, the performance is enhanced. Therefore, performance is the outcome, as related to the tasks performed by the individual (Goodhue & Thompson 1995). High TTF increases the performance since the technology fits the tasks performed (ibid.).

In contrast to the TTF model, the TPC model takes into account utilisation and feedback. Precursors of utilisation on the bottom part of the model, are the expected
consequences as well as the surroundings affecting the individual utilising or not utilising the technology. The utilisation can be both voluntary or involuntary. The task-technology fit and utilisation are linked due to the task-technology fit affecting the user’s expectations of the technology. Hence, the user might experience the technology to be less or more useful. (Goodhue & Thompson 1995)

The feedback to the far right of the model puts the utilisation of the system and the fit into perspective: as the individual performs the task using the technology, they will experience the TTF as lower or higher, which affects future performance of tasks and utilisation of the technology. Thus, the individual can learn, in repetitive usage of the technology, which might affect the fit of the technology as well as the performance. (Goodhue & Thompson 1995)

2.1.3 Application of theory in previous studies
The TTF model has mainly been applied on information system studies (Spies, Grobbelaar & Botha 2020), which also was the focus of Goodhue and Thompson (1995). Many of the studies have focused on information systems within healthcare (Spies, Grobbelaar & Botha 2020). However, TTF has lately been used in research also on social media. Fu et al. (2019) researching how TTF affects social media usage in companies; Lin et al. (2020) look into how well social media fits marketing purposes in the hospitality industry; Li et al. (2019) write on Gen Y in China, and how TTF influences their choices of using social media; Dwyer (2007) initiate a discussion on how well social media platforms fit the tasks carried out on them, i.e. relationship development. However, a majority of these studies combine TTF, in different variations, with some other research models, as the Technology Acceptance Model, Post-Acceptance Model and Gratification theory. On the other hand, TPC has presumably not been used in studies on social media. Nevertheless, a comparative study of interest by Kim et al. (2017) dissects the usage of different personal devices, like laptops and smartphones, using TPC to explain the individuals reasoning behind the choices.

2.2 Definition of visual impairment
The term “visually impaired” has in many studies been used interchangeably with “low vision” and “partially sighted”, without attention being paid to the details or the differences of visual impairments (Kleynhans & Fourie 2014). Begnum et al. (2019) point out it is of weight to differentiate between blind users and users with reduced vision, as their user needs do not necessarily align. As the visually impaired community is diverse, a clear definition of “visually impaired” is called for before evaluating accessibility or designing for accessibility (Kleynhans & Fourie 2014).

As stated in the introduction, there are 286 million visually impaired individuals globally (WHO 2010). However, the numbers vary since they are complicated by some individuals having several eye conditions causing visual impairments (WHO
2019), as well as the numbers being dependent on the definition of being visually impaired (Synskadades stiftelse). Synskadades Riksförbund (2021) underline the visual impairment strongly varying between individuals, as do the issues related to the visual impairment. Furthermore, WHO (2019) points out that most reports and studies on visual impairment do not include individuals who have a visual impairment which can be corrected with either glasses or contact lenses.

The WHO (2019, p. 10) defines visual impairment as something which “occurs when an eye condition affects the visual system and one or more of its vision functions. To define the level of visual impairment they classify the visual acuity from mild, to moderate, to severe, which is followed by blindness (ibid.). Further, WHO (ibid.) draws upon the International Classification of Functioning, Disability and Health, in which disability is used to refer to the limitations a person might encounter due to their impairments. WHO (ibid., p. 14) continues by stating these limitations are not only due to the visual impairment itself, but are affected by “the physical, social and attitudinal environment in which the person lives”.

This statement is closely related to the social model of disability which is one out of three different models of disability that Klynhans and Fourie (2014) discusses. The social model suggests it is the society that places limitations on the disabled individual, causing the individual to be viewed as impaired (Oliver 1996, cited in Klynhans & Fourie 2014). In other words, it is the visually impaired interacting with the world built for the sighted majority which leads to the disability becoming an impairment. The social model thus focuses on inclusion and removing barriers, without denying the impairment being an obstacle for the individual (Seale 2006, cited in Klynhans & Fourie 2014).

In addition to the social model, Klynhan and Fourie (2014) also put forward the individual and the administrative models of disability. The individual model of disability assumes that the disability is a problem for the person, viewing the person with a disability as not normal or not being able to fully function (Dewsbury et al. 2004, cited in Klynhans & Fourie 2014). The model has been criticised, as it marginalises the disabled individual’s needs (ibid.) and focuses on altering the individual, instead of changing society (Kearney & Pryor, 2004, cited in Klynhans & Fourie 2014). The administrative model of disability is mostly used for assessing the right to for example benefits, focusing on the impairment itself (Klynhans & Fourie 2014). This model has, like the individual model, often been criticised for focusing on the person instead of the surroundings (ibid.).

2.3 Accessibility for visually impaired
According to the ISO-standard 9241-11:2018, accessibility is defined as the “extent to which products, systems, services, environments and facilities can be used by
people from a population with the widest range of user needs, characteristics and capabilities to achieve identified goals in identified contexts of use”.

Devices both in homes and in society becoming increasingly equipped with touchscreens, has been a technological advancement less accessible to visually impaired users than their sighted peers (Kane, Bigham & Webbrock 2013). As the needs of the visually impaired users started to be taken into account and assistive technology was developed, there were still barriers to overcome for visually impaired users (Khan & Khusro 2020): At one point, the Internet largely consisted of text but has since shifted into combining text with both pictures and videos (Carey 2007) making the Web 2.0 largely sight-centred, excluding visually impaired users (Babu 2014). Babu (2014) is not alone with this notion, as inaccessibility of social media has been shown in numerous studies (Della Libera & Jurber 2017; Qui, Hu & Rauterberg 2017; Whitney & Kolar 2020; Wu & Adamic 2014).

2.3.1 Assistive technology
In general, assistive technologies for the visually impaired encompass all parts of life, from enabling walking safely to using complex technical devices (Pal 2011, cited in Khan & Khusro 2020). Assistive technology can be defined as “the concept of an item or piece of equipment that enables individuals with disabilities to enjoy full inclusion and integration in society” (Hakobyan et al. 2013, p. 514). Today the smartphone has become a hub for assistive technology (Hakobyan et al. 2013), although initially not accessible for the visually impaired (Smaradottir, Håland & Santiago 2018).

Touchscreens are challenging for visually impaired individuals, as the navigation to a large extent is designed for the user to be able to see what is happening on the screen (Hakobyan et al. 2013). Without buttons for tactile feedback and limited or close to no audio feedback, touchscreens are hard or impossible to navigate for visually impaired users (Kane, Bigham & Wobbrock 2013). Thus, with the touchscreen also came the possible exclusion of the visually impaired users, which potentially could lead to this group not being able to function at work or in the society at large (ibid). Therefore, assistive technologies for usage of smartphones are an important factor for visually impaired users to be able to function independently and safely, which directly affects their quality of life (Hakobyan et al. 2013; Khan & Khusro 2020).

As the visually impaired community raised the accessibility issue (Kane, Bigham & Wobbrock 2013) and researchers accentuated designing interfaces that are accessible, inclusive and user-friendly also for visually impaired users (Khan & Khusro 2020), the manufacturers started to take the needs of the visually impaired into account (ibid.). Since smartphones can be used for many different activities, it generates diverse needs for the smartphone-based assistive technologies (Khan & Khusro 2020). Nowadays, the assistive technologies for smartphones allow an extensive number of activities, from general mobility and scanning the environment to
communication and leisure (Hakobyan et al. 2013). In general, smartphones have made information more accessible for visually impaired users, who previously have had to rely on audio-based media (Khan & Khusro 2020).

Furthermore, as the visually impaired community is diverse (Kleynhans & Fourie 2014), so are the needs for assistive technologies in accessing smartphones and all the features attached to (Khan & Khusro 2020). Examples of assistive technologies for using technical devices are screen magnifiers, screen readers, voice recognition, alternative keyboards and alternative pointing devices (Kleynhans & Fourie 2014).

Smaradottir, Håland and Martinez (2018) took a closer look at the Apple Inc. screen reader VoiceOver, evaluating it on iPhone with six visually impaired users. Their research indicated that the user experience of VoiceOver was good and that the functionality was intuitive and easy to use for the most part, although some gestures were difficult to perform (ibid.). However, in general, the speech feedback correctly guided the users through the user interface (ibid.). Furthermore, the six users specifically underlined VoiceOver supporting their independence (ibid.). These findings are in line with Khan and Khusro (2020) pointing out, screen readers have made smartphones more accessible for the visually impaired group.

Acknowledging that some of the difficult VoiceOver gestures made it hard to master the smartphones, Smaradottir, Håland and Martinze (2018) brings forward user training to be the key factor in visually impaired users mastering smartphones. This is aligned with Khan and Khusro (2020), stating that the design of assistive technologies for smartphones is increasingly challenging, as the users need to understand the dynamics and logics of the interface, to be able to utilise it.

2.3.2 Shortcomings in accessibility

Although assistive technology enables usage of smartphones, visually impaired users still have challenges navigating the Web (Aizpurua et al. 2016). Thus, for the visually impaired to be able to use smartphones, the Internet and social media on equal ground as their sighted peers, the products and services need to be accessible (Khan & Khusro 2020). However, there is not one single defined way of how to make products and services accessible and with high usability, for the visually impaired.

In a study by Bigham, Lin and Savage (2017), blind and sighted users completed the same tasks online. Some of the tasks were designed to be easy to accomplish, others impossible for the visually impaired users (ibid.). The results showed the visually impaired individuals using up to double the time to complete the tasks, which has Bigham, Lin and Savage (2017) suggesting part of the reason is the blind users spending a significant amount of time looking for information that was not included. When accessing a web page or looking for some specific information, the user needs to know what is there and what is not to be able to choose what to do next (ibid.). Bigham, Lin and Savage (2017) exemplify this with a blind user looking for a phone.
number on a website. If the information is saved as a picture, the number is there, but the blind user cannot access it, making it impossible for the blind user to know if they should ask a sighted person to fetch the number from the website or look somewhere else for the information (ibid.).

Shortcomings in accessibility online is a severe problem, as further showcased in a study by Whitney and Kolar (2020), where the conclusion was in line with Bigham, Lin and Savage (2017): The visually impaired users felt they missed out on information, not even being aware of the content inaccessible to them. Furthermore, Bigham et al. (2007, cited in Khan & Khusro 2020) state that blind users avoid engaging with content they beforehand deem hard to access.

(In)accessible social media
For many, social media is an inevitable part of everyday life (Kemp 2021a) and individuals with visual impairments use social media as much as others (Della Libera & Jurber 2017). Smartphones (Kane, Bigham & Wobbrock 2013) and social media (Whitney & Kolar 2020) are, however, not as accessible for visually impaired individuals as for sighted ones although assistive technology has made smartphones more accessible (Khan & Khusro 2020). Wu and Adamic (2014) underline that visually impaired users have a barrier they need to overcome to be able to take part in online social networks.

Since mobile technology has changed the way we communicate (Guy 2010, cited in Della Libera & Jurber 2017), social media has taken an important position in creating community (Gruzd & Haythornthwaite 2013). In general, social media can facilitate feelings of social connectedness: In a study on elderly and disabled who were isolated or homebound, the participants started forming friendships online, with others in similar circumstances (Bradley & Poppen 2013). Visually impaired are more likely to get isolated (Coyle, Steinman & Chein 2016, cited in Whitney & Kolar 2020), while Covid-19 in general has made everyone more isolated and homebound (Geirdal et al. 2021).

According to Wu and Adamic (2014), visually impaired users are, with the help of assistive technology, as active on Facebook as their sighted peers. In their research on Facebook, Wu and Adamic (ibid.) concluded visually impaired Facebook users create content and comment on the content of others to the same extent as sighted users. In addition to this, visually impaired users receive more comments on their content (ibid.). However, visually impaired users add fewer photos and generally also comment less on photos posted by others (ibid.). Wu and Adamic (ibid.) state that photo sharing is one of the Facebook features which gives the impression of being designed to be used only by sighted users. Thus, despite Facebook having developed some special keyboard shortcuts to enable certain commonly used actions as well as
navigate on the site, it does not allow the visually impaired users to engage in the same manner as their sighted peers (Wu & Adamic 2014).

In contradiction to Wu and Adamic (2014), Qui, Hu and Rauterberg (2015) point out in their preliminary observation based on a qualitative study, that on social media, blind people are more on the receiving end, and contribute less themselves. They (ibid.) are however aligned with Wu and Adamic (2014) when singling out photos as being problematic since they cannot be read with the help of screen readers. Also, Whitney and Kolar (2020) present in their study on Facebook, that 77% of the posts on Facebook contain images with embedded text, which is inaccessible for visually impaired users. This supports the notion of Volyinska et al. (2016, cited in Whitney, & Kolar 2020) that there is an increased usage of photos without descriptions.

Furthermore, Whitney and Kolar (2020) point out that social media often consists of cluttered pages and big amounts of data, which makes it difficult for the user to know what to focus on. Taking in information becomes increasingly difficult when the user is visually impaired and needs to use assistive technology to be able to access the information (ibid.). The study by Whitney and Kolar (2020) shows that due to this, visually impaired users miss out on information, and furthermore, they are excluded from parts of social media.

The accessibility and usability issues become yet again evident in the study by Babu (2014), where blind users were given assignments, this time related to accomplishing common tasks on Facebook. With the help of screen readers the users were to search for people, communicate with others and schedule a social event (ibid.). The first task was to search for someone on Facebook, the users having issues with locating the search field, entering search terms in the requested format, them also being confused regarding why their searches did not go through. Babu (2014) states that both the ill-advised labelling of the search field, as well as the unclear rules for search terms are violations of WCAG. The second task was communicating through the timeline with others. The blind users had issues with finding the timeline and the input area of the timeline, which according to Babu (2014) is a violation of WCAG principles due to lack of descriptive labelling. The third and last task was to schedule a social event, where the WCAG was not followed regarding fields not being editable using the keyboard. (Babu 2014). Babu (2014) concludes that all of the issues encountered by the blind were de facto design errors due to not following WCAG principles.

While Facebook has been the social media most visually impaired users prefer (Della Libera & Jurber 2017) and which many studies focus on (Wu & Adamic 2014; Whitney & Kolar 2020; Babu 2014; Qui, Hu and Rauterberg 2015), Della Libera and Jurber (2017) conclude in their study that the students they interviewed chose WhatsApp over Facebook. The reason for this was, among other things, that they prefer WhatsApp since it relies more on text and audio, while images are less frequent. This aligns with the results of the previously presented studies, where
visually impaired users of Facebook interact less with and through photos (Wu & Adamic 2014).

The study by Whitney & Kolar (2020) indicates that visually impaired users do not find using social media as relaxing as they would want it to be, since they experience navigating the sites being both difficult and time-consuming. This results in the visually impaired users choosing to use social media which is accessible to them (Della Libera & Jurber 2017; Wu & Adamic 2014), instead of being able to follow their peers to any platform (Whitney & Kolar 2020).

2.4 Designing for accessibility

Depending on what design approach is chosen, accessibility can be interpreted in different ways (Persson et al. 2015). There are several design approaches focusing on accessibility of which one of the most commonly highlighted is universal design (ibid.). In the research by Babu (2014) it becomes evident that some issues with accessibility and usability are related to design which does not meet the standards of WCAG. At the same time guidelines do not encompass all issues related to usage (Begnum et al. 2019). Power et al. (2012, cited in Aizpurua, Harper & Vigo 2016) suggest that half of the problems blind users encounter on the Internet are not covered by WCAG 2.0. In their study, Bigham, Lin and Savage (2017) turned to the visually impaired users, to ask for their assessment of why they think they could not accomplish certain tasks. However, they did not explicitly take a UX perspective. As a matter of fact, according to Nogueira and Ferreira (2018), there is a lack of studies focusing on the combination of visual impairments, web accessibility and UX. In their review of 1015 scientific papers they only managed to identify five research papers on these very topics. None of these studies discussed UX and visual impairments in combination with social media. However, several studies advocate that the focus should be turned to be more user-centric (Aizpurua, Harper & Vigo 2016; Bigham, Lin and Savage 2017; Khan and Khusro 2020).

2.4.1 Universal design

In the design approach universal design, the aim is to fit all users from the start (Persson et al. 2015). This, in comparison to design for all, which aims to design for the widest possible range of individuals but with less emphasis on one solution fitting everyone, while the inclusive design approach strives to include as many users as possible, but to a reasonable extent as inclusion of individuals with disabilities can be disregarded if deemed too expensive or difficult (ibid.) Of these design approaches, universal design seems to be the approach most widely referred to in official documents when it comes to accessibility. For example, both universal design and design for all are highlighted in the ISO-standard 9241-171:2008. Also, the United Nations Convention on the Rights of Persons with Disabilities (UN 2006), article 4, states that State Parties should promote universal design when creating and adjusting standards and guidelines. A third example where universal design is promoted is the
Directive 2016/2102 of the European Parliament and of the Council of 26 October 2016. Thus, universal design has come to play an increasingly important role in national and international legislation (Begnum et al. 2019). Furthermore, there are large companies, like Apple Inc., taking universal design into account when developing accessibility and design guidelines (ibid.).

In the United Nations Convention on the Rights of Persons with Disabilities (UN 2006), universal design is defined as:

> “the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. ‘Universal design’ shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.”

There are seven guiding principles in universal design which are widely used as guidance when designing for accessibility (Persson et al. 2015):

1. **Equitable Use** refers to the design being useful to individuals with diverse abilities.
2. **Flexibility in Use** underlines the design allowing a range of individual preferences and abilities.
3. **Simple and Intuitive Use** stands for the design being easy to understand.
4. **Perceptible Information** refers to the design effectively communicating necessary information.
5. **Tolerance for Error** states that the design should be reducing risks and serious consequences of accidental or unintended actions from the users part.
6. **Low Physical Effort** refers to the design being easy and comfortable to use.
7. **Size and Space for Approach and Use**, encompasses for the design to be possible to approach, reach and use.

### 2.4.2 WCAG: Guidelines for accessibility

Goodwin (2009) states that designers should strive for designing products that are accessible for all, much in the spirit of universal design (Persson et al. 2015). However, Goodwin (2009) continues by explaining that creating products that are accessible for all users requires a vast amount of research and hence, few companies are willing to make an effort to take into consideration marginal user groups. Instead, Goodwin (2009) recommends turning to existing guidelines, which also Begnum et al. (2019) highlight as a common tool when working on improving accessibility. The Web Content Accessibility Guidelines (WCAG) are the most popular standards for web accessibility and usually turned to at an early stage in the design process (Bigham, Lin & Savage 2017; Begnum et al 2019).
WCAG 1.0 was developed by the World Wide Web Consortium (W3C) in 1999 (Bigham, Lin & Savage 2017) to explain how web content can be made more accessible (Persson et al. 2015). WCAG 2.1 is the current version, released in 2018 (WC3 2018b). W3C is planning to publish WCAG 2.2 in 2021 (W3C 2018a). WCAG 2.1 consists of four principles (WC3 2018b). Within the principles there are in total 13 guidelines with goals to facilitate in creating accessible content for individuals with disabilities (ibid.). While the guidelines provide a framework, they are not testable like the success criteria which are provided for each guideline (ibid.). Furthermore, for each guideline and success criteria there are a mix of techniques: sufficient techniques that describe how to meet the success criteria and advisory techniques which surpass the very success criteria (ibid.).

The four principles presented in WCAG 2.1 are

1. *Perceivable*, contains guidelines on how to make texts more understandable. For example, providing alternative texts and possibilities to present content in different ways still including all information.
2. *Operable*, contains guidelines on making the interface components and navigations operable. For example, giving the user enough time to interact with the content and utilising sections as well as headings, helping the user to determine where they are.
3. *Understandable*, containing guidelines on how information has to be understandable. For example, by providing consistency in the layout to make the interphases predictable.
4. *Robust*, containing guidelines on how the content can be made robust enough for it to be accessible also on, among other, assistive technologies. For example, using complete markup tags and avoiding duplicate attributes.

### 2.4.3 User Experience

Established guidelines are important when designing for accessibility, but Begnum et al. (2019) advocate it is equally important to empathize with the end-user and have knowledge of the specific end-user group. According to Aizpurua, Harper and Vigo (2016) UX design might be one of the keys to making the online world more accessible, as there is an interplay between accessibility and UX design. *User experience* is defined by Garrett (2011, p. 6) as “the experience the product creates for the people who use it in the real world”, pointing out that the user experience is if something is easy or hard for the users, and also how the usage feels.

Thus, concerning the more intangible characteristics of a webpage, for example how the users feel when interacting with it, it is instead helpful to look at the web page through a UX perspective (Aizpurua, Harper & Vigo 2016). Also, Yesilada et al. (2013) underline that the accessibility focus needs to be UX centred and based on the needs of actual users. One way of assessing the more intangible characteristics is by
doing a UX and usability analysis (Arvola 2014). Arvola (ibid.) builds upon the usability framework by Löwgren and Stolterman (2004, cited in Arvola 2014), creating a prism of qualities to assist in analysis and to include different aspects of usability. Arvola (2014) writes that the prism facilitates in adapting different aspects for different situations.

The prism of usability consists of six aspects:

1. **Technical**, is how the product works from a technical aspect. This aspect should be present in the development process, but the users should not focus on the logics of the product extensively during usage.
2. **Practical**, is what the product can be used for. In this aspect the user focus is on the qualities of the content or the media the tool produces.
3. **Communicative**, is the usage in relation to others. This aspect includes how the usage of the product relates to others in the proximity of the user.
4. **Organisational**, is which role the product has in a flow. Here the product is viewed from afar, placing the product to be part of a larger context, further explaining why the product is being used.
5. **Aesthetic**, is the individual experience of the product. This aspect is present when the usage of a product does not have a practical purpose but rather the purpose is the experience itself.
6. **Ethical**, is the behaviour that the product creates or hinders. The aspect encompasses what kind of behaviours and norms the product encourages.

### 2.4.4 Overlap between accessibility, usability and UX

Closely related to accessibility is the concept of usability (Kleynhans & Fourie 2014). **Usability** can be defined as “the extent to which a system, product or service can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use” (the ISO-standard 9241-11:2017). A high level of usability smoothens the usage of the products and services for all users (Persson et al. 2015). When comparing the problems of sighted and blind users, Aizpurua, Harper and Vigo (2016) noted in their study, that 14% of the issues were shared, putting forward the idea of these standing for the overlap between accessibility and usability. However, accessibility and usability both need to be taken into account, as applications and websites otherwise can become accessible but barely usable – or the other way around (Aizpurua, Harper & Vigo 2016; Kleynhans & Fourie 2014).

Thus, to get the full picture of the web accessibility of a web page, a holistic approach could be argued for, where both objective characteristics of the web page are assessed normatively, with the help of, for example, guidelines, as well as considering the user’s subjective perception of these characteristics turning to usability and UX (Aizpurua, Harper & Vigo 2016). A designer should not use design tools and
knowledge unreflectively, but rather approach design situations thoughtfully, as each situation is unique (ibid.).

Yesilada et al. (2013) highlight that accessibility not only being applicable for and the issue of disabled users (ibid.). Similarly, Persson et al. (2015) argue that not only do individuals with disabilities benefit from higher accessibility – it is beneficial for everyone (Persson et al. 2015). Thus, by adapting a product to fit user groups with higher accessibility needs, the product will at the same time be more accessible for all users (ibid.).

2.5 Summary of literature study and theoretical application

Above the theoretical model utilised in the study, the Technology-to-Performance chain (TPC) has been presented. Furthermore, the most prominent concepts for the study have been discussed: visual impairment, assistive technology and smartphones, social media accessibility, as well as designing for accessibility, usability and user experience.

In this study, the definition of visual impairment is aligned with WHO (2019) as well as with the social model of disability (Kleynhans & Fourie 2014). This perspective is also in line with the framework proposed by universal design (Persson et al. 2015).

The theoretical model for the study is the technology-to-performance chain by Goodhue and Thompson (1995). Goodhue and Thompson (ibid.) argue that the outcome is affected by how well the technology fits the tasks the individual performs. Furthermore, the fit affects the expectations which in combination with other precursors affect the utilisation of the product, which affects the outcome (ibid.).

In addition to the theoretical model to explain the usage and utilisation of the platform, this study is positioned in the field of studies on visually impaired users of social media on mobile touchscreen devices. Due to the development of assistive technology smartphones have been made accessible (Khan & Khusro 2020) and both the devices as well as the screen reader technology have a central role in this study. However, neither of these will be assessed separately, but rather, the focus is on the accessibility issues when using screen readers in combination with a social media platform.

Designing for accessibility has also been discussed extensively. In this study UX is given a central role, keeping the user and the more intangible characteristics in focus (Aizpurua, Harper & Vigo 2016) with the usability prism by Arvola (2014) as a central framework.
3 Methodology

Below the research approach, selection, methods chosen and the analysis of the results are presented. Concludingly reliability and validity as well as the ethical aspects are discussed.

3.1 Research approach
The research question was answered by conducting qualitative research in the form of a case study (Chism, Douglas & Hilson 2008). A case study was deemed suitable, as the understanding of a specific case can lead to insights also applicable on other similar cases (ibid.). The methods for data collection were observations in combination with a product assessment, unstructured interviews with experts as well as semi-structured interviews with visually impaired users of an audio chat platform. Qualitative research methods being flexible (Chism, Douglas & Hilson 2008) and having an “emphasis [...] on discovery and understanding” (ibid., p. 22) fit the aim of the study and were therefore selected.

Throughout the study, ensuring methodological soundness was of importance (Chism, Douglas & Hilson 2008). Both reliability and validity were taken into account (ibid.). Reliability is the repeatability of the research (Thurén 2007), while validity indicates how accurate the findings are (ibid.). Furthermore, several ethical issues should be taken into consideration when conducting research (Chism, Douglas & Hilson 2008). In this study, of highest importance was not to cause any harm or discomfort for the participants during or as a result of the study (Goodwin 2009).

3.2 Data collection
Below the research setting for the case study is described, followed by the criterions in selection of the informants. Thereafter the data collection methods are presented. The study was initiated with observations and a product assessment of a live audio chat platform. Simultaneously, in the beginning of the study, the experts interviews took place. The user interviews were conducted last and make out the main data collection point of the study.

3.2.1 Research setting
The case selected for the study was the live audio chat platform Clubhouse. The platform allows for anyone to start a room that others can join for discussion. The speakers (and often also the moderators) partake in discussions, while individuals in the audience are listening to the discussions. A more detailed description of Clubhouse can be accessed in Appendix 1. Visually impaired individuals, including the participants in this study, use VoiceOver to access the Clubhouse application in general. VoiceOver is a screen reader that describes with audio what is visible or selected on the screen, allowing the user to navigate and interact with their iPhone
using different gestures (Apple 2021). A more detailed description of VoiceOver can be accessed in Appendix 2.

There were two reasons Clubhouse was selected as the case of the study. Firstly, Clubhouse was the biggest active live audio chat platform during the course of the study. Second, as Clubhouse had done many improvements regarding accessibility since launching, the platform had the potential to be particularly inclusive for visually impaired users if user experience was taken into account continuously in the development of the product.

3.2.2 Selection
The observations and the product assessment were conducted on Clubhouse described above. The interviews were conducted with expert informants as well as with visually impaired users of Clubhouse.

The experts were all working in the field of visual impairments and accessibility, some in governmental authorities, some in non-profit organisations and some in private organisations. Thus, criterion sampling was utilised for identifying the experts with the best possible fit and knowledge (Chism, Douglas & Hilson 2008). Age, gender and other demographic information was not deemed as important in the selection, as the sampling was done based on expertise.

The user informants were chosen by the criteria of living in Sweden, using Clubhouse and having a visual impairment that necessitated VoiceOver to use the application. Despite the sampling being close to convenience sampling (Chism, Douglas & Hilson 2008), as most of the informants were found by recommendations from other informants, the specific requirements made the selection that of criterion sampling (ibid.). The criteria set were deemed to lead to the richest possible on-topic data. Age, gender and other demographic information was not presumed as of importance in the selection of user informants. Rather, what was strived for was finding users who had been using Clubhouse for different amounts of time as well as defining themselves as having different levels of technical skills.

3.2.3 Implementation
The research approach is visualised in Figure 2. In the first part of the data collection phase observations and product assessment as well as expert interviews were conducted. The aim of the observations and the product assessment was to broaden the understanding of the case at hand, leading to more meaningful discussions and interviews (Aull Davies 2007). Furthermore, the insights of the observations were used to narrow down the focus of the study (Punch 1998, cited in Chism, Douglas & Hilson 2008). The aim with the expert interviews was further familiarisation with the field of visual impairment and accessibility, as well as discussing preliminary observations. The input from the experts was further of value to be able to take the needs of the user participants into consideration (Della Líbera & Jurber 2017),
especially since interviewing visually impaired users about their success with technology can be a sensitive subject (Qui, Hu & Rauterberg 2015).

Figure 2. Visualisation of research approach

The data collected from the observations and the expert interviews amounted to, after being analysed and fed back to the experts for feedback, a solid basis for the user interviews which constituted the second part of the data collection phase. The aim of the user interviews was to learn about which functionalities contributed to making Clubhouse more accessible to visually impaired individuals as well as identifying areas in the platform where the accessibility for visually impaired individuals was lacking or insufficient. There was also a broader aim to identify technological characteristics as well as other characteristics that contribute in making social media platforms in general more accessible to visually impaired individuals. As in-depth interviews render another type of information than casual observations (Goodwin 2009), the semi structured interview format was a good complement to the observations conducted early in the study. Thus, while both the observations and the expert interviews were of importance to understand the field better as well as add to
the findings in the user interviews, the emphasis of the study was on the user interviews as they enabled determining the user experiences and needs.

**Observations and product assessment**

The observations and product assessment were conducted from the start of the study, until the user interviews took place, spanning over five weeks. The observations took place when the platform was released in versions 0.1.31–0.1.33. Towards the end of the five weeks new observations had decreased drastically, suggesting that the data was saturated (Chism, Douglas & Hilson 2008). The notes taken were descriptive, explaining what was seen and heard (ibid.).

Observations were conducted on Clubhouse with the focus on user behaviour and interaction in chat rooms. The observations were not for collecting data on specific individuals, but to deepen the understanding of the product in general, to observe different ways of moderating rooms as well as to observe how users were contributing and participating in the audio chats. Thus, the number of individuals observed were not of interest. As there was no disclosure of the role of the observer, the observations were unobtrusive (Angrosino 2005, cited in Chism, Douglas & Hilson 2008). However, in so-called public space observations it is inevitably impossible to share with all individuals being observed that one is observing (Goodwin 2009).

As a complement to the observations of user behaviour, the usability of the Clubhouse application was assessed, altering between using VoiceOver and not using it, to get a better understanding of the perspective of the visually impaired users. By using the application with VoiceOver data on which information VoiceOver included and which information it omitted. As with the observations of user behaviour, descriptive notes were taken during the assessment of the application and its functionalities.

**Expert interviews**

The expert interviews were conducted with a list of topics and questions of interest as guidance (Appendix 3). The list consisted of 13 subjects, varying from more general questions on terminology on visual impairments and enquiries on assistive technology in use, to more particular questions on accessibility of social media and WCAG. Both the literature study as well as the insights from the observations and product assessment were used as a basis in defining a relevant set of topics and questions. Since two of the experts were Clubhouse users themselves, Clubhouse as well as the initial insights from data collection, were discussed with them. The interviews were conducted when Clubhouse was released in version 0.1.32.

Prior to the interviews, the experts were sent the list of subjects as well as an encouragement to raise any topics they wanted to highlight during the interviews. Thus, the interviews with the experts were rather unstructured, as this best supported the aim, allowing the informants to elaborate on the topics their expertise encompassed (Chism, Douglas & Hilson 2008). As typical for unstructured
interviews, there were topics of focus, yet not a set of questions gone through systematically (ibid.). Furthermore, the interviews had a clear starting point with an introduction, as well as ending in a wrap-up (Goodwin 2008). In the interviews with the experts more of a partner role was taken (Chism, Douglas & Hilson 2008), as initial observations, thoughts and ideas were shared.

Four experts were interviewed individually, each of the interviews taking approximately 30 minutes. One of the interviews was conducted over the phone while the rest were held online. The online interviews were recorded and transcribed, while the interview on phone supposedly was recorded. However, a malfunction of the recording device resulted in the interview instead being written down directly after the interview.

**User interviews**

The user interviews were conducted by asking a set of questions and follow-up questions (Appendix 8). The knowledge accumulated from the literature study as well as the insights from the observations, the product assessment and the interviews with the experts were used as a basis when formulating the interview questions. Furthermore, the TPC model by Goodhue and Thompson (1995) was kept in the centre. For example, TTF was central in the questions which regarded how accessible the different features when partaking in discussion were, while the theories of attitudes and behaviours were taken into consideration in the questions on which social media the users were using and why they preferred those. In addition to this, the seven principles of universal design were considered when creating the interview questions. For example, in the questions regarding suggestions on personal settings in the application, flexibility in use was reflected. In the questions about finding a balance between adding functions and at the same time not disturbing the user, simple and intuitive use was considered. The questions were also designed keeping in mind Goodwin’s (2009) advice “go beyond the product, but not beyond the design problem”: A major share of the questions were quite broad and open-ended to identify accessibility problems in general, encompassing accessibility of other social media and online meeting platforms. The interviews stretched over a timespan of three weeks and were conducted when Clubhouse was released in versions 0.1.32–0.1.36.

Initially the interview consisted of eleven main questions, however before the fifth interview some questions were dropped and some rephrased, leaving seven questions for the remaining interviews. The questions that were cut had not given much data of relevance. Furthermore, the updates of Clubhouse enforced revisions of the questions. Additionally, a suggestion made by an early user informant was deemed of interest and thus presented also to other informants for collection of their thoughts. Both the initial version as well as the revised version of the interview questions can be accessed in Appendix 7.
The interviews with the users were semi-structured (Goodwin 2009). In this format the interviewer leads the discussion based on predefined questions, but the interviewer can ask follow-up questions based on what the informant airs (ibid.). The user interviews clearly differed from the expert interviews: Chism, Douglas and Hilson (2008) suggest that the interviews can be categorised “based on the questions being asked, on the individuals being interviewed as well as on the structure of the interview itself, which affects how the data from the interviews is analysed”. In the user interviews the collection of the thoughts and the ideas of the informants were central (Chism, Douglas & Hilson 2008).

Ten users were interviewed individually, the number of informants chosen for collection of a sufficient amount of data (Nyberg & Tidström 2012). Each interview lasted for approximately 30 minutes. Eight of the interviews were conducted online while two of the interviews were conducted as phone calls. All interviews were recorded and transcribed.

3.3 Analysis

The initial thematisations of the data collection points were done separately. Thus, the results for the data collection points are presented separately in 4 Results. The reasons for this were two-fold. Firstly, the insights from the earlier data collections (observations, product assessment and expert interviews) were utilised in the following data collection (user interviews). Secondly, while the data collected in the earlier data collections had their place in the study, the user interviews were treated as the main data collection point. Thus, separately thematising the data collected in the user interviews assured for the user perspective to be kept in the centre.

The analysis of the observations as well as the product assessment was done with an interim analysis taking place throughout the observations and assessment of functionalities, gradually replacing them completely (Chism, Douglas & Hilson 2008). Furthermore, the observations and assessment started off as general, the continuous analysis narrowing down the focus (ibid.). The data collected from the observations and product assessment resulted in a list of features and behaviours. The data was categorised to find overarching themes (ibid.). The data not adding to answering the research question was deducted from the analysis (ibid.).

The transcriptions of the expert interviews were “chunked” for the core of each interview to be crystallised (Chism, Douglas & Hilson 2008). Thereafter the chunks were added to predefined categories. Using predefined categories leads to more of a shallow analysis, which was deemed suitable for the expert interviews (ibid.). The transcriptions of the user interviews were also “chunked” to capture the essence of what the informants were saying (ibid.). The answers were thereafter analysed in an affinity diagram with the goal of identifying overarching themes, allowing for them to arise from the material (Arvola 2014).
Concludingly in 5.1 Analysis of results the insights from all data collection points were examined jointly, also including the theoretical framework and literature study, albeit also here allowing the user perspective to take the main stage. Here the analysis was conducted with regards to TPC (Goodhue & Thompson 1995), leaning on firstly the Theories of Fit and following the Theories of Attitudes and Behaviour. TPC allowed for singling out which results were related to the fit of the product and which to the utilisation of it. Furthermore, both the different aspects of Arvola’s (2014) usability prism as well as the guidelines of universal design were leaned on to facilitate in encompassing different aspects of using the product as well as illuminate the intangible user perspective (Aizpurua, Harper & Vigo 2016).

Last the insights from all the points of data collection were used to formulate guidelines (Appendix 9) for what to take into consideration to make partaking in audio-chat based social media more accessible for visually impaired users.

3.4 Reliability and validity
Several measures were taken to increase the reliability, keeping in mind ensuring another researcher being able to repeat the same study under the same circumstances (Aull Davies 2007). Reliability is increased when the risk of coincidence is decreased (Thurén 2007). Thus, the narrow and clearly defined focus of the different data collection points affects reliability in a positive way. The expert informants were chosen by criterion sampling with defined requirements on their knowledge (Chism, Douglas & Hilson 2008), which heightens the reliability of the study (Thurén 2007). Also, the user informants were selected by criterion sampling (Chism, Douglas & Hilson 2008): visually impaired individuals in Sweden who use Clubhouse with the help of VoiceOver. Furthermore, the audit trails consisting of, for example, the interview questions accessed in Appendix 8, contribute to making research more transparent and allowing for the reader to draw their own conclusions (ibid.).

Higher validity is reached by triangulation (Lincoln & Guba 1985, cited in Chism, Douglas & Hilson 2008). Method triangulation (ibid.) has been in place as there were three methods for collecting data. As the study was conducted by two individuals, also researcher perspective triangulation has been in place (ibid.). Furthermore, as the interview statements were fed back to the informants, triangulation with the participants heightened the validity of the study (ibid.). Striving for a “shared understanding of the setting” (ibid., p. 32) knowledge was collected both via a literature study, observations as well as expert interviews.

3.5 Ethical aspects
Chism, Douglas and Hilson (2008) stress that there are several ethical issues which should be taken into consideration when conducting research. At the very basis is the reason for the researchers to be doing the study in the first place (ibid.): There was a genuine interest in adding to the knowledge of creating accessible platforms for the
visually impaired. Furthermore, in the analysis, the collected data was put together without enforcing results (Goodwin 2007).

However, with no-disclosure observation, ethical questions arise (Angrosino 2005, cited in Chism, Douglas & Hilson 2008). Nevertheless, observations on Clubhouse could be argued to be comparable to public settings observations (Goodwin 2009): The focus was on understanding the behaviours and the application in general and not on recording any personal data or the details of any single user. This was of importance, it being unethical to do so without disclosure and, furthermore, also against the Clubhouse Community Guidelines.

Before the interviews it was of importance to share information about the study with the informants (Chism, Douglas & Hilson 2008). Thus, both the aim of the study as well as how the data was to be handled was clearly presented (Appendix 4 and 7). Informed consent was obtained from all informants (Chism, Douglas & Hilson 2008). Furthermore, the informants were all sent the summaries of their interviews, for them to be able to go through if they had been understood correctly, keeping the relationship reciprocal (ibid.). Furthermore, confidentiality was strived for in the study (ibid.).

Treating the informants and the data collected carefully, not to create any discomfort was central in the study (Chism, Douglas & Hilson 2008), especially when it came to the user informants. Having the capabilities of using social media questioned can be a sensitive subject for visually impaired participants (Qui, Hu & Rauterberg 2015). This was addressed by clarifying that the focus of the interviews was on the technical functionalities and not on the individual’s technical skills. Another ethical aspect of utter importance was to take into consideration the needs of the users participating in the study, as pointed out by Della Libera and Jurber (2017). With this in mind, the interviews with the user informants were planned with special consideration and sensitivity to the communication being accessible for visually impaired users.
4 Results

Below the results from the three data collection points are presented. First the observations and product assessment results are shared after which the insights from the experts are disclosed. Conclusively, the visually impaired Clubhouse users’ realities, needs and wishes are displayed.

4.1 Observations and product assessment

The selective, somewhat unstructured observations (Angrosino 2005, cited in Chism, Douglas & Hilson 2008) in combination with a product assessment with and without the usage of VoiceOver led to findings on both the application as well as on user behaviour. In the two first weeks of observations, the interim analysis (Chism Douglas & Hilson 2008) showed that Clubhouse was quite popular among the visually impaired users as well as already technically quite accessible for the visually impaired. However, the interim analysis further showed that what seemed to be lacking was a more accessible way for visually impaired to actively take part in audio chats. Thus, from week three and onwards the focus was on the partaking in discussions.

The final categorisation of the data collected suggested that there were accessible and inaccessible behaviours as well as accessible and inaccessible features on Clubhouse. For further insights, the data collected from both the observations and the product assessment was placed in a matrix as shown in Appendix 5. Most prominently the results suggested that while Clubhouse was quite accessible when it came to the features, for example, almost all buttons were labelled on VoiceOver, it was the behaviour of the users and how they utilised the features which caused the most accessibility issues. Examples of this were how the mute button was used for both applause as well as asking for the floor, while VoiceOver only could state if one participant was muted or unmuted at a specific time. Nevertheless, there were also examples of the opposite: while knowing the name of the person speaking was unavailable on VoiceOver, the users’ behaviour of presenting themselves by name made the information available.

4.2 Expert interviews

Interviews were conducted with experts working professionally within the field of accessibility and visual impairments. Two of the experts were also active on Clubhouse themselves. The data collected was categorised and added to one of the following predefined categories: accessibility and design, the audio chat platform Clubhouse and preparation for the user interviews. Insights of each individual expert can be accessed in Appendix 6 in length.
4.2.1 Accessibility and design
Two issues with social media were highlighted by the experts: a heavy reliance on pictures as well as big and cluttered user interfaces. The experts stressed the need for social media platforms to be accessible as training on neither social media nor VoiceOver was provided by Swedish authorities. Regarding guidelines the experts stated that in comparison to other groups with disabilities, WCAG included many aspects important for visually impaired users. However, since WCAG is broad and general it also omits important aspects regarding accessibility for visually impaired. The experts recommended the following complements to WCAG: Best Practices, involving visually impaired users through the design process, usability tests, well thought through language, clear and uncluttered user interfaces as well as individual accessibility settings.

4.2.2 The audio chat platform Clubhouse
The Clubhouse using experts highlighted two positive aspects of Clubhouse: equitable use when partaking in discussions as videos were omitted as well as an uncluttered and functionality-sparse user interface. Problems aired about Clubhouse revolved to a large extent around actively partaking in discussions. For instance, it was hard to know who was talking; the number of individuals in the audience was not accessible when in a room; it was not possible to know when others flashed their mute buttons indicating they were applauding and the audio feedback for ‘raising hand’ and ‘joining on stage’ was the same. Furthermore, moderating rooms was deemed a bit tricky in general, one reason being it was hard to know when someone wanted to join on stage.

4.2.3 Preparation for the user interviews
The experts provided guidance for how to communicate with the visually impaired individuals to be interviewed. They clarified terminology regarding visual impairments and stated that expressions like “look at” and “see” could be used as visually impaired individuals use the same metaphorical language as sighted. Regarding technical aspects the experts suggested informed consent could be collected orally as forms can be inaccessible. Furthermore, they recommended getting acquainted with how Voiceover was used on Clubhouse.

4.3 Qualitative semi-structured interviews
The visually impaired Clubhouse users interviewed were between 26 and 60 years of age, the majority of them in their 30s. A majority of the interviewees were blind, while one could differ between light and dark and additionally, two had 1–3% sight left on either one or both eyes. However, all informants used Clubhouse with VoiceOver and needed the accessibility feature to comfortably use Clubhouse. The informants had been on Clubhouse from two weeks up to three months, however one of the informants had re-joined lately, having some prior experience. In addition to the interviewees’ familiarity with Clubhouse, they differed in their technical skill
levels, five of the informants being highly skilled VoiceOver as well as Clubhouse users, while the remaining five had moderate to basic level skills.

In the thematisation of the data, three themes surfaced. The first theme encompassed other social media and audio communication tools the informants used, here focusing on which platforms they liked and which they disliked, combined with the reasons for this. The second theme was Clubhouse more in general and specifically the reasons for the popularity of the live audio chat platform. The third theme was a combination of the current situation and the hopes for future development when it comes to listening and discussing in as well as moderation of rooms on Clubhouse. The third theme encompassing the biggest amount of data was further divided into the following sections: Information of one’s own actions in rooms, information of the other participants in rooms, information of who is talking in the room and introducing VoiceOver gestures, showing appreciation in the rooms, moderating rooms, settings menu and concludingly, activity section.

4.3.1 Using social media and online audio communication tools

“Video and pictures have become a bigger thing and it naturally makes it [...] harder to make it accessible”, one of the informants explained about social media. In addition to the visual point of dissent, another negative aspect aired was the social media platforms being too big and complex which made it hard to navigate and furthermore, raising the threshold to start using it in the first place: “When it comes to social media, it’s important it works easily from when one attempts to start using it” one of the informants said. Accessibility of social media was, furthermore, not constant, as the informants pointed out updates at time caused issues like removing labels of icons. Still, all the informants were using some other social media in addition to Clubhouse. The social media platform of their choice was dependent on what they were set out to accomplish as well as how accessible it was. Furthermore, what one is accustomed to was pointed out as a reason whether one prefers one platform over another.

Facebook stood out as the most popular: all informants used it regularly. Facebook was a place to turn to for community as well as for connecting with friends. A majority of the informants experienced the development of Facebook being attentive to the needs and requests of the visually impaired. Despite Facebook being popular, an informant pointed out it had become more difficult to navigate, it being a huge platform with many different features. However, one of the informants described how Facebook had integrated different kinds of VoiceOver gestures making liking, commenting and sharing quick and easy. In addition to this, four informants were using Facebook Messenger which an informant pointed out had well labelled icons and buttons. In relation to discussing messaging one of the informants pointed out how voice messaging had affected their life as recording a voice message was a convenient way of communication.
In addition to Facebook, Twitter was deemed quite accessible due to it mostly consisting of text, commonly used for finding information and articles. Instagram was less popular as was also Snapchat and TikTok, all platforms some users had tried but decided not to pursue further. These were not deemed as accessible by the informants as they to such a large extent were based on pictures and videos. Two of the informants explained that they at times did add photos to Instagram, but although taking and uploading pictures to Instagram was doable, they still needed the help of a sighted person to, for example, know what the photo they were uploading portrayed.

All informants were also using different kinds of online audio communication tools. Teams and Zoom stood out as the most popular tools, but in addition to these, three of the informants explained they had been voice chatting on Skype with both strangers and friends many years ago, although Skype in general was not popular amongst the informants anymore. Regarding Teams and Zoom, a majority of the informants used them for work, some due to changes related to Covid-19. Both were mentioned as compatible with VoiceOver, regarding which the informants stressed the importance of clearly labeled buttons. A feature in place for raising your hand when you want to ask for the floor in formal settings was also deemed as positive. One informant also exclaimed that hotkeys, for instance to mute one’s microphone, were very efficient in usage.

Regarding the online meetings the informants brought up that using them can be exhausting as one is expected to look into the camera during meetings. One informant explained that while sighted can see the visually impaired individual, for the visually impaired a Zoom call with video is just like a phone call, with the additional pressure of taking the camera into account, as was also brought up by another of the informants.

4.3.2 The popularity of the live audio chat Clubhouse

In general, the enthusiasm for the new platform Clubhouse was unmistakable. “Clubhouse has taken over my world” one of the informants said, “I’ve been waiting for this for 10–15 years, it’s amazing that we [who are visually impaired] finally can take ownership of what we are saying, just like anyone else. This is the first app where we can be truly integrated”. What the interviewee referred to was the fact that Clubhouse is sound based, which was discussed – and cheered for – in all ten of the interviews, several informants pointing out the potential with the format. “We’ve joked among friends we’ve wished there was something like Voicebook instead of Facebook, which is exactly what Clubhouse is” another informant told with a laugh, exhibiting delight for the format of live voice chats. In addition to the possibility of being fully integrated users, the informants mentioned several different reasons for them to be excited about the application for live voice chats: they liked communication by talking, they had missed talking with others and they felt talking opened up to possibilities for spontaneous conversations. Furthermore, the possibility
to listen in on topics of interest, finding new contacts with shared passions and networking were mentioned.

Several of the informants explicitly pointed out that Clubhouse was unique since it was not focused on the visual. Furthermore, two of the interviewees noted that they enjoyed Clubhouse since there was no camera to be taken into account, as compared to talking on Zoom or Teams. On the topic of visual elements, one informant discussed how there was no dedicated way of sharing photos or pictures on Clubhouse but pointed out that the users had found a method to do so anyway. The interviewee explained how Clubhouse users mid-discussion changed their profile picture to illustrate something and that way “shared” a picture. The informant continued by speculating that despite the lack of other current possibilities to share pictures, Clubhouse will probably add some feature for sharing pictures, since the pressure was there from the users, which was something the informant was not delighted about.

Nevertheless, as of now some of the informants had noted that the group of Swedish visually impaired users was growing steadily, pointing out that Clubhouse seemed to be favoured by this very group of users. “We who are visually impaired, we are usually not the first to start using some new social media”, one of them said, “but Clubhouse works for us”. A majority of the users had grown curious about Clubhouse after hearing about the application on the radio, in a podcast or from friends and colleagues. One of the informants pointed out that the emergence of Clubhouse was timely: they suggested the timing of Clubhouse was perfect as people during the pandemic have had the chance to get accustomed to talking over Zoom and Teams. This, while two of the informants speculated that the usage of Clubhouse might decrease after the social distancing due to the pandemic not taking place anymore. On the other hand, two of these interviewees continued by stating that Clubhouse has filled a place in many of the more isolated or lonely users’ lives, visually impaired users forming regular hang-out rooms. Furthermore, a few of the informants pointed out Clubhouse also was a place of information, as there were rooms dedicated to discussing and teaching usage of, for example, VoiceOver.

How well marked the different buttons and sections are for VoiceOver users was deemed by the interviewees to be another reason for the popularity of the application. The informants who discussed more in general the usability of the application mentioned that only a few buttons were unmarked, which meant one could guess what the unmarked buttons were used for. Nevertheless, there were issues too with the marking of buttons and sections: after an update some information was suddenly not available on VoiceOver anymore which two of the informants pointed out, as their interviews took place in the proximity of the update. “After the last update, I cannot see how many there are in the rooms anymore […], they’ve removed that information, and that’s a shame”. Another unmarked button mentioned by a few of the informants was the “Add new event” button. Also, a visual unclickable icon with a green house
in proximity to the club name was mentioned as unmarked, since the icon was referred
to in rooms when moderators encouraged room participants to follow the club
organising the room. Following other users and clubs are of importance to have a feed
of interest, which was the reason for the informant to highlight the accessibility issue
with the green house icon.

The success of Clubhouse amongst the visually impaired community in Sweden was
as speculated by three of the informants to be due to the low threshold: they all
explicitly pointed out how fast they had learnt to orient themselves on the application.
“Being so used to new applications [...] requiring some time to get accustomed to, I
think Clubhouse is quite easy to learn to use” one of the informants stated. This was
according to a majority of the informants first of all due to how simple and small in
size the application was. “The advantage of Clubhouse is that it’s really limited,
there’s not that many things one can do” one of the informants said, the six other
informants echoing this statement. “It’s simple, maybe even a bit too simple”, was
however the opinion aired by one of the interviewees. The simplicity and using the
few functionalities in place in creative ways as well as the lack of accessibility-related
features became particularly clear in relation to partaking in rooms, as elaborated in
the following section.

4.3.3 Partaking in rooms: listening, discussing and moderating
All informants had been listening to live chats and, furthermore, all of them also took
part in the discussions on Clubhouse. This, while only a few of them had moderated
discussions. Furthermore, all informants had input on how Clubhouse could be
developed further regarding accessibility. Below the findings regarding the
accessibility of both the actions of the users themselves as well as those of others are
displayed.

Information of one’s own actions in rooms
In general, the informants said one easily could take part of the topic of the room as
well as both join the room and “leave quietly”, as the icon for leaving a room was
labelled. However, when listening to discussions in smaller rooms, two of the
informants explained they at times felt they were asked to join the stage, despite their
wishes of merely listening to the discussion. Thus, they wished for a dedicated way
of signalling that they were there to just listen.

All the informants stated that in addition to listening they had been partaking in
discussions on Clubhouse, some in informal rooms, some also in bigger rooms with
stricter moderation. A majority of the informants explained it was easy to both enter
and leave the stage. The informants deemed the icons to be labelled clearly and
positioned on the bottom of the screen making it possible to use a VoiceOver gesture
to locate the icon. One of the early Clubhouse users explained that many
improvements had been made in the application since they started to use it: “In the
beginning, you couldn’t even join as a speaker [...] but it works much, much better now. Now you can do practically anything”. However, the double commando of first selecting the raised hand icon labelled “Request to speak, button” on VoiceOver and then, as the moderators had accepted the request, confirm again a popup with a button labelled “Join to speak, button” was by some of the informants deemed as unnecessarily complicated. In addition, or instead of, some of the informants thought it would be good for Clubhouse to have a dedicated sound for when one is let up on stage, as Clubhouse now was using the same sound for different functionalities.

While on stage the informants considered it easy to locate the mute/unmute icon as it was placed in the same place as the icon for requesting to join as speaker. However, accessing the mute/unmute was suggested to be made more accessible by adding a gesture for mute and unmute, combined with a sound notification which would confirm that the selection has succeeded. This way the users would not have to locate the icon on the screen to access it.

However, the mute icon was used for more than merely muting and unmuting: Users signalled a wish to speak by unmuting or slowly blinking with the mute button. “I often interrupt when talking, for example, because I haven’t been able to see that someone else has been blinking”, an informant explained, with close to all informants pointing out blinking with the mute button being inaccessible on VoiceOver. Thus, five of the informants felt a way to ask for the floor in combination with an accessible waiting list of speakers would be beneficial in rooms more strictly moderated. The informants concluded it could be the moderators who would choose if the room had a list of speakers or not. In combination with the list of speakers, two of the informants elaborated further that when it was one’s turn to talk, there could be a small sound notification, informing of one’s turn arriving.

Information of the other participants in rooms
A drawback of the ease of entering and leaving the rooms was that the informants did not know when someone else entered or left neither the room nor the stage. Furthermore, they did not effortlessly have information of how many participants there were in the room in total.

Adding the information of the number of participants in the room in total as well as the number of participants in each section of the room was something all ten interviewees wished for. According to them this would lessen the need to jump back and forth to the hallway to know the size of the room, the discussion being interrupted by VoiceOver. Furthermore, it would give them better insights of the movements within the room. Also clarifying the sections by dividing the stage into “moderators” and “speakers” as well as in the titles of the section mention if it is the “stage” or the “audience” was requested, since two of the informants pointed out the layout of the room was not clear to them as they could not see if the individuals in the room had a
moderator or microphone icon next to their picture, as an indicator for them being on stage.

To further clarify the movements of the other participants, eight of the informants wished for VoiceOver to react to someone entering the room. “When you can’t see you are dependent on all the time actively checking if someone new comes into the room” one of the informants explained. Regarding VoiceOver information of when someone leaves the room, the opinions were divided. While some of the informants liked the suggestion for them to better keep track of who still was in the room, the majority preferred Clubhouse the way it was now. However, the informants thought it would be good if VoiceOver would announce when someone enters or leaves the stage. One of them elaborated this would be good for knowing the name of someone new joining the discussion, while another pointed out it is good to know when someone leaves for one to not continue the conversation with that participant.

A worry all informants uttered when discussing VoiceOver reacting to the users’ actions in the rooms was that the ongoing discussion would drown in the constant VoiceOver announcements. This was throughout the discussion the reason why some of the informants did not want an action to automatically be included on VoiceOver. Especially in big rooms, where users entered and exited frequently both the room and the stage, the informants pointed out that VoiceOver would take over and be more of disturbance than assistance.

The informants had different suggestions of how to limit the amount of VoiceOver communication. One suggestion uttered several times was to relate the room size to the amount of information conveyed on VoiceOver while another suggestion was that the information could be limited to individuals one followed. However, in the discussion with the informants, they concluded that the wishes they have depended on their role in the room as well as the characteristics of the conversation. Furthermore, some of the informants pointed out that among the visually impaired users the user skills and needs vary, and therefore the possibility of adjustments to the level one wishes was of importance. Thus, settings were something that came up during many parts of the interviews.

As an option to the VoiceOver saying the names of the users the informants were positive regarding Clubhouse to utilise sound to a larger extent. In general, sounds were experienced as a good substitute for VoiceOver, as sounds can be much shorter. However, as with VoiceOver feedback, the majority of the informants were worried there was the possibility of too much sound feedback, to the point of it being disturbing. Furthermore, usage of different sounds was highlighted as a balancing act: “There is a risk that if there are too many notification sounds, you can’t remember them all. ‘What was that sound again?’”
**Information of who is talking in the room and introducing VoiceOver gestures**

Someone unmuting their microphone was something three informants thought would be good to be informed of while some users had solved it by using the “watch” functionality on VoiceOver. The reason for wishing to know who unmuted was both related to recognising who wished to speak next but also to knowing the name of the current speaker since this was not accessible to the VoiceOver users throughout the study. The informants explained it was important to know who was speaking both when they were listening as well as when they themselves were partaking in discussions. Furthermore, several of the informants pointed out it was important to be able to follow interesting speakers as it affected the content of Clubhouse and in order to do that they first needed to know who the speaker was.

The information of who was speaking was visually shown on the screen throughout the study, but it was not accessible on VoiceOver until the update 0.1.35 which included the magic tap gesture for VoiceOver to say the name of the person currently speaking. Five of the interviews were conducted before and five after this Clubhouse update. Of the five informants interviewed before the update, all stated they sometimes knew who was speaking and sometimes not. According to some of the informants they were dependent on if they could recognise the voice of the person talking or if the person presented themselves. Furthermore, as mentioned, a few of the interviewees used the “watch” feature of VoiceOver to know if someone unmuted themselves to figure out who the speaker was. However, the method was not flawless. In general, all the “clicking around” when attempting to identify the person talking was surfaced as stealing the attention away from the conversation.

Since the update with the possibility of finding out the name of the one speaking with a magic tap, all five informants this was discussed with mentioned they were excited about the addition. “If you would have asked me just a few days ago [what I’m missing on Clubhouse] I would have said it’s a shame you can’t see who’s talking” one of the informants said. For a majority of the informants the magic tap announcements worked well. However, for two of the informants the magic tap gesture was not working as expected, the VoiceOver not announcing the name of the speaker or the gesture starting other applications in the background.

Still, despite knowing the name of the speaker there was no straightforward way of following the participant, as explained by the informants. It was difficult to identify who the speaker was on stage, especially if there were many participants on stage, some of them possibly with the same name or being unmuted at the same time. Another informant explained that if they knew the name, they could search for the person, however, they pointed out different spellings of the same name or speakers with the same name still made it difficult to find the right person to follow. When attempting to find the speaker to be able to follow them, the participants stated that
there at times was too much audio feedback from VoiceOver, disturbing when listening to the ongoing discussion on Clubhouse.

Thus, despite the addition of the magic tap gesture a need remained: to be able to follow the person talking. Prior magic tap one informant suggested that the person currently talking could automatically be moved to be on top of the page, where one could focus the VoiceOver if one wanted to access the participant. After the magic tap was introduced, the informants suggested VoiceOver gestures could be utilised further. “For example, [following the magic tap gesture] one could pull down to get options, like follow” for the participant selected, one informant suggested, adding that there could be a whole menu, with, for example, the options “view”, “show” and “follow”. Other informants expressed ideas in line with this, suggesting their own combinations of gestures and the actions related to them.

In general, several of the informants mentioned how Clubhouse specific VoiceOver gestures had not been implemented. The informants explained that without gestures in use icons and features on screen had to be located for access. With gestures, this could be avoided, and it would save time from the informants. One informant furthermore elaborated, that if they could perform actions faster, they would listen to the VoiceOver less and hence the discussion would not be disturbed to the same extent. Furthermore, the more advanced rotor function used for shortcuts was also brought up by one informant, as completely unutilised on Clubhouse.

*Showing appreciation in the rooms*

A dedicated way of applauding was requested by the informants, as applauses were conveyed by rapidly blinking with the mute button. Nine of the informants wished for a way to react and be reacted to, possibly with different kinds of reactions, while one liked that Clubhouse was a like-free zone. The informants were torn between letting everyone in a room applaud or only allow it for the ones on stage. The worry was related to how the visually impaired users would be able to access the applause: “The risk is, that if also the audience can applaud, and there are 1200 individuals in the audience and someone says something amazing, that’s gonna be one heck of a hullabaloo if the VoiceOver reads the names of everyone who has applauded”. Furthermore, when contemplating if one should be able to hear both the applause oneself received as well as the ones others received, the informants were yet again divided, as they worried that there would be too much disturbance from hearing the applause, despite some of them being interested in receiving as much feedback as possible.

Related to this, the informants also discussed how they would like to take part of the applause: while some wanted VoiceOver to say the name of the participant applauding, others deemed it to be enough information to know there were applause,
while some wished to know how many applauded. Also sounds and vibrations were mentioned as alternative ways to convey applause taking place.

**Moderating rooms**

Six informants stated they had been moderating rooms. The role of the moderator, as presented earlier, was more of importance in the stricter rooms, where there was a predefined subject and one or several moderators who handed out the floor.

The informants who had moderated in more strict rooms explained that one can moderate by oneself or together with others. Several informants explained that when moderating together they usually had divided the responsibilities: one moderator was talking and answering questions, one moderator was inviting people to the stage and presenting them while one moderator was moving people who had said their piece back to the audience. According to the informants this arrangement worked smoothly since when moderating alone one had to simultaneously focus on all parts. One informant stated: “If you have to click around and invite people to the stage and send them down you can miss out on a lot of what is actually being said in the group as you have the [VoiceOver] speech going on at the same time”. Moderating together, however, had some drawbacks too, as one of the informants explained how it at times was difficult to keep track of, for example, if the other moderators had let someone up on stage. This was partly due to, as a few of the informants pointed out, there being some issues with the popup moderators were presented with when someone in the audience had asked to join on stage: while some of the moderators could hear a sound from the request, others could not, and thus, according the informants, speakers were at times let up on stage without their knowledge.

Regarding letting people who had raised their hand up on stage there was another accessibility issue as well: the informants explained that there was a popup visible on the screen, when someone in the audience raised their hand, however, it was unclear to the informants what the popup contained. Some of the informants guessed that there was a separate popup for each person requesting to get up on stage, some pondered if the popup contained all the ones who had raised their hand. Furthermore, the popup only showed for a short time, which annoyed a majority of the moderating informants. Thus, the popup was deemed redundant unless it was developed further since the information of the participants with raised hands also was accessed in another menu in the room.

Several informants pointed out how moderating could be made easier if there would be gestures, for example, for muting a speaker or for moving them to the audience: “Locate the speaker, swipe up and down, receive the options and select”, one of the informants suggested.
Settings menu
As mentioned in the sections above, the informants wished for several different actions and movements to be announced on VoiceOver: entering and leaving a room, joining and leaving a stage, unmuting, applauding and information of one’s turn to talk. However, as the actions wished for would be announced on VoiceOver or by sound, the informants deemed them as possibly disturbing while partaking in the rooms. In general, the informants stated that the issue when using VoiceOver on an audio platform was that one often had two voices in one’s ears. Hence, the informants were torn between receiving the information they wished for, and not wanting to be disturbed by the information.

Some suggestions for limiting the VoiceOver feedback were put forward by the informants, however, the most popular of them all was adding individual user-based settings and the possibility to choose the level of feedback. The feedback could be either VoiceOver or sound. Out of the ten informants, eight of them felt this was the best way of regulating how much information they would be receiving. The informants recognised that, first of all, they themselves had different needs in different rooms: the differences in wishes to hear information was related to the size of the room; the other participants present; the format of the room being more or less formal; the informants focusing solely on the conversation at hand or if they were doing other things simultaneously as partaking in a room on Clubhouse. Furthermore, their role in the room, meaning if they were listening, speaking or moderating, also affected the amount of information they wished for. Additionally, several of the informants reflected on how their personal needs and preferences might differ from what information other visually impaired users would like to receive.

As discussed with the informants, there could be an “Accessibility settings” section located in the user’s profile or there could be a settings section for each room. One of the informants suggested there would be both, where the room settings would be temporary, for merely that particular room, while the settings in the profile would be the default. The informants wished that the accessibility settings would make it possible for them to individually select which information they wanted to hear and what information they did not want to hear. However, some of the interviewees pointed out that the accessibility settings might become quite complex, and thus suggested there would be a few different pre-set levels that less advanced users could select from. Furthermore, one informant stressed the importance for clear headings in the settings, for it to be easily navigated with the help of VoiceOver.

Activity section
An activity section as a complement or alternative to accessibility settings in the room was suggested by one of the informants and discussed with an additional four of them. The informant explained that VoiceOver can be set to automatically read out changing information. Hence, the informant suggested that if the information of people
applauding, coming or going, would be shown on a dedicated part of the screen the visually impaired user could navigate to. When the users would have selected the “activities” section the information would be read out loud, while the users could leave the section if the VoiceOver started to overpower the discussion. The other informants who this was discussed with agreed with this idea as a self-regulating way of accessing information only when one wished to. One of the informants suggested the information would be accessible in the activity section for only a limited time, after which it would be replaced with new information, while another thought they might want to view only certain information in the activity section, having the possibility to individually set which content showed up and which did not.
5 Analysis

Below the joint result with the user interviews in the centre is analysed with the Technology-to-Performance Chain as the framework. First jointly, from an overarching TPC perspective and then turning to firstly the technologies of fit and secondly the theories of attitudes and behaviour.

5.1 Analysis of results

In general, the results highlighted both functionalities that were popular, accessible and fit the users well, as well as functionalities that were out of reach for users relying on VoiceOver. Furthermore, the results encompassed suggestions of how to make social live audio chat platforms more accessible for visually impaired users. Additionally, the results indicated the reasons behind utilisation.

In this study Technology-to-Performance Chain (TPC), a model combined of Task-technology-fit (TTF, also called Theories of fit) and Theories of attitudes and behaviour, is used to assess how well the current technology fits visually impaired users to partaking in audio-chats on Clubhouse as well as the reasons behind the utilisation of Clubhouse. Thus, placing the results in the model, the tasks were partaking in discussions, the technology was Clubhouse and the individuals the visually impaired users. Since the data collection focused on accessibility, the TTF is how accessible the product is. Further, the TPC model proposes TTF affects both the performance directly as well as the expected consequences of utilisation. Other precursors of utilisation affecting are social norms, habits as well as facilitating conditions, these according to the results being, for example, other visually impaired users and the current widespread social distancing. In addition to TTF, also utilisation affects the performance, being the outcome of visually impaired individuals partaking in the discussions on Clubhouse, which feeds back to both the theories of fit as well as the theories of attitudes and behaviours, affecting both TTF and utilisation. (Goodhue & Thompson 1995)

Looking at the features currently implemented an answer to what influences accessibility to successfully partake could be drawn: the results indicated that features with a high TTF were accessible while features with a low TTF were inaccessible. Furthermore, suggestions of features to implement indicated how TTF could be heightened. The TPC model is further applied and exemplified in the following sections. Goodhue & Thompson (1995)

5.1.1 Theories of fit

One technical aspect (Arvola 2014) of the accessibility of Clubhouse affecting TTF positively (Goodhue & Thompson 1995) was the limited scope and clear sectioning: the user informants pointed out that they had learnt to orient themselves on Clubhouse quite rapidly, due to the platform consisting of a limited set of features as well as
clearly labelled buttons, something also noted by the experts and in the product assessment. This contrasts to Whitney and Kolar (2020) who identified social media consisting of cluttered pages and vast amounts of information complicating usage for visually impaired individuals.

Furthermore, the visually impaired users experienced inclusion and independence when using Clubhouse as the practical aspects (Arvola 2014) of producing and taking part of audio content in itself did not necessitate the use of assistive technology. Thus, while Qui, Hu and Rauterberg (2015) stated blind individuals are more on the receiving end when taking part of social media, the results of the study are more in line with Wu and Adamic (2014) who concluded that on Facebook visually impaired users create as much content as sighted. Therefore, in the audio chat rooms on Clubhouse, the prominent technical aspect was that the users could produce content without the help of sighted and to a lower extent rely on assistive technology (Arvola 2014): Clubhouse was popular since the users deemed they could have ownership of their actions as the core communication was conducted by talking, rendering in high TTF (Goodhue & Thompson 1995). Due to this the users experienced they could be truly integrated and on equal ground with sighted Clubhousers, which is in line with universal design (Persson et al. 2015).

This was further facilitated by, in comparison to Teams, Zoom and other online tools for voice communication, there being no camera to be taken into account on Clubhouse, a fact both experts and users highlighted as accessible. This technical aspect (Arvola 2014) heightened TTF (Goodhue & Thompson 1995). On the other hand, the results from the user interviews also suggest that, in tandem with an increased usage of video conferencing tools during the Covid-19 pandemic, partaking in discussions on Clubhouse had made the visually impaired users more comfortable using voice media. This adheres to Narcisi and Alspach (2020) stating that video conferencing tools like Zoom and Teams have grown exponentially during the pandemic.

Della Libera and Jurber (2017) showcased how students preferred WhatsApp over Facebook since WhatsApp relied on text and audio, while images were less common. In line with this, Clubhouse not being image-centred in general was a positive technical aspect (Arvola 2014), as according to the visually impaired users. Carey (2007) and Babu (2014) point out how sight-centred the content online is and according to Wu and Adamic (2014), visually impaired users interact less with photos than sighted users, as photos make social media less accessible for the visually impaired users. This relates to how the users interviewed in this study clearly were less active on social media platforms with a heavy visual focus, for example, Snapchat, Instagram and TikTok. Both the users and the experts pointed out that several of these applications were difficult to master due to a visual impairment. Thus,
being not image-centred made the technology more accessible and fit the individuals in performing their tasks (Goodhue & Thompson 1995).

Nevertheless, the findings of the study indicated that the visually impaired users partaking in discussions was the achilles heel of Clubhouse, in other words, the part of the technology that was not as accessible as it could have been and did not fit the users (Goodhue & Thompson 1995). In general, partaking in the rooms worked from a technical aspect on a satisfactory level (Arvola 2014) as it, for example, was easy to join and leave the stage. However, all the interviews eventually surfaced issues the users wished would work smoother. Many of these issues were related to the visually impaired having an understanding of what sighted users could see in the interface and wanted to have access to the same information: participants joining the room and the stage as well as leaving them. Thus, the case was not as in Whitney and Kolar’s (2020) study, where the visually impaired users felt they were missing out on information as they were not aware of the content inaccessible, but rather the opposite. Therefore, some of the issues with the fit were related to the user interface was not transmitting crucial information on VoiceOver but which was accessible on the screen, therefore not adhering to the equitable use of universal design (Persson et al. 2015). However, the results also indicated that the combination of audio-based media with VoiceOver could be a technical aspect of disturbance rather than that of assistance (Arvola 2014), this affecting TTF and the performance outcomes negatively (Goodhue & Thompson 1995). Thus, to solve the accessibility issue and heighten TTF the users suggested individual accessibility settings (ibid.).

One of the identified prominent accessibility issues was that of knowing who was talking in a chat room. Clubhouse did mid-interviews implement a VoiceOver gesture for the visually impaired users to know the name of the person talking, nevertheless not fully solving the technical aspect (Arvola 2014). According to Hakobyan et al. (2013) as well as Khan and Khusro (2020) implementing and using assistive technology paves the way for the independence of visually impaired users. However, as the VoiceOver gesture implemented did not fulfil the subjective needs of the users, the TTF regarding this specific performance in partaking in the discussions was low (Goodhue & Thompson 1995). Furthermore, since the content in the feed being based on who one follows, the experience of the audio platform was impacted. To increase the TTF, the results indicated that Clubhouse should implement more VoiceOver gestures, to allow for equitable use (Persson et al. 2015).

The partaking in the discussions was further complicated by the users having taken the matters into their own hands: while accessing the mute icon was not an issue of a technical aspect it indeed was that of a practical, since the mute icon was utilised for applauding and asking for the floor (Arvola 2014). Thus, to heighten the TTF dedicated features for both applauding and asking for the floor were suggested, these furthermore, being accessible on VoiceOver. Similarly, the possibility to add a profile
picture was used in a manner which made it inaccessible: the users added other photos, than those of themselves as profile pictures as there was no other dedicated way of sharing pictures. Thus, some of the accessibility issues with partaking in the discussions were related to how the application in practice was used creating an unforeseen accessibility issue with the user interface (ibid.). The lack of a like button on the platform might be a conscious choice, and thus a way of forming the ethical aspects of using the product (ibid.). As one of the informants put it, the social media is to a large extent focused on collecting likes, something Clubhouse might be going against. Nevertheless, as elaborated above, the users still have found a way to show appreciation, making it inaccessible in the process.

5.1.2 Theories of attitudes and behaviour

Bigham et al. (2007, cited in Khan & Khusro 2020) pointed out that blind users avoid engaging with content they on beforehand deem to be hard to access. In contrast, since TTF was high, the expected consequences of utilisation among the visually impaired Clubhouse users were positive which resulted in favourable attitudes (Goodhue & Thompson 1995). As TTF was high, the expectations were to a large extent fulfilled, thus leading to the amount of visually impaired users on Clubhouse growing (ibid.).

This on the other hand created a social norm for more visually impaired users to join (Goodhue & Thompson 1995). Of the users interviewed, many mentioned they had joined Clubhouse since a friend or colleague to them had spoken highly of the platform, which led to many of the user informants mentioning having positive expectations even before starting to use the platform (ibid.). Thus, this indicated that communicative and practical aspects to be of importance in regards of utilisation of the platform and partaking in the discussions (Arvola 2014).

The joint results further indicated that there were communicative aspects (Arvola 2014) on Clubhouse as it had become a platform for community among the visually impaired. In general, Gruzd and Haythornthwaite (2013) point out social media has an important position in creating community, and a heightened so due to increased usage because of the current social distancing (GlobalWebIndex 2020a). Thus, there were facilitating conditions in place, which heightened the utilisation of the platform (Goodhue & Thompson 1995). Since Clubhouse according to the results became a place for community where the users also hung out and spent time with each other, it had become a habit, which further affected utilisation (ibid.).

Furthermore, some of the users also pointed out that Clubhouse was a place for sharing information and advice regarding assistive technology, further elevating its position in the lives of the visually impaired users and creating facilitating conditions (Goodhue & Thompson 1995). This need for and importance of user training is also reflected in both expert statements and previous research by Smaradottir, Håland and Martinez (2018), as the support is needed in mastering usage of smartphones, albeit
at times inaccessible. Although VoiceOver has been deemed to function intuitively, there were gestures Smaradottir, Håland and Martinez (2018) brought up being difficult to master. This also became clear in the user interviews, where the more technically advanced users had come up with more ways of utilising VoiceOver, which they themselves deemed too difficult for most VoiceOver users to use on Clubhouse. Thus, a part of the popularity of Clubhouse among the visually impaired could also be that the visually impaired users receive support from each other in usage of the platform, which makes usage smoother, which feeds back as increased utilisation (Goodhue & Thompson 2014). Furthermore, the partaking in the discussions was deemed meaningful in the sense that topics of interest as well as knowledge were shared, adding to the communicative aspects (Arvola 2014).

Other facilitating conditions (Goodhue & Thompson 1995) were those of the current circumstances: According to Coyle, Steinman and Chein (2016, cited in Whitney & Kolar 2020) visually impaired individuals are in general more likely to get isolated while the Covid-19 pandemic added to it (Geirdal et al. 2021). This also partly could explain the popularity and utilisation of Clubhouse among the visually impaired. Social media in general can facilitate feelings of social connectedness (Bradley & Poppen 2013) which the joint result from this study also indicates.

Thus, the joint result indicates that, apart from practical purposes of making connections, listening to interesting topics and learning about VoiceOver (Arvola 2014) the mere experience of using Clubhouse is an important factor for the platform’s popularity. Thus, the experience of Clubhouse contrasted with that of other social media and video conferencing tools. Therefore, while Whitney and Kolar (2020) presented interacting with social media platforms being both difficult and time-consuming for visually impaired users, leading to usage being less relaxing for them, Clubhouse distinguishes itself from this aspect. The positive experiences of using the platform included ease of use, feeling relaxed, included and independent. Therefore, the results indicate that the performance impact does feed back to heighten utilisation (Goodhue & Thompson 1995).
6 Discussion

Below the results of the study are discussed. The results are positioned within the introductory background as well as in relation to the theoretical framework. Concludingly, a reflection of the methods takes place.

6.1 Discussion of results
At the time of the study a new type of social media was on the rise: the live audio chat platform (Mosen 2021b). If platforms of this type take accessibility for visually impaired users into account, they have the potential to be particularly inclusive for this group since the core format, audio chats, is not sight-based. However, previous studies acknowledge visually impaired users in combination with accessibility of social media in particular and the Internet in general as an unexplored field of study (Wu & Adamic 2014). Therefore, this study aimed to create a better understanding of the subjective user experience of visually impaired users of social live audio chat platforms by identifying what influences accessibility, especially when it comes to taking part of and creating audio content.

6.1.1 Accessibility for visually impaired
The analysis concluded that the results of the study encompassed both patterns regarding the fit of the technology, adhering to how accessible the platform was. Additionally, there were patterns indicating reasons for utilisation. (Goodhue & Thompson 1995)

Fit of audio-based platform
Partaking in the discussions, carried out by the visually impaired users was facilitated by the social live audio chat platform, indicating that the TTF was fairly high and thus, resulting in a positive impact on the performance (Goodhue & Thompson 1995). Several of the indicators for accessibility were heavily based on the technological and practical aspects (Arvola 2014). The results indicate that the core content having a limited scope and being audio-based influence accessibility positively, which is in consonance with the results of Whitney and Kolar (2020). Thus, while Qui, Hu and Rauterberg (2015) came to the conclusion that visually impaired do not create as much content on social media, the results of this study are more in line with those of Wu and Adamic (2014), suggesting for visually impaired to be fairly active on live audio chat platforms. The results further indicate that visually impaired users deem to have ownership of their actions on voice based social media and thus can partake in the discussions on equal terms with their sighted peers, also adhering to universal design (Persson et al. 2015).

Thus, the results are in line with Della Libera and Jurber (2017), who state visually impaired users partaking in their study preferred WhatsApp over Facebook due to the former relying on text and audio. Social media has had a prominently visual
focus, built on sharing images and videos, making social media less accessible for visually impaired users (Della Líbera & Jurber 2017; Qui, Hu & Rauterberg 2017; Whitney & Kolar 2020; Wu & Adamic 2014). Therefore, the joint result showcased how going against this was attractive amongst the visually impaired users, as was the lack of incorporating video. Downplaying the visual and letting the voice chatting take main stage thus seems to play a big part in the fit and accessibility of a social media platform.

However, the results further implicated that a limited set of features also can lead to accessibility issues: if the number of features is limited and the users can become creative in utilising them, this can lead to practical aspects becoming an issue with accessibility (Arvola 2014). Thus, the results indicate that the organisations behind the platforms should keep in mind that also ethical aspects can influence accessibility if the users take matters into their own hands (ibid.).

Furthermore, the results showcased how visually impaired users might be fully aware of the content they are missing out on, in contrast to the implications made by Whitney and Kolar (2020). The users to requested for the same to be made accessible for them on VoiceOver is in line with universal design (Persson et al. 2015). Nevertheless, the results also indicated the complexity of combining an audio-based platform with usage of VoiceOver: the technical aspect (Arvola 2014) of hearing both discussions and VoiceOver information at once, creating a need of the possibility to set up individually the amount of VoiceOver feedback.

**Utilisation of audio-based platform**

However, based on the feedback loop from the performance impact, the results implied that in line with TPC as the partaking on the audio chat platforms in general was successful, the individuals chose to return as users (Goodhue & Thompson 1995). Furthermore, as the results indicating the TTF was high it also positively affected the expected consequences of utilisation, which additionally was affected by other precursors of utilisation (ibid.). Della Líbera and Jurber (2017) point out that the social media singled out to be used are the ones which are deemed accessible, while Bigham et al. (2007, cited in Khan & Khusro 2020) explain blind users prefer not to engage with content which initially is deemed hard to access. The results indicate that social norms like the platforms being popular among the visually impaired users affect utilisation positively (Goodhue & Thompson 1995). Thus, the suggestions and opinions of visually impaired peers play a big role in the choice to utilise the audio-based platforms in the first place.

Other facilitating conditions for utilisation were the fact that the study was positioned in a time when usage of social media was growing (GlobalWebIndex 2020a) at the same time as the Covid-19 pandemic forced people into isolation (Gruzd & Haythornthwaite 2013), an aspect which surfaced also in the results. Thus, social
media moved from being entertainment to a place for connection (GlobalWebIndex 2020b), which was further supported by the results the study rendered. The results suggest that the social media platforms become a place for creating community, which is in line with Gruzd and Haythornthwaite (2013).

6.1.2 Designing for accessibility

Guidelines, like WCAG, are a popular and often utilised starting point when designing for accessibility (Goodwin 2009) but it is equally important to empathize with the user and have knowledge of the user group (Begnum et al. 2019). Aizpurua, Harper and Vigo (2016) state that a UX perspective could be of value for identifying intangible characteristics, for example, the feelings of the users. The results of this study highlight how insights can be derived when turning to a subjective experience of the visually impaired users, which is in line with Yesilada et al. (2013). UX perspective makes it possible to pinpoint intangible characteristics of the subjective user experience as it allows for the users elaborate on their wishes and feelings in relation to usage, rather than merely assess if a functionality is accessible or not, as has been shown in the results.

Due to there being a lack of studies focusing on the UX perspective of web accessibility for visually impaired (Nogueira & Ferreira 2018), this study builds upon the sparse knowledgebase. Specifically, the study adds to the knowledge of what it is that influences the accessibility of live audio chat platforms for visually impaired users. The knowledge can help to promote the independence of visually impaired users (Hakobyan et al. 2013), to contribute to design allowing for visually impaired users to take part of the social platforms of their choice (Whitney & Kolar 2020) and facilitate for visually impaired to participate in society of equal terms as their sighted peers (UN 1948; UN 2006).

For the results to be more tangible, they were concluded in guidelines, accessed in full in Appendix 9. The guidelines can be utilised, for example, in combination with a normative assessment, for a holistic approach, as advocated by Aizpurua, Harper and Vigo (2016). Furthermore, the guidelines are a more hands-on addition when adhering to concepts like universal design (Persson et al. 2015). In general, the guidelines heavily lean on the social model of disability, which has as its goal to remove barriers and advocate for inclusion, still acknowledging the impairments creating obstacles for the individuals (Seale 2006, cited in Klynhans & Fourie 2014). The four sets of guidelines contain different aspects of importance, from more general issues which affect accessibility to accessibility issues specifically regarding partaking and moderating audio chats. The guidelines also encompass that they do not exist in a vacuum: there is an existing body of knowledge regarding accessible design which should be utilised (Begnum et al. 2019).
6.2 Reflection on methods

The literature study grounded the study in previous research within the field while the TPC model provided a perspective on the relation between the technology and the utilisation of it. The field of the study was defined beforehand to decrease the risk of the result being affected by coincidence (Thurén 2007). However, the literature study consisted of too many articles. Ideally, it would have consisted of a smaller number of articles even more relevant for the study.

Conducting the research as an instrumental case study (Chism, Douglas & Hilson 2008) rendered data of value regarding fulfilling the aim of the study. The qualitative approach rendered results emphasising understanding (Chism, Douglas & Hilson 2008), keeping the subjective point of view of the visually impaired users in the center of the study. Nevertheless, a combination of qualitative and quantitative research methods would have increased the validity of the study (Thurén 2007).

For the data collected not to be affected by coincidence and thus, lower the reliability of the study (Thurén 2007), the populations from which to draw informants were clearly defined beforehand. However, making the criteria even stricter would have affected the reliability positively. For instance, the level of visual impairment (WHO 2019) could have been more clearly defined, since the study did not take into account whether the informants were blind or not. Also, age and technical skill level could have been used as additional criteria. Nevertheless, the user demographics were described for transparency, which increases the reliability (Chism, Douglas & Hilson 2008).

The research methods, observations and in-depth interviews, were chosen to fit the aim of the study. Triangulating different types of data collection methods increases the validity as different sources can represent different points of views (Lincoln & Guba 1985, cited in Chism, Douglas & Hilson 2008). However, as a study being difficult to repeat lowers reliability (Thurén 2007) it could have been beneficiary to collect the data from the observations and product assessment in accordance with a predefined plan rather than in an unstructured manner. For example, the usability prism by Arvola (2014) could have been included more closely in the planning of the data collection, for example by utilising it in conducting the observations and the product assessment as well as basing the interviews on the different aspects.

The topics and questions in the interviews with the experts and the users respectively were based on the research problem as well as on the theoretical framework of the study as recommended by Nyberg and Tidström (2012). While changing the user interview questions after the conduction of three interviews decreased reliability, sharpening the questions increased the validity for the last seven interviews as the adjusted versions ensured the interview questions were relevant (ibid.). If the
interview questions would have been tested before the interviews (ibid.), it is possible that the adjustments could have been avoided.

Describing the steps of the analysis, as is done in *Chapter 3. methodology*, increases reliability of the analysis (Chism, Douglas & Hilson 2008). Patterns detected across the different data sources indicate the study having high validity (Lincoln & Guba 1985, cited in Chism, Douglas & Hilson 2008). Furthermore, triangulation of methods and researcher perspectives as well as triangulation with participants increases both the reliability and the validity, also reduces the bias of the writers (Chism, Douglas & Hilson 2008). Since the analysis also rendered in results of utilisation and not merely on accessibility, the analysis should have been overlooked for only data of value to answer the research question to be included.

In small-scale qualitative research Nyberg and Tidström (2012) advise not to make too wide generalisations. Thus, the results of the study cannot be assumed to be generalised and applied on a wider audience or on similar situations, but rather the results of the study can be applied on the very context being studied (Chism, Douglas & Hilson 2008). To be able to generalise the results, extended research with a bigger, representative sample would be called for.
7 Conclusion

The research question the study set out to answer was:

What influences the accessibility for visually impaired VoiceOver users to successfully partake in discussions on social live audio chat platforms?

The question can be answered by the results of the study, with reservations regarding the limited scope of the study not allowing for the results to be generalised and further, that the study cannot encompass all possible aspects affecting accessibility as there is a plethora of those. Nevertheless, the results point in a clear direction for which features fit and which did not fit the individuals, and thus influenced the accessibility for visually impaired VoiceOver users to successfully partake in discussions on social live audio chat platforms. Below the most prominent insights of the fit of the features are presented. A more detailed list of what influences accessibility can be accessed in Appendix 9.

The results indicate that the most important aspects, both technical and practical, influencing accessibility and the possibilities to partake in discussions include the user interface being limited in size and scope, the voice-based communication being placed at the core as well as the visual elements being kept at a minimum. Furthermore, the importance of a sufficient amount of VoiceOver feedback, which should be adjustable per user in dedicated accessibility settings, influences accessibility and the possibilities to partake in discussions. Another practical aspect of importance is being aware of how user behaviour affects accessibility. For instance, if a desired functionality is missing on a platform this can lead to users improvising a creative solution to overcome the missing functionality, the substitutional solution possibly not being accessible for visually impaired individuals. Thus, despite leaving out a functionality might be that of a conscious choice from an ethical aspect, it might render in inaccessibility. Thus, the most important characteristics that influence accessibility for the visually impaired users are: limited size and scope, having voice-based communication at the core, visual elements kept at a minimum, accessibility settings and dedicated functionality for all features.

All of the above is encompassed by the importance of capturing the more intangible characteristics and the user’s subjective perspective, clearly indicated by the results of this study. This coincides with the aim of the study which was to create a better understanding of the subjective user experience of visually impaired users of social live audio chat platforms by identifying what influences accessibility, especially when it comes to taking part of and creating audio content. Therefore, the aim of the study has to a fairly large extent been fulfilled. The analysis of the results indicates clear themes of what the visually impaired users considered important regarding accessibility, the insights further supported by the other data collection points.
7.1 Proposal for future research

This study being among the first on an audio based live chat platform with the focus on the user experience of visually impaired VoiceOver users, there is a clear need for further investigations on the subject. In further research, a more extensive study focusing on the users’ subjective perception of the accessibility of the platforms is proposed. As there is a lack of studies making the voices of the visually impaired users heard (Aizpurua, Harper & Vigo 2016), the future research could include observations of the visually impaired users using the live audio chat platforms, taking the collection of data even closer to the users. This approach is in line with universal design as it puts emphasis on the importance of end-user knowledge and cultivating user empathy (Begnam et al 2019).

Nevertheless, Aizpurua, Harper and Vigo (2016) stress it is equally important to focus on the more technical characteristics. Thus, as the topic of live audio chat platforms is unexplored, a study with mixed methods, conducting a normative accessibility assessment with, for example, WCAG in combination with taking a UX perspective would have the potential to lead to further insights on the subject.
References


Mosen, J. (2021a) Mosen At Large Podcast: Episode 97: Following every moment of the impeachment trial, more on when disability rights and religion collide, thoughts on Clubhouse and more. (2021-04-08)
Mosen, J. (2021b) *Mosen At Large Podcast: Episode 99: All you need to know about Clubhouse from a blindness perspective* (2021-04-08)


Appendix 1 – Description of the live audio-chat platform Clubhouse

Clubhouse is a live audio-chat based platform where anyone can start a room that others can join. The users of Clubhouse have their own personal profiles. The audio chat rooms can be hosted by individuals or by clubs. The clubs and the individuals one follow affects which rooms one sees in the “hallway”, which is what the feed of currently live chat rooms is called.

The audio chat room is divided into a stage, where the moderators of the rooms as well as the speakers are placed, and an audience. If there are individuals in the audience who are followed by the speakers these are placed in their own section called “Followed by the speakers” while the rest of the audience is in the “Others in the room” section. The audience can listen in the room as well as raise their hand to ask to be let up on stage to speak. The speakers can talk on stage, having access to a microphone/mute button. The moderators control the room, being in charge of letting people up on stage or returning them to the audience as well as having access to closing down the room.

Figure 3. View from inside a room in Clubhouse, with names and images replaced by placeholders.
Appendix 2 – Description of VoiceOver

VoiceOver is the built-in Apple Inc. screen reader accessible on, among others, iPhones. VoiceOver allows for users to control their smartphone with gestures. VoiceOver describes with audio what is visible or selected on the screen, allowing the user to navigate and interact with the phone through audio. To interact with VoiceOver one can drag one finger across the screen or use gestures. Examples of gestures are tapping the screen rapidly twice with one finger which is used for selecting, tapping the screen rapidly twice with two fingers (called magic tap) which is used for play/pause and swiping down the screen with three fingers which is used for scrolling. (Apple 2021)
Appendix 3 – Information email / list of interesting topics, experts

Här kommer också listan på diskussionsämnen vi är intresserade av - men vi kan absolut frångå listan också. Vi planerar alltså inte ha en strikt intervju, utan mer av en diskussion. Listan är lång, och vi förväntar oss inte att komma in på allt detta på 30 minuter. Vi pratar om det du anser dig vara mest insatt i eller tycker är mest relevant:

- Att vara synnedsatt i ett samhälle där majoriteten är seende
- Definition av synnedsatt, samt skillnader på terminologi som synnedsatt och synskadad
- De mest populära tekniska hjälpmedlen för synnedsatta
- Tillgänglighet för synnedsatta på sociala medie-plattformar som Facebook, Instagram, TikTok, Twitter
- Att använda Clubhouse som synnedsatt
- Generellt, vad är det som gör att sociala medie-plattformar fungerar bra ur ett tillgänglighetsperspektiv för synnedsatta och varför?
- Generellt, vad är det som gör att sociala medie-plattformar fungerar dåligt ur tillgänglighetsperspektiv för synnedsatta och varför?
- Tillgänglighetsproblem för synnedsatta på sociala medie plattformar som inte tas höjd för i riktlinjer som WCAG 2.0
- Metoder att använda eller undvika vid insamling av data från synnedsatta.
  - Passar intervju via Zoom?
  - Om vi vill utföra användbarhetsatest av Clubhouse med synnedsatta - tips på hur bör vi gå tillväga?
- Input på hur vi bör formulera oss om synnedsättning?
- Input på hur vi bör formulera oss om tillgänglighet?
Appendix 4 – Consent, experts

Informerat samtycke för expertintervju

Detta är ett formulär för ett informerat samtycke för en intervju i samband med en kandidatuppsats. Börja med att fylla i din e-postadress nedan.

1. Introduktion och syfte

Vi, Charlotte Bern och Linda Liljeström, är två studenter som läser interaktionsdesign på Linnéuniversitetet. Vi skriver nu vår kandidatuppsats om tillgänglighet av sociala medier för synnedsatta. Vår uppsats behandlar mer specifikt tillgängligheten av den sociala medieplattformen Clubhouse.

Syftet med expertintervjuerna är att samla in bakgrundsinformation om att leva som synnedsatt i ett samhälle där majoriteten är seende, om tillgänglighet av sociala medier samt om tillgänglig design. Din unika expertis avgör vilket fokus samtalet kommer att få.

2. Genomförande av intervju

Intervjun genomförs över Zoom och tar ca 30 minuter. Intervjun spelas in. Om du önskar att intervjun inte spelas in behöver du informera om det på förhand.


3. Efter intervju

Efter att intervjunmaterialet har gått igenom kommer du få en sammanställning av materialet från din intervju. Du har då möjlighet att förtydliga eller korrigera dina uttalanden.

4. Intervjuerna i uppsatsen och senare

Dina svar från intervjun kommer att samlas in tillsammans med svar från andra experter som också intervjuas. Expertintervjuerna används som bakgrund för uppsatsen, samt som stöd i beslut kring mer specifik problemställning för och målsättning med uppsatsen.
Innehåll från expertintervjuerna kommer att inkluderas i uppsatsen i form av omskrivningar och direkta citat. Du kommer inte omnämnas med namn i uppsatsen, och du har möjlighet att påverka hur vi omnämner dig.

Uppsatsen kommer publiceras. Du har möjlighet att läsa igenom uppsatsen i sin helhet innan publikation, ifall du så önskar.

Anteckningar och dokumentation från din enskilda intervju sparas till och med 2021-08-31 och därefter raderas det.

5. Kontakt

Om du har frågor om intervjun eller innehållet i detta samtycke kan du kontakta oss.

[Contact information was available here]

6. Samtycke

Jag har läst och tagit del av informationen i detta informerade samtycke. Kryssa i nästföljande ruta.

Jag samtycker

Fyll i fullständigt namn

Fyll i dagens datum
Appendix 5 – Observations and product assessment

Findings placed in a matrix diagram for clarification of results.

<table>
<thead>
<tr>
<th>Accessible</th>
<th>Inaccessible</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behaviour</strong></td>
<td></td>
</tr>
<tr>
<td>In small rooms the participants talk, as in any conversation, without waiting for someone to hand them the floor or asking for the right to chip in.</td>
<td>In more structured rooms, the moderator asks to “pull to refresh” for the order to talk to be displayed on the screen.</td>
</tr>
<tr>
<td>In some rooms (mostly in English speaking ones) one is asked to present oneself by name when starting to talk, for instance “Hi! My name is Emma”, and then finish with “I am Emma and I am done speaking” to make it clear when one is done.</td>
<td>In more structured rooms, when a person wishes to talk, they unmute themselves (or blink very slowly) to signal a wish to speak.</td>
</tr>
<tr>
<td>In more structured rooms, the moderator asks to “pull to refresh” for the order to talk to be displayed on the screen.</td>
<td>In discussions participants are prompted to “pull to refresh” in order to see profile pictures which have been switched during the discussion (e.g. to show a picture, a graph).</td>
</tr>
<tr>
<td>Applauding is done by rapidly flashing the mute button.</td>
<td></td>
</tr>
<tr>
<td><strong>Feature</strong></td>
<td>VO (VoiceOver) does not recognise different Latin alphabet languages when reading the room names (it does however recognise Arabic, Russia, Chinese, e.g. other alphabets = the voice changes and pronounces correctly).</td>
</tr>
<tr>
<td>The app is quite compact and has rather few different sections.</td>
<td>VO cannot be used for knowing if others are applauding.</td>
</tr>
<tr>
<td>Almost all buttons are labelled.</td>
<td>VO is useless when trying to figure out who is speaking in a room. The VO states the name of the person and if the person is muted or not, but if there are 20 people on stage, there is a risk that after one has listened through all the names and microphone statuses, the situation would have changed already and one has to</td>
</tr>
<tr>
<td>The latest update (0.1.32) did clarify/streamline some buttons, for instance “All rooms” was labelled “Hallway”, as it was called Hallway in other places already.</td>
<td></td>
</tr>
<tr>
<td>The information on ongoing rooms is clear and accessible.</td>
<td></td>
</tr>
<tr>
<td>The only pictures in the application are the profile pictures of people and of clubs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Findings on the visually impaired community on Clubhouse

- Users of VoiceOver have their own guided session “Welcome to Clubhouse” to learn how to use the application.
- Swedish visually impaired users have small informal rooms only for their followers.
- Many state in their bio that they are visually impaired or blind (it is however impossible to know the number of users not telling about this in their bio).
- Blind and visually impaired users have formed clubs on Clubhouse.
- A Swedish group had “ask a disabled” and “ask a blind” rooms, as well as rooms sharing insights on using technology.
Appendix 6 – Expert statements

Expert 1

- Worked as an expert on accessibility at a national authority, and had a deep knowledge of accessibility issues in general.
- Clarified the terminology regarding visual impairments.
- Gave advice on what the writers should take into account when reaching out to and conducting the interviews with the Clubhouse users. The expert encouraged not to worry: “All the sighted make the same mistakes”, the expert stated, when the writers aired some concerns for mistreating the users to be interviewed.
- Had deep knowledge in assistive mobile technology, and could lengthily explain both how and when the assistive technology was used.
- Pointed out that one of the issues with social media is them heavily being built upon pictures
- Was positive regarding the built in AI on explaining the photos on Facebook.
- Instagram was less well functioning for visually impaired users, as the AI works with less precision and furthermore it could be hard to locate where descriptions ended and the comment section started.
- Stressed that clear and uncluttered design is of importance, as well as there not being special versions of social media platforms or applications, but rather one version which does not exclude any users, as this is one of the pillars accessibility.
- Was positive regarding the possibilities of special settings, e.g. bigger font size, which the product would remember, as the particular user logs in.
- For products to be developed to be truly accessible, the expert stressed that all kinds of users needed to be involved from the start.
- Stated that issues with accessibility often re-appear as an application is released in an updated version.
- Regarding guidelines for accessibility the expert stated that Best Practices were a good complement to WCAG, and mentioned further that www.webbriktlinjer.se was a good source of information.

Expert 2

- Worked as an administrative official at a non-governmental organisation focusing on the issues of the visually impaired.
- Was one of the two Clubhouse using experts.
- Pointed out how differently usage of technology, such as smartphones, works for visually impaired users, leading to the visually impaired users not being able to ask their sighted peers for help.
- Mentioned that although visually impaired Swedes can get advice on the usage of technology from Swedish authorities this only encompasses basic training, and no training at all on social media.
- Explained that even though technology might be both usable and accessible, it might still be out of reach for the visually impaired users.
- Mentioned that for those who cannot see (at all), VoiceOver is the only way to access Clubhouse.
- Was aware that Clubhouse initially had received negative feedback from VoiceOver users, but pointed out that the accessibility has increased.
- Stated that the application had gained in popularity amongst the visually impaired.
- One of the reasons for the popularity according to the expert could be the equal grounds for taking part in discussions, with no video to be taken into account.
- Pointed out that there were some visually impaired communities being formed on Clubhouse.
- Stated that for one to access discussions of interest, one needs to follow the right people.
- Regarding social media in general, the expert exclaimed “it is what it is, you just have to try to make the best out of it”
- Exemplified with Facebook, stating it is somewhat accessible
- As Facebook is very cluttered, the mobile site works better for visually impaired users.
- Noted that accessibility had to be taken into account from the start of development, as making changes to existing products and services is both costly and a lot of work.
- Stated that WCAG does include quite many aspects important for the visually impaired.
- Best practices can also be useful
- www.webbriktnjor.se can be useful
- The expert stressed that, apart from guidelines, well thought through language and ease of use is of importance to achieve a high accessibility for visually impaired users.
- Suggested keeping collecting informed consent as simple as possible, preferably on tape.

Expert 3

- Worked as a public advocate at a non-governmental organisation.
- Brought up that as VoiceOver is a built-in functionality in Apple Inc. products, it is not categorised as an assistive technology in Sweden, which leads to usage of it not being taught in centres for assistance.
● Pointed out that social media in many cases is visual, which makes it difficult to use by the visually impaired.

● In development and design, it is important to do it the correct, inclusive way from the start with disabled users represented in the process alongside typical users.

● Pointed out that in the best of worlds one solution would fit all users.

● Explained that the needs of different groups often collide: users with a cognitive impairment favour symbols while users with a visual impairment have issues with these.

● Was of the opinion that WCAG does not include everything which is important when it comes to accessibility for visually impaired, and explained there are other guidelines as well.

● In creation of new guidelines they should be kept short to focus on the most important.

● Pointed out that including representative users during the process as well as to conduct usability tests with end users is a complement to any guidelines.

● Stressed that in this very study, the writers should make sure to include visually impaired users of different ages and technical skills.

Expert 4

● Was working at a private company with questions regarding accessibility and diversity.

● Was one of the Clubhouse using experts, and turned into a key informant during the study, as the expert opened several doors when it came to accessing users to interview and made themselves available for further discussion.

● Was interviewed twice and later contacted via email for some further elaboration.

● Stated that when it comes to accessibility and design, it is the visually impaired who know what they need.

● Suggested that individuals with visual impairments should be a part of the product development process from the start.

● Had been contacted by other students, who at times approached with an idea of a product for blind individuals – instead of asking “what would a blind person need?”, which is a collaborative approach the expert would have appreciated.

● Pointed out that in the development of social media like Facebook and Instagram, sighted seem to have been the potential users in mind from the start, while the accessibility issues have been aimed to be solved afterwards.
• Issues come and go, especially in relation to product updates, whereas both Instagram and LinkedIn have become less accessible recently, making visually impaired users at times regret updating the application.

• Proclaimed Clubhouse to be amazing for the visually impaired, as it is based on sound.

• Found Clubhouse to be accessible since it is quite uncluttered and does not consist of that many parts.

• This could be compared to Facebook and LinkedIn that the expert deemed tricky since these platforms had so many menus and functionalities that it was hard to get an overview.

• Had noted that the visually impaired community on Clubhouse was growing both internationally and in Sweden.

• Found Clubhouse to be a good place for community and knowledge sharing among the visually impaired.

• The company providing Clubhouse had strived for being inclusive from the start, and that they probably had noticed it being a format well suited for visually impaired users.

• Noted that since the expert had joined Clubhouse in early 2021, there had been several updates and improvements, which had turned things for the better. For instance, while it earlier was difficult to “raise hand” to ask for an invitation to talk on stage, this had now been fixed.

• Did still point out several points of improvement: ‘Schedule new room’ was unlabelled, it was hard to know who is talking since VoiceOver does not say the name of the person, knowing how many people are in the audience is not accessible when in the room, as moderator it was not that accessible to know when someone wants to join on stage, moderating a room could be made easier in general, the audio feedback for ‘raising hand’ and ‘joining on stage’ was the same, and one did not have any feedback for when someone joined the room.

• The expert pointed out that despite the profile pictures being one of the few places for images, the spot for the profile picture was utilised by people to also show other images during discussions.

• Blinking with the mute button, meaning one is applauding, was brought up as inaccessible by the expert. In addition to this the expert also mentioned that it would be good to have more functionalities accessible directly in the chat room.

• Pointed out that visually impaired users together try to educate and enlighten sighted users on how to make communication more accessible.

• Had noted that in many foreign rooms the participants follow the protocol of first presenting themselves with their name, then talk and finish off by again mentioning their name and say they are finished talking.
This is mostly in use in Swedish rooms when someone who is visually impaired is present or reminds about it. The reaction from the others can be “oh, now this and that person is here, let’s remember to say our names while we’re talking”. The expert pointed out this feels targeted to being singled out, “the blind are here now”.

Stated that the protocol of saying one’s name is also beneficial for keeping up a structure in the discussion as well as for anyone who is not looking at their screen, for example, because they are driving.
Appendix 7 – Consent, users

**Informerat samtycke för intervju**

1. **Syfte med intervju**

Syftet med intervjun är att ta reda på vad som gör att tekniska tjänster fungerar bra och fungerar mindre bra för synnedsatta som använder VoiceOver. Specifikt vill vi ta reda på vad som fungerar bra och vad som fungerar mindre bra i Clubhouse. Med utgångspunkt i detta ämnar vi ta fram riktlinjer och en checklista för hur Clubhouse och liknande tjänster kan göras mer tillgängliga för synnedsatta.

2. Genomförande av intervju

Intervjun genomförs över Zoom och tar ca 30 minuter. Intervjun spelas in. Om du önskar att intervjun inte spelas in behöver du informera om det på förhand så vässar vi pennan för att anteckna istället.

Skulle det vara frågor som du inte vill svara på går det bra att inte svara. Du kan även när som helst under intervjun avbryta ditt delta.

Intervjun består av ett antal förutbestämda frågor, vilka vi även kan frångå, beroende på vilka ämnen vi kommer in på under intervjun. Frågorna berör teknik, onlinemötesverktyg, sociala medier och Clubhouse.

3. **Efter intervju**

Efter att intervju materialet har gått igenom kommer du få en sammanställning av materialet från din intervju. Du har då möjlighet att förtydliga eller korrigera dina uttalanden.

4. **Intervjuerna i uppsatsen och senare**

Dina svar från intervjun kommer att samlas in tillsammans med svar från andra Clubhouse-användare som också intervjuas. Intervjusvaren kommer att analyseras för att ta reda på vad som gör en ljud chatt-baserad social medieplattform tillgänglig för synnedsatta.

Datan från intervjuerna kommer att inkluderas i uppsatsen i form av samlad resultat och slutgiltigt lösningsförslag (guidelines/checklista för hur live-audio chatt baserade sociala medie tjänster kan göras mer tillgängliga för synnedsatta). Enstaka citat kan också komma att tas med. Du kommer inte omnämnas med namn i uppsatsen.
Uppsatsen kommer publiceras. Du har möjlighet att läsa igenom uppsatsen i sin helhet innan publikation, ifall du så önskar.

Anteckningar och dokumentation från din enskilda intervju sparas till och med 2021-08-31 och därefter raderas det.

5. Kontakt

Om du har frågor om intervjun får du gärna kontakta oss.

Contact information was available here
Appendix 8 – Questions, user interviews

Version 1

1. Vilka sociala medier använder du?
   - Varför?
   - Vilka funktioner från dessa skulle du önska fanns i Clubhouse?

2. Har du ljud-chattat på andra ställen än Clubhouse? (Whatsapp, Messenger, Instagram, Skype, annat?)
   - Vilka funktioner från dessa skulle du önska fanns i Clubhouse?
   - Förslag: Brukar det fungera smidigt? Varför?

3. Vilka appar för onlinemöten har du använt? (Teams, Zoom, Google Meet)
   - Vilka funktioner från dessa skulle du önska fanns i Clubhouse?

4. Är det något du tycker fungerar osmidigt på Clubhouse?
   - I så fall vad? + Varför?

5. Är det något du tycker fungerar extra bra på Clubhouse?
   - I så fall, vad? + varför fungerar detta så bra?

6. När du lyssnar på diskussioner på Clubhouse, vad saknar du då?
   - Har du förslag på hur det kan lösas? (Kanske inspiration från någon annan produkt?)
   - Brukar du veta vem som pratar?

7. Brukar du delta i diskussioner på Clubhouse?
   - Berätta om dina upplevelser kring att delta i diskussioner.
   - Är det smidigt att kliva upp på scen? Delta? Kliva av?
   - Brukar du veta när det är din tur? -> Hur vet du att det är din tur?
   - Brukar du veta vem som pratar? -> Hur vet du vem som pratar?
   - Vad är det som oftast/mest ställer till med problem?

8. Brukar du moderera samtal?
   - Berätta om dina upplevelser kring att moderera samtal.
   - Vad är det första du gör när du går in i rummet?
   - Fungerar det smidigt att hålla koll på diskussionen?
   - Fungerar det smidigt att släppa upp/ner folk?
   - Vad är det som ställer till mest problem?
9. Är det några personliga konfigurationer du skulle vilja kunna göra i appen, som inte går att göra i dagsläget?

10. Nedan följer ett antal förslag. Vad är din spontana reaktion?
   - Ljuden för olika funktioner skiljer sig tydligt åt, exempelvis är det ett sorts ljud när du räcker upp handen och ett annat sorts ljud när du blir uppbjuden på scen
     - Vilka andra ljud skulle vara intressanta?
   - Du kan inne i rummet se hur många som är på scen/i publiken som talarna följer/i resten av publiken (tex en siffra inom parentes vid varje utmärkt del)
   - Det finns en dedikerad knapp för att applådera vilket även hörs på VoiceOver
     - Du kan välja att slå på och av följande funktioner i rummet (enskilt, eller alla på en gång)
       - VoiceOver säger namnet på den som går upp på scen
       - VoiceOver säger namnet på den som börjar prata
       - VoiceOver säger när någon unmutear sig
       - VoiceOver säger namnet på den som kommer in i rummet
       - VoiceOver säger namnet på den som lämnar rummet
       - Kommender du på någon annan information du önskar få höra?
         - Generellt: hur tänka på balansen mellan ljud och att voiceover säger namnet på personer?
         - Skillnader om du är i publik/

11. Är det något vi inte tagit upp, angående Clubhouse?

Version 2

2. Du använder säker många olika program eller medier för att kommunicera. Kan du berätta om några produkter eller appar som du tycker gick riktigt bra? Kan du berätta om några som var riktigt dåliga?

3. Varför använder du Clubhouse?
   - Smidigt?
   - Osmidigt?

4. När du lyssnar på diskussioner på Clubhouse, vad saknar du då?
   - Har du förslag på hur det kan lösas? (Kanske inspiration från någon annan produkt?)
- Brukar du veta vem som pratar?

5. Brukar du delta i diskussioner på Clubhouse?
   - Berätta om dina upplevelser kring att delta i diskussioner.
   - Är det smidigt att kliva upp på scen? Delta? Kliva av?
   - Brukar du veta när det är din tur? -> Hur vet du att det är din tur?
   - Brukar du veta vem som pratar? -> Hur vet du vem som pratar?
   - Vad är det som oftast/mest ställer till med problem?

6. Brukar du moderera samtal?
   - Berätta om dina upplevelser kring att moderera samtal.
   - Fungerar det smidigt att hålla koll på diskussionen?
   - Fungerar det smidigt att släppa upp/ner folk?
   - Vad är det som ställer till mest problem?

7. Nedan följer ett antal förslag. Vad är din spontana reaktion?
   - Ljuden för olika funktioner skiljer sig tydligt åt, exempelvis är det ett sorts ljud när du räcker upp handen och ett annat sorts ljud när du blir uppbjuden på scen
     - Vilka andra ljud skulle vara intressanta?
   - Du kan inne i rummet se hur många som är på scen/i publiken som talarna följer/i resten av publiken (tex en siffra inom parentes vid varje utmärkt del)
   - Det finns en dedikerad knapp eller ikon för att applådera vilket även hörs på VoiceOver
   - Du kan välja att slå på och av följande funktioner i rummet (enskilt, eller alla på en gång)
     - VoiceOver säger namnet på den som går upp på scen
     - VoiceOver säger när någon unmutar sig
     - VoiceOver säger namnet på den som kommer in i rummet
     - VoiceOver säger namnet på den som lämnar rummet
     - Kommer du på någon annan information du önskar få höra?
- Skulle denna information kunna ligga i en viss del av skärmen, så om den är vald så hör du, annars hör du inte den?

- Generellt: hur tänka på balansen mellan ljud och att voiceover säger namnet på personer?

- Skillnader om du är i publik/diskuterar/modererar

8. Är det något vi inte tagit upp, angående Clubhouse?

Demographic questions asked from all informants:

A. Vilken grad av synnedsättning har du?
B. Hur gammal är du?
Appendix 9 – Guidelines

Based on the findings, the different issues related to creating accessible live audio chat platforms for visually impaired VoiceOver users have been identified. The findings have been guidelines encompass both general issues to be taken into account when assuring accessibility for visually impaired users, as well as the accessibility of visually impaired users who partake in discussions on live audio chat platforms. The guidelines have been put together for the study to be The complete list of guidelines can be accessed in Appendix 9.

The first set of guidelines consist of General guidelines for designing accessible audio chat platforms. These are proposed to be used as a basis for creating accessible design on platforms used for audio chatting. The guidelines are for example limiting the scope of the platform, avoiding emphasis on photos and/or videos as well as allowing the user to set up how much VoiceOver feedback they wish to receive.

The second set of guidelines are Guidelines for the user interface of live audio chat rooms. These guidelines focus specifically on the chat rooms. Here the guidelines suggest adding a way to clarify for the participants when it is their turn to contribute to the discussion and use headings for easy and clear navigation. Furthermore, the guidelines encompass adding ways of receiving information of the actions of others in the room, nevertheless, as stated in another guideline, to be mindful of the conversation still being the centre of attention in the chats. Thus, an additional guideline is to allow for temporary, room specific changes to the accessibility settings as well as implementing VoiceOver gestures for the users to be able to work their way around the room faster and easier.

The third set, Guidelines regarding administration of chat rooms highlight administration, this too a way to partake. Utilising sound notification for actions requiring the administrator’s attention is suggested, as well as taking into account that while some prefer to administer alone, some wish to do it together, and thus design for both situations to be as accessible as possible.

The fourth and last set of guidelines are general Guidelines for the design process. Here the guidelines point out to utilise WCAG and the principles of universal design, as well as to take UX into consideration. Thus, the guidelines advise to involve visually impaired VoiceOver users in the design process. Furthermore, the guidelines advocate to stay up to date with how the product is being used, to be able to design with targets to fulfil and resolve already existing use-cases with creative, yet inaccessible solutions.
General guidelines for designing accessible audio chat platforms

- Ensure compatibility with VoiceOver
- Label buttons clearly
- Label visual elements clearly
- Keep the platform architecture simple
- Limit the intended scope and use of the platform
- Avoid emphasis on photos and/or videos
- Allow users to define their own accessibility settings
- Allow users to set up how much VoiceOver feedback they wish to receive
- Allow users to set up how much sound notifications they wish to receive
- Allow users to set up how much haptic feedback they wish to receive
- If implementing accessibility settings, add pre-set levels for smooth usage

Guidelines for the user interface of live audio chat rooms

- Make joining and leaving a chat room accessible with clear labels and feedback
- Make joining and actively participating in a conversation accessible with clear labels and feedback
- Allow users to front their willingness to partake in discussion
- Allow users to front their unwillingness to partake in discussion
- Clarify for participants when it is their turn to contribute to the discussion
- Use headings to divide and enable easy and clear navigation
- Add ways of receiving information of the actions of others in the room
- Add ways of participants familiarising themselves with other participants
- Be mindful of the conversation being the centre of attention in the chats
- Allow for temporary, room specific changes to accessibility settings
• Consider a flow of user activity information on a dedicated part of the screen
• Avoid using the same elements for several actions, unless the outcomes are clearly separated and accessible
• Implement VoiceOver gestures for faster and easier access
• Build for utilising the VoiceOver rotor functionality for shortcuts

Guidelines regarding administration of chat rooms
• Utilise sound notification feedback for actions requiring administrator’s attention
• Take into consideration some prefer to administer chats alone
• Take into consideration some prefer to administer chats together and thus the actions of the other administrators

Guidelines for the design process
• Utilise WCAG
• Utilise the principles of Universal design
• Take a UX perspective
• Involve visually impaired users, including VoiceOver users in the process
• Do not be afraid to be different or stand out
• Stay up to date with how you product is being utilised