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**THE STREAMING CONTENT USAGE OF
YOUNG VISUALLY IMPAIRED PEOPLE
IN PUBLIC SERVICE MEDIA:**

The perspective of digital accessibility

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ABSTRACT

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The context of this research lies within public service broadcasting companies launching streaming services amidst digitalization. In this context, public service media practitioners must understand the youth audience's viewing habits to reinforce relationships with them. Furthermore, even though digital services involve accessibility functions in the products, individuals with different visual impairments need further study to avoid accessibility problems and increase inclusivity, which is also the responsibility of public service media. Therefore, this research aims to discover the usage of streaming media in public service media among youth with different visual impairments from the perspective of digital accessibility.

This thesis employed the qualitative research method with semi-structured and email interviews to answer the research question, "How do young visually impaired people use streaming media in public service media from the perspective of digital accessibility?." Four participants with various visual impairments joined the thematic interview. Finnish broadcasting company (YLE) served as the research case for this investigation. The current study evaluated the interview data using thematic analysis.

The main findings demonstrated that young respondents with blindness and low vision watched diverse video content for entertainment and education in streaming applications with low frequencies of using the recommendation system. The accessibility problems, including incompatibility between assistive technologies and applications, inaccessible interface design, and insufficient audio descriptions, were identified in this study. This research revealed participants' suggestions for enhancing digital accessibility by envisioning accessibility features and increasing the accessibility awareness of video content creators and developers.

The findings of this research are significant for academic research, the Finnish public service broadcasting company, and media policies worldwide. The application developers and media practitioners might devise more barrier-free and customizable streaming services to ensure every individual receives excellent experiences, following the improved media accessibility policies. In addition, this study could provide new understandings for future research in accessibility, disability, youth, streaming and public service media.

Key words: public service media, streaming media, youth, visual impairment, digital accessibility

The originality of this thesis has been checked using the Turnitin Originality Check service.

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1. INTRODUCTION

According to the WHO World Report on Vision Impairment and Blindness, approximately 2.2 billion individuals globally are diagnosed with visual impairment. Compared with the general population, individuals with visual disabilities encounter mobility difficulties, lack equal rights to education and employment and experience insufficient disability services, as the report indicated. In addition, the swift advancement of information and communication technology has contributed to integrating digital services and applications into the daily lives of disabled individuals. This integration has become even more significant during the COVID-19 pandemic, as there has been a substantial rise in digital content and a decline in face-to-face communication (Chadli, 2021). As Sharma (2020) stated, the trend of diverse digitalized services and activities will continue and expand. However, digitalization creates hidden virtual barriers for visually impaired people to access, which involve complicated website and application structures to navigate, inaccessible design and the recurring untrustworthy automatic captions problem (Baumgartner, 2021; Pettersson, 2023).

Given the situation, the Web Content Accessibility Guidelines have been formulated to help product designers and web developers devise accessible services for every individual (Lazar, 2015). In addition, several laws, for instance, the United Nations Convention on the Rights of Persons with Disabilities and the Americans with Disabilities Act, have supported related practitioners to ensure individuals with vision, physical and hearing impairments can access all technological products. Adhering to these accessibility guidelines and laws, most web services and application designers consider disabled people's needs to produce accessibility features, which demonstrate the growing awareness of creating inclusive and accessible digital products. Nevertheless, digital accessibility still faces limitations in fulfilling the various needs of people with disabilities (Kulkarni, 2019) since most digital services offer basic and

limited functions for disabled people. Based on the International Classification of Diseases, visual impairment is classified from mild to blindness, exceeding the range of current accessibility features aimed at visually impaired people. Hence, digital services need a sufficient understanding of individuals with different visual impairments to decrease accessibility issues.

In the digital age, youth perceive watching television as an activity that happens anywhere without restrictions on time, place and devices (Podara, 2021). Unlike the last generation, they prefer using cell phones and tablets to view television (Salandria, 2020). The drastic change in video consumption is due to the emergence and application of the Internet to support selecting and watching video content with versatility and low costs (Møller, 2021). Considering adapting to the Internet-driven age and young generation's viewing habits, public service broadcasting is shifting from the traditional way of disseminating content, such as broadcasting television, to online streaming services, which promote the societal, cultural, and democratic values of society on technological platforms (Donders, 2019). The British Broadcasting Corporation (BBC), a prominent public service broadcasting institution, initiated the transition of its television channel, BBC Three, from traditional television broadcasting to online platforms in 2014 to preserve young people (Ramsey, 2018).

Other European public service broadcasting companies also confront the fact that young audiences frequently turn to the Internet for information consumption and sharing instead of traditional linear television (Sundet, 2019). The necessity for a more profound comprehension of how youth utilize media is emphasized by managers who work in Finnish, Swedish and German public broadcasting companies (Lowe, 2019). Furthermore, ensuring the audience's universal access to the online service is included in the development mission of public service media in digitization (Muntsant, 2018). Therefore, the objective of this thesis is to understand young visually impaired people's needs and problems using streaming services in public service media. This research implements a qualitative research method, utilizing semi-structured and email interviews to discover the usage of streaming services in public service media from young visually impaired people's perspectives. Youth respondents with different degrees of visual impairments were recruited for this study.

Selecting the Finnish Public Broadcasting Company (YLE) as the research case involves several reasons. Firstly, Yleisradio Oy, the national public broadcasting

company in Finland, has a fundamental media role in Finnish society. It involves diverse television, radio, and digital services, reaching 94 percent of Finnish weekly and remaining steady in recent years (YLE, 2022). Additionally, it has faced a 44 percent average rise in young audiences since 2019 (Horowitz, 2020). According to the Channel and Service Image Survey of YLE from the autumn of 2020 to 2022, the statistics show that the reach of YLE digital services accounts for a substantial portion of age groups among 15-to 29-year-olds. Even though YouTube and Netflix occupy significant shares of the streaming market, YLE Areena is third in the young age group. Therefore, improving the relationship with the young customer group is inevitably included in the long-term development goals of YLE. Moreover, the European accessibility act, adopted in 2019, indicates that public service media providers in member states should ensure that audiovisual services are accessible to persons with disabilities, which is also in accordance with the public service duty of YLE regarding social responsibility. Based on the annual report of YLE in 2022, it strives to elevate the accessibility of its service and content by providing subtitles, sign language, and audio descriptions. However, the online services of YLE, such as YLE Areena, still need to improve the technical accessibility of websites and mobile application versions since they lack further understanding of specific minority groups (young visually impaired people). Hence, the goals and responsibility of YLE conforms to the aim of this thesis, which is to understand how to strengthen ties with youth and develop digital accessibility during the boost in the age of streaming services usage. Secondly, the previous report investigating the accessibility of the YLE streaming service was limited to an extensive overview of its functions for people with visual and hearing impairments (Forsell, 2022). It allows the current thesis to conduct a concrete and detailed investigation of young visually impaired people's experiences with the accessibility of the YLE streaming service. Thirdly, the author is based in Finland and is undertaking a master's study, offering an excellent opportunity to do research closely.

The structure of this master thesis encompasses seven chapters. The first chapter serves as an introduction, presenting justifications and the objective of this investigation. The literature review in the second chapter comprises previous academic studies on assistive technology and mobile accessibility features for visually impaired individuals, public service media in the digitalization context, and streaming media and youth. Moreover, the conceptual framework and research question are included. In the third chapter, the methodology of this research is clearly explained. The fourth chapter

demonstrates the insights derived from the interview data of young visually impaired people. The fifth chapter further discusses the findings with the prior literature. The sixth chapter evaluates the trustworthiness and ethics of the current study. The seventh chapter finalizes with a concise overview of the main findings, implications of this research, and future work endeavors.

2. LITERATURE REVIEW

This chapter will thoroughly present the prior academic research encompassing digital accessibility and visually impaired people, public service media in the digital era, and streaming media with youth. Based on the literature review, the conceptual framework and the research question in this study are raised.

2.1 Digital accessibility and visually impaired

2.1.1 The notion of digital accessibility

Accessibility incorporates the ability of the individual to explore, enter, understand and utilize elements of a physical, digital, or conceptual environment, which enables people with diverse physical, sensory, and cognitive capacities to actively engage in every facet of society (Harniss, 2014). Iwarsson (2003) raised several dimensions to discuss accessibility involving physical surroundings, information technologies, and social services and activities. Accessibility research has long been preoccupied with investigating physical access to public buildings and transport to promote urban and mobility sustainability since accessibility is often considered in terms of physicality (Harniss, 2014). However, with the advent of technology, Goldstein (2015) argued that access to digital information should be extended to every individual, regardless of whether they are disabled. Therefore, digital accessibility is presented in various academic studies, which refers to ensuring that people with disabilities, consisting of visual, auditory, motor, or cognitive impairments, are as capable of acquiring and accessing digital services and information on various technological products as the general population (Lazar, 2015).

Other scholars also demonstrated the definition of digital accessibility. Botelho (2021) conceptualized it as a network of dependencies where standards, content, hardware, software, and training must coexist coordinately and be understood as evolving processes. Sharma (2020) argued that digital accessibility broadly comprised social and digital media, mobile applications, and the equitable virtual access of

websites to all people since the Internet constantly evolved and expanded the scope of digital accessibility. Gretete (2021) stated that digital content should be accessible, navigable, and perceivable for everyone to interact with, conforming to the principles of the Web Accessibility Initiative.

Previous studies on digital accessibility span a wide range of topics: Inal (2020) researched UX (user experience) specialists' perspectives and practices of digital accessibility in their project working process in Nordic countries, discovering specialists' insufficient accessibility knowledge and a small time commitment to work accessibility issues. Bong (2021) conducted a systematic literature review of higher education institutions to enhance faculty members' competencies of digital accessibility and education inclusion in the e-learning environment. Concerning tourism, Maldonado (2022) assessed the digital accessibility levels of smart tourism in European cities through their official web pages, which found it did not adhere to the norms of the Web Accessibility Initiative and created communication obstacles. Chemnad (2024) investigated the academic research in recent five years on artificial intelligence applications and digital accessibility, highlighting the pivotal significance of AI and the potential to reduce the exclusion and advocating more AI-driven digital accessibility studies to individuals with different disabilities, including hearing, motor and autism impairments.

Regarding digital accessibility and disabilities, the research varies from investigating the accessibility usage of individuals with disabilities in specific circumstances to the difficulties and opportunities in developing accessible technologies (Pettersson, 2023; Botelho, 2021). Based on Chadli's (2021) systematic literature review of digital accessibility, visually impaired people are selected as the target group, which accounts for one-third of 19 studies with specific components. Hence, studying people with visual impairment occupies one place in the current research on digital accessibility. Among studies on digital accessibility and the visually impaired, assistive technology usage and mobile accessibility are the primary perspectives to discuss since they are significant means for visually impaired people to access digital content and the key factors to consider for establishing accessibility of digital offerings, as outlined in the Web Content Accessibility Guidelines.

2.1.2 Assistive technologies with visually impaired people

Assistive technology is defined as an extensive range of assistive, adaptive, and rehabilitative technologies for individuals with impairments and the methods involved in their selection, location, and usage (Gilbert, 2019). It consists of equipment, devices, and systems that help persons with disabilities overcome social, physical, and other obstacles to fully and equally participate in society (Hersh, 2008). The previous research on assistive technology mainly concentrates on mobility, navigation, and object detection through traditional electronic devices for individuals with visual impairments (Bhowmick, 2017). However, with technological improvements, integrated assistive devices, including the screen reader and magnification, have elicited numerous research and discussions on visually impaired people.

Screen reader on computer

Screen readers are software that runs on computers and mobile devices and utilizes synthesized speech or braille to help visually impaired people understand the visual output on the screen (Gilbert, 2019; Hersh, 2008). It is the standard assistive technology utilized by people with visual impairment, either total blindness or partial vision impairment, due to the affordable prices and high penetration rate (Kleinman, 2007). The studies on screen readers and visually impaired people revolve around evaluating different services and designs for improvement. Concerning the evaluation, Devi (2011) assessed the websites with screen readers. The scholar found several limitations in the image description, visual layout, and interpretations of data tables, which conformed to Kleinman's (2007) study investigating visually impaired people's frustration with screen readers. Based on Kleinman's (2007) findings on 100 participants' frustrating experiences, the most common reasons for frustration were unclear screen reader feedback caused by page layout, a form that was poorly designed or lacked labeling, and the absence of alt-text for images. Moreover, most participants indicated their inability to solve the problem when it occurred. Except for the problems mentioned above, the usability issues in desktop computing, such as the difficulties in switching screen readers and different platforms and customized settings, brought substantial obstacles to visually impaired people in employment and education (Billah, 2017). Cetin's (2015) research investigating the usability of a university website also demonstrated the

conflict between screen readers and different websites, and some links were unreadable for visually impaired students.

Some problems with the screen reader are the subject of additional study and discussion. Murphy (2007) revealed that complicated and long web page designs generated difficulties in navigation with the screen reader, comprehension ability, confusion and additional mental workload in the empirical study of the obstacles faced by Internet users with visual impairments. Williams (2019) also discovered discrepancies between the page information and the website format, which misled visually impaired people when using the screen reader to browse websites. Aiming at the alternative text for visually impaired people to access images, Raymond (2023) reviewed commercial posts on three social media platforms and found that deficiencies and inaccuracies of alt-text exist in most posts, hindering visually impaired consumers from accessing information. In addition, the insufficient alt-text with visualizations was presented in the major online news outlets since the news authors did not adhere to the accessibility guidelines (Jung, 2022).

Researchers in previous studies continue to strive to discover methods to elevate the screen reader experience in various facets. Sodnik (2010) devised a spatialized text reader prototype for individuals with visual impairment, which built on synthetic speech and employed a variety of voices placed in arbitrary spatial positions. Miura (2020) designed a web browser extension to remove extraneous headings, links, and other components in webpages that can make them difficult to view with a screen reader, reducing the elapsed browsing time. Miyashita (2007) developed an accessible Internet browser for multimedia to help visually impaired people control the audio volume of embedded media and the screen reader with keyboard shortcuts. A display reader prototype was created by Morris (2006), who used the basic operating principle of the screen reader to enunciate the information shown on the LCD or LED screens of domestic appliances. Leporini (2004) raised 18 usability criteria for developing accessible websites to enhance user navigation and eliminate potential issues with usability for visually impaired people viewing the website on screen readers.

Screen Magnification on computer

Screen magnification software serves as an accessibility tool for individuals with low vision to see the magnified text about the rest of the screen by adjusting the text and

graphic sizes (Gilbert, 2019). The interaction between visually impaired people and the computer is similar to that of sighted people who use a keyboard and mouse (Hersh, 2008). The primary magnification methods utilized by individuals with low vision on websites are expanding a specific screen area for scrolling horizontally by using magnification software and increasing content through the browser control depending on the coding of the web page (Hallett, 2018; Arnsdorff, 2015). Jewett's (2018) and Sweet's (2015) studies evaluated and compared the two methods in task performance and user experiences. Jewett (2018) found no disparities in reading comprehension between the two methods, but the browser magnification features provided better levels of usability and less visual nausea caused by horizontal scrolling for a long time than the magnification software. Sweet's (2015) study participants also indicated that the browser magnification control enhanced the efficiency and accuracy of the reading task and completed the data input with less time. However, Tang's (2023) findings in comparing the lens and full mode with the two methods presented that both modes have certain users based on which modality was perceived as the more accessible instead of eliminating one mode.

Szpiro (2016) investigated how low-vision individuals utilize computing devices, demonstrating several difficulties in using screen magnification. It included the panning movement the screen magnification required, which was strenuous for participants, reducing the ability to see context due to the narrow field of view, and the challenges in navigating and comprehending the content simultaneously since the magnification was constant across the screen, irrespective of the content (Szpiro, 2016). In allusion to decreasing the difficulties in using screen magnification, various studies were conducted to find suitable techniques to address them. Aydin (2020) developed a screen magnifier interface for individuals with low vision to access multimedia content on computers to lower tiredness and unpleasant experiences by enabling users to customize the magnification levels and switch distinct regions of interest with simple mouse clicks. Schwarz (2020) devised a magnification prototype concerning head-eye tracking to control the magnification mode via head and eye movements without the keyboard and less mouse usage. Hoeft (2002) discovered that magnification display design should minimize the background and peripheral movement to reduce motion sickness when using magnification.

2.1.3 Mobile device accessibility with visually impaired people

Mobile devices, including mobile phones and tablets, have penetrated a wide range of people's daily lives, demonstrating new opportunities for developing accessibility to information technologies and society (Billi, 2010). People with visual impairment are among the group since it decreases the discriminated or stereotyped feelings by subtly integrating assistive applications into ubiquitous devices and continuously evolving to help visually impaired people overcome various challenges (Lilit, 2013; Senjam, 2021). Numerous types of research have targeted studying the accessibility of mobile devices and applications in designing, evaluating usability, and comparing analysis with sighted people (Almoaiqel, 2021). The following content will focus on the related knowledge needed to understand mobile device accessibility for visually impaired people.

Accessibility features and applications usage

Previous academic studies on mobile accessibility begin with researching the usage of accessibility features and applications for visually impaired people. Senjam (2021) investigated overall built-in accessibility features in IOS and Android platforms for operation and third-party accessible applications designed for visually impaired people, which also found that accessible technologies based on smartphones can be employed in daily activities, such as GPS navigation, communication, entertainment and education. Similar results were presented in Shirley's (2017) studies on the general mobile application usage of visually impaired people by surveying them in different age groups, demonstrating that they frequently use applications to carry out daily tasks. In addition, young visually impaired people were more inclined to use applications on mobile devices with high frequencies (Shirley, 2017).

Alajarmeh (2021) presented that the most used built-in accessibility features of visually impaired people were screen readers on mobile devices: Talkback for Android and Voiceover for iOS, activated by tap, swipe and touch gestures. Among the Talkback and Voiceover features, more visually impaired people would choose the screen reader on the IOS platform since it had fewer accessibility issues than the Android system. Another widely used feature was voice commands through voice assistants, as revealed in her study, which provided voice control of the device via speech recognition and speech-to-text technology to accomplish hands-free operation and interaction with mobile devices. The blind and visually impaired group considered voice assistants like

Siri in Apple a helpful tool to be applied to auditory entertainment, weather inquiries and alarm clock settings in Oumard's (2022) research about the current status of speech-based interfaces for individuals with blind and visual impairments. Concerning low-vision people, Irvine (2014) demonstrated that the zoom feature was primarily used in smartphone and tablet devices through multiple gesture movements such as tap and finger dragging. Participants with low vision determined that Voiceover should be utilized on their mobile devices, in addition to the zoom feature, in Robinson's (2015) studies on accessibility options for visually impaired individuals. Another significant finding in his study was that people with visual impairment had no grasp of the accessibility features functions because of the absence of advice from the doctor and inadequate accessibility knowledge of the patient.

Accessibility problems in mobile devices

Examining the issues visually impaired individuals encounter when utilizing mobile devices was discussed in the prior research. Damaceno (2017) executed a systematic review to identify the obstacles faced by individuals with visual impairments during the usage of mobile devices. Gesture-based interaction has been discovered to have the highest number of problems among accessibility issues (Damaceno, 2017). The same problem was found in Smaradottir's (2018) examination of the smartphone screen reader with visually impaired individuals. The results indicated that the system inconsistently responded to participants' gestures; for instance, participants ended the phone call with a two-finger double-tap with a low chance of success. Moreover, participants reported that the four-finger and two-finger double-tap gestures were challenging to perform with Voiceover (Smaradottir, 2018).

Besides the gesture problems, Kuber (2012) discovered that the speech output of the mobile screen reader brought cognitive burden to visually impaired people when it read extended text message information since they need to be highly concentrated on the voice and simultaneously processing the information in the mind. Another problem would be the conflict between the screen reader and third-party applications in converting speech from graphically oriented cues. Regarding the voice-based virtual assistant supported in mobile devices, Branham (2018) observed voice assistant usage by blind people and found problems in erroneously interpreting input voice commands and providing unuseful feedback, frustrating participants. In addition, participants were

concerned about privacy issues when using the voice assistant in public places, which was also shared in Kreimeier's study (2022) about private data being listened to by third parties.

Carvalho (2018) examined accessibility issues that visually impaired people face when utilizing websites and applications on mobile devices, which was more associated with the perspectives of mobile version website design. The problems mainly included the participants not receiving any feedback from the homepage of the website that their operation had an effect and lacking alternative text for screen readers to read images, especially since diverse images and icons dominated the websites. Based on Kane's (2009) research, environmental conditions could affect visually impaired people's mobile device usage, posing challenges to their abilities. For example, participants with low vision found difficulties using the mobile device under the blinding sun, and crowded spaces hindered blind participants from hearing sound in the phone.

Improving mobile device accessibility

Numerous academic scholars have committed to seeking methods to elevate accessibility in mobile devices. Oliveira (2018) presented the current conditions of mobile accessibility guidelines, standards, and recommendations to developers, characterized when to employ them and with what degree of technological maturity in the development process through a systematic literature review. Shera (2021) devised an accessibility problems checklist, categorizing potential problems into organizational, behavioral and presentational levels, and applied it to designing an education application interface process for visually impaired people. The testing results proved that the cognitive effort of people with visual impairment was reduced while navigating the interface employing the checklist, which offered valuable guidelines for creating user-friendly interface designs for visually impaired people. Uchidiuno (2017) executed Personalized Assistive Web to create a website with a hierarchical outline view for visually impaired people to browse on mobile with easy and effective interaction with the web. The study suggested that the adaptation of the hierarchical outline view achieved a favorable outcome in their performance in information search and perception.

Improving the screen reader and voice-based feature was another research direction. Ahmetovic (2023) shared three approaches (adaptive equalization, adaptive volume increase, and speech rate slowing) to screen reader speech compensation to solve the

problem of visually impaired people using mobile screen readers in noisy environments during mobility. The participants indicated that the intelligibility of the screen reader was elevated in the experiment. Felix (2018) proposed an application initiated by the voice command to identify the content in the images and recognize the text in the documents through text analysis to assist visually impaired people. Chen (2018) established a voice assistant prototype to detect falling objects, describe the surroundings, and provide safety care to people with visual challenges when walking outdoors. The digital AI assistant designed by Marvin (2020) identified text on actual things and instantly offered an audio response based on speech and text recognition and speech synthesis capacity with high accuracy in a quiet environment. In addition to studying the screen reader and voice assistant improvement, Liu (2021) created a video search interface to reduce the effort of visually impaired people searching videos since they usually employ a laborious trial-and-error method. The enhanced video search interface with video accessibility metrics increased the efficiency of selecting videos.

Audio description

Audio description refers to a commentary that is added between scenes of a movie or television program to explain what is happening on screen for visually impaired audiences, filling the absence of accessibility in media (Rai, 2010). People with blindness and low vision can access and understand visual information through audio descriptions supported in various contexts, such as educational institutions, multimedia events, museum exhibitions, and Internet websites (Snyder, 2005). According to Web Content Accessibility Guidelines 2.2, all prerecorded video content in synchronized media should provide an audio description to ensure multimedia accessibility. Therefore, streaming services and technological companies like Netflix and Apple enable audio description as an accessibility feature in the application and mobile device settings.

Evaluating the audio description to identify visually impaired people's needs is a significant topic in prior studies. Lopez (2018) surveyed people with sight loss to investigate their overall audio-description experiences in the UK. The investigation demonstrated that most participants would like the AD to consider diversity and preferences for different audiences. Their preferred feature of audio description was obtaining information that would not be available otherwise, receiving the most responses. Moreover, they desired that the availability of audio descriptions increase so

that they could access a wider variety of content (Lopez, 2018). Bardini (2017) compared three audio description content styles (denotative, cinematic, and narrative) and found that audio description impacted comprehension enjoyment and emotion, intimately connecting the film experience. Walczak (2017) also tried to discover which standard and creative audio description style could affect visually impaired people's spatial presence and engagement. The findings indicated that a creative style involving subjective narration of the character and camera operation in the content could increase the presence of the participants and engage them more while watching compared with the objective standard style.

As for enhancing the audio description, Ableitner (2022) built a multi-layered audio description with optional definitions for terminology to ensure more video content could be described and understood. Abreu (2017) also targeted creating a platform that facilitates AD creation for television shows with a voluntary structure to address the expensive and complicated problems of creating AD. Oliveira (2016) developed a video player (ADV player) containing an audio description feature to review the usability of the ADV player for visually impaired students to view visual content. Based on the results, they discovered that most students could understand the video information through voice descriptions, and the improvements in voice speed and audio volume should be advanced in future development to increase flexibility for visually impaired individuals. In addition, the research provides the potential for digital media platforms to further research how to enhance accessibility features in transforming visual content into verbal descriptions.

2.2 Public service media in digitalization

Numerous academic authors have studied public service media (PSM) in digitization, from identifying the necessity to transition to examining its performance. According to Enli's (2015) studies investigating the effects of digital intermediaries and convergence on traditional television platforms, the emerging digital services offered by third parties, such as Netflix and YouTube, allowed individualized and customizable viewing through algorithms to boost audience fragmentation, changing the traditional broadcasting markets, business models and audience preferences. Ramsey (2018) tried to analyze the rationale behind transferring BBC Three online, which also presented the pressures of

public broadcasting organizations on retaining audiences under the robust development of online streaming companies. Therefore, in this situation, public service media represents a technology-neutral role that public broadcasters play in meeting their public service goals by offering services across multiple platforms and devices (Donders, 2011).

Muntsant (2018) clarified that the goals and roles of public service media needed to be adapted to the digital era, which expands the diversity of their delivery channels and discovers communication methods to establish connections with audiences through new patterns. Hence, many public broadcasting companies commonly adopt the multi-platform strategy to target a larger audience, particularly younger demographics and those who do not watch public television (Keinonen, 2014). According to Shagrir's (2014) research, traditional PSM services, such as television programs or radio, could be accessed on social media, websites and applications owned by public broadcasting companies. The multi-platform strategy brings opportunities to comply with contemporary media consumption habits but presents challenges, including internal organization and capturing viewers' preferences in an evolving media landscape (Shagrir, 2014).

In allusion to the previous studies on public service media performance in the digital media landscape, Sehl (2020) performed a web-based survey targeting three countries (Germany, France, and the UK) to examine their PSM performances in contrast to other digital media. The results demonstrated that the attraction of the PSM to the younger target group needed a further increase, although PSM still holds a significant position in video distribution in Western Europe. Donders (2019) found that digital-only content was regarded as supplementary and still needed to be more abundant, even though the increasing variety of content posted online by public broadcasters in analyzing the approaches of public service broadcasting institutions across Ireland, Flanders, the Netherlands, and the United Kingdom. Debrett (2009) and Iosifidis (2011) argued that the PSM should support more dedicated online content with equal amounts and quality and utilize the opportunities in new platforms to their fullest. Bulck's (2020) study revealed that active third-party servers triggered privacy problems when using PSM news websites since they had the possibility to gather customer data. In addition, it indicated the risk of undermining the integrity and transparent value of the PSM if the PSM did not address the issues.

2.3 Streaming media and young people

Streaming is defined as the method of sending and receiving digital data over the Internet, identifying the ability for the user to view, hear, or read content as it is being transferred (Lüders, 2021). Based on Andersen's (2021) study on streaming media, the media form includes podcasts, radio, e-books, audiobooks, movies, television, games, music, and podcasts. Among the diverse research on streaming media, young people's perspective is essential because their media consumption is digital, signifying a fresh "media generation," and their media habits will become more widely ingrained in the future, as the media industry executives stated their perceptions of the youth steamer in Sundet's (2022) study. The vast possession of mobile devices could be the crucial factor shaping youth media habits and changing traditional media consumption since it provides the medium for young people to do online activities such as watching streaming videos on applications and accomplishing social activities in their daily lives (Davison, 2020).

The advent of video streaming platforms with easy operation, flexibility in usage, and convenience of watching the content prompts youth to choose it, as indicated in Kumar's (2021) studies on reasons for Indian youth's tendency to use video streaming platforms. Singh's (2020) research on college students also proved that traditional media was less appealing to young adults than video-streaming services concerning entertainment. One of the major causes participants mentioned is that they can watch the content on streaming platforms following their schedule and preferences as opposed to linear television programs, which have specific days and times for airing (Singh, 2020).

Discovering young people's viewing habits is a significant aspect of video streaming and youth study. Masiola (2021) surveyed 1000 students to understand young audiences' characteristic viewing patterns regarding streaming television in post-crisis Greece. They found that most young people preferred watching entertaining content (movies and TV series) on online platforms because the content of local broadcasting companies was not young and dynamic. Besides the entertainment video content, youth seek audiovisual content to meet their diverse requirements (such as education and knowledge) and yearn for compelling stories (Sobral, 2019). As an attractive platform for young people to consume content, YouTube performs a broad use for youth, including playing background music in multitasking, learning knowledge on tutorial

videos and socializing by commenting (Bulger, 2020; Pires, 2019). Moreover, recommendation systems are gaining popularity among consumers in obtaining personalized content for better viewing experiences through mobile devices. In Kaur's (2023) research on customer opinions on Netflix, the author presented that almost half of the participants depended on the recommendations of Netflix based on algorithms to find content they appreciated effectively.

2.4 Summary and Conceptual framework

According to previous studies on digital accessibility and visually impaired people, streaming, and public service media, these findings offer valuable theoretical support for conducting the current study. Concerning the similarities between the previous studies and this thesis, this study will continue to discuss some aspects related to the research mentioned above. For instance, the problems in using screen readers and magnification will be discussed more when studying the streaming media usage among young visually impaired people. In addition, young people's viewing habits and the situations of the public service media in the streaming context inspire this thesis to study young visually impaired people's experiences from a broad context instead of only focusing on the usability of streaming applications. While reading the studies related to accessibility and visually impaired individuals, it was discovered that the discussion in academic articles encompassing exploring accessibility problems on mobile devices and assistive technologies and specific features without video streaming and public service media perspectives, which can be a research gap in studying the visually impaired group and digital accessibility. Moreover, accessibility and disability are deficient and need further study to create inclusive and barrier-free services when studying streaming and public service media. Even though some academic articles select young audiences as the primary age group to research the impacts of video streaming, youth with visual impairments still need to discuss their conditions.

The interview guidelines and analysis are based on the conceptual framework (Table 1) obtained from the literature review. The main category of the conceptual framework can be divided into three aspects: assistive technology usage among young visually impaired people, streaming media accessibility features usage in public service media and youth's viewing habits of streaming media.

Based on the literature review, the research question is how do young visually impaired people use streaming media in public service media from the perspective of digital accessibility?

Table 1 The conceptual framework of this thesis

Conceptual Framework	
Assistive technology usage among young visually impaired people	The assistive technology operation; The problems of using assistive technology.(screen reader problems in incompatibility and alt-text; screen magnification inconvenience in zoom a video);
Streaming media accessibility features usage in public service media	The accessibility features choice; The accessibility problems(cognitive burden, low accuracy and privacy issues in voice assistant); Audio description (availability, content).
Youth's viewing habits of streaming media	Video content needs; Attitudes toward recommendation system;

3. METHODOLOGY

This chapter will explicitly introduce the research method to conduct the study and recruit participants. In addition, the process of data collection and analysis is demonstrated.

3.1 Research design

The research question is “How do young visually impaired people use streaming media in public service media from the perspective of digital accessibility?” which stems from the literature review. According to on the research question, the study follows the interpretivist paradigm and uses the qualitative research method. The interpretivist paradigm serves as the foundation and framework for designing the research since it emphasizes understanding the viewpoints of the studied subjects and their interpretation of the environment in the socially constructed reality (Kivunja, 2017), corresponding to the objective of this study to learn young visually impaired users' needs and problems in using streaming media through their experiences.

The qualitative research method encompasses the worldview and goal of the interpretivist paradigm, offering subjective perspectives and describing a social phenomenon (McQueen, 2002). Moreover, it answers research questions starting with how, why, and what (Patricia, 2010), which applies to responding to the questions of this study. Qualitative research focuses on eliciting the social meanings of individuals' experiences, situations and circumstances through texts and words rather than numbers (Leavy, 2010). Therefore, interviewing in qualitative research can be the appropriate method to collect data and support the following analysis.

Compared with other data collection strategies in qualitative research, interviewing can create an environment that allows interviewees to share feelings, meanings, and

thoughts and help the interviewer study from their perspectives through interaction (Lichtman, 2014; Cypress, 2018). In addition, it is an essential method to understand the critical aspects of the conversational world, containing rich and in-depth information regarding the social and personal facets of human lives (Brinkmann, 2013). The applied interview format is semi-structured and thematic. The semi-structured interview is equipped with the interviewer's purpose of acquiring knowledge and centres on the interviewee's description of real-world description, comprehending the meaning of the description by interpreting it (Brinkmann, 2013). It balances the strengths and limitations of structured and unstructured interviews, which provides clear guidelines for interviewers and interviewees to avoid digressing the content and has more flexibility to change questions depending on circumstances (Lichtman, 2014; Cypress, 2018).

Besides applying the semi-structured interview method, email interviewing is also considered an auxiliary method used in the study. One of its benefits is that the interviewer and interviewee can self-transcribe in written text, which is essentially available for data analysis (Kvale, 2009). However, it requires skills in written communication, and some interviewees may be poor at expressing themselves through writing in complex and nuanced ways (Brinkmann, 2013). Moreover, the interviewer has the possibility of receiving brief and limited responses from the interviewees, affecting the data collection and analysis (Hawkins, 2018). Hence, Email interviewing in the study acts as the method for the interviewer to obtain some basic information before the official interview and answer follow-up questions arising during preliminary data collation after the interview.

3.2 Participant Recruitment

Participant recruitment complies with the purposeful sampling method in qualitative research, which selects information-rich cases determined by the purposes of the study and resources (Patton, 2002). The criterion sampling strategies in the purposeful sampling method aim to find and choose every case that satisfies a predefined significance criterion (Palinkas, 2013).

The following criteria were applied to choose participants in this study. Firstly, the chosen participant must have a visual impairment, referring to the partial or complete absence of vision acuity ranging from partially sighted to total blindness based on the International Classification of Diseases definition. Visual impairments are experienced by people whose eyesight cannot be rehabilitated by surgery, medicine, standard glasses, or contact lenses. Moreover, they find it difficult to perform daily tasks without device-related support, such as assistive devices. Secondly, the participants need to be familiar with the common streaming services, including YLE Areena and have used them in their daily lives. Furthermore, they have basic knowledge about digital accessibility and experience with the accessibility service provided by streaming applications. Thirdly, the participants' age range should be from 17 to 29. According to the Youth Act in Finland, a young person's age is defined as being fewer than 29. Regarding the minimum age in the study, even though the Child Welfare Act defines the age under 18 as a child, only individuals under 17 are eligible for the statutory child benefit. Therefore, the age of 17 is regarded as the end of childhood age and the beginning of youth. Finally, the participant should possess intermediate English communication skills in describing and providing justifications for opinions since the interview is in English, and it would be significant for the non-Finnish-speaking interviewer to understand the meaning.

Following the establishment of the recruitment criteria for participants, this study encountered several challenges in finding participants. At first, the current research determined to find participants through visually impaired organizations and social media due to difficulties getting in touch with individuals with visual disabilities. The Finnish Federation of the Visually Impaired Youth Work planner was first contacted to help recruit suitable participants and send the invitation of this study (Appendix 1) to ten possible visually impaired youth. Consequently, only P1 responded to be confirmed to attend the study, and no response from other youth was received after some time. Given the unfavorable situation, the Tampere Visually Impaired Federation was added to the contact and the invitation of the study was posted on the Facebook group of visually impaired people, but still received no response from them. Under the thesis supervisor's suggestions, this study used the snowball technique with the help of P1's network to contact P2, P3, and P4 to engage in the study.

After confirming the chosen participants, the interviewer of this research contacted them through Email, along with some of the fundamental information of the study and

questions about their visual impairment and streaming media choices so that the interviewer could have a general understanding before the interview. In addition, the Email involved the interview duration, the selected video conference platform (Microsoft Teams), and the interview schedule. Once the participants agreed on the meeting time, they would receive the meeting link. The four interviews were conducted from 7th November to 8th December 2023. Participants in the research are demonstrated in Table 2.

As the table shows, the four participants have visual impairment to distinctive degrees, and their ages fall within the scope of 17 to 29. Concerning the residential location, two participants live in Vantaa, one in Helsinki, and one in Turku, and they are distributed in different areas in Finland.

Table 2 List of participants

Participant	Visual Impairment	Age	Gender	Residential Location
P1	Nystagmus Refractive Errors	18	Female	Vantaa
P2	Blind	17	Female	Helsinki
P3	Congenital cataract Low vision	18	Female	Vantaa
P4	Blind	22	Male	Turku

3.3 Data collection

The knowledge from the literature review was used to devise the interview questions. Apart from gathering adequate and pertinent information through interview questions, the fresh perspectives of interviewees who contributed to the discussion were also valuable for the study.

The online video interview held in Microsoft Teams is the primary method during data collection because of geographical constraints. Online interviews, often called e-interviews, are in-depth interviews performed with computer-mediated communication,

which facilitates the researchers and the participants conversing in synchronization (Salmons, 2012). On the one hand, the online interview offers a familiar environment for interviewees to proceed comfortably, and researchers can see the participant's facial expressions and body language via the screen (Irani, 2019; Bratt, 2021). On the other hand, technical issues likely happen during online interviews, such as poor Internet connections, which affect the voice and visual clarity and audio-recorded files (Irani, 2019). Therefore, based on Irani's (2019) raised considerations on online interviews, the interviewer of this study familiarized the menu and functionality of the chosen video conference platform to avoid the unskillful operation of distracting participants in advance. In addition, before starting the interview, the interviewer chose a quiet and private room and checked the camera, microphone and Internet connection conditions to conduct the interview smoothly.

The pilot online interview was conducted with the thesis supervisor in November 2023 to inspect the feasibility of the interview and find the potential issues that might be ignored. Even though the supervisor had no visual impairment, it did not affect the interview process; however, some questions needed to be rephrased for clear understanding. For example, the supervisor indicated that the interviewer should complement the definition of streaming applications when asking interviewees what streaming video applications are commonly used. After the pilot interview, the interviewer revised the questions and reflected on the interview process to adjust the questions for participants with different visual impairments and value developing rapport during the interview.

The official interview process includes three sections to proceed. Each interview started with the interviewer extending a kind greeting and introducing the study information, requesting verbal approval to participate in the recording and explaining the confidentiality and anonymity of the data. To evoke richness and depth in the interview, the interviewer adhered to Rubin's guidelines (2005) on structuring interviews and integrating main and follow-up questions and probes in the body of the interview. The main questions translate research topics for interviewees to answer more explicitly, rooted in books and academic literature (Rubin, 2005). Hence, the main questions in the interview are about participants' experience in streaming media, assistive technology, accessibility feature usage, viewing, and suggestions in 5 themes. Regarding the follow-up questions, they were asked to acquire details and insight answers. For instance, the interviewer asked the participants how to find video content

with audio descriptions on streaming platforms, which was not a predetermined question and was raised during the discussion of audio description availability. The probes are used for further clarification of answers, reflected in questions, such as Please give an example of the challenges of using streaming services. Finally, the interview ended by asking for participants' background information, and interviewers conveyed appreciation for the participant's involvement in this study. All the interviews were conducted in one hour and roughly 30 minutes and recorded using the Microsoft Teams recording function.

After finishing the online interviews, some new follow-up questions that could bring nuanced answers appeared during the initial stage of collating data. For example, the interviewer found that the interviewee did not mention why they do not use voice assistants to access streaming services during online video interviews. Therefore, the email interviewing was conducted to gather additional information until no further knowledge could be extracted from the interviewees.

3.4 Data analysis

The analysis procedure adhered to the guide outline established by Braun and Clarke (2006) via the six steps of conducting thematic analysis. The six steps are: 1. Familiarizing with collected data; 2. Generating initial codes; 3. Searching for themes; 4. Reviewing themes; 5. Defining and naming themes; 6. Producing the report.

First and foremost, the analysis begins with familiarizing the collected data. The familiarization of the data started after each interview by listening to the recording and generally collating the data with critical words into tables. As Clarke (2006) suggested, the verbal data produced by the interview should be meticulously transcribed into written form for thematic analysis. Therefore, the initial text version of the transcription was acquired with the built-in live transcription function in Microsoft Teams and manually revised multiple times in Microsoft Word after repeatedly listening. The final version of the transcriptions removed the interjections and pauses, such as well and hmm, to retain the significant information the study required. In addition, it was carefully examined more than once with the original recording. Some critical texts were underscored, and notes were taken for the coding phase in the transcription process.

Secondly, codes were generated in Microsoft Word by manually selecting texts and adding comments. All four transcriptions, including video and email interviews, were read cautiously and coded for relevant and potential themes as much as possible. After reviewing the first coding round, some codes were refined in a consistent format for following the interview frame; for instance, the code for the screen reader operational process in streaming applications is "Assistive technology usage: Screen reader navigation." Moreover, several codes were revised to provide more accurate descriptions and merged accordingly. During this step, all the data were initially compiled and coded.

In the third step, the codes were differently colored and bolded in Word to find themes. For example, dark blue is used for visual impairment descriptions. The codes were first arranged into 23 themes.

Fourthly, the created themes in the third step must be reviewed and refined by re-reading the compilation of coded extracts in each theme to ensure adequate data supports the themes and remove the overlap between themes (Clarke, 2006). For instance, the built-in accessibility features in mobile devices that visually impaired individuals use to navigate the applications are the mobile form of assistive technologies, such as Apple Voiceover and screen reader, so that they were combined in the same theme. After the review, the final thematic map (Figure 1) was done, and nine themes were the main finalists. The nine themes are: 1. Young visually impaired people's streaming media choices and using context; 2. Effect and challenges caused by visual impairment in using streaming applications; 3. Satisfactions on recommendation system and suggestions on video content; 4. The navigation, compatibility, problems of screen reader in streaming applications; 5. The navigation, compatibility, problems of magnification in streaming applications; 6. Audio description experience; 7. Low usage of voice assistant; 8. Future assistive technologies and accessibility features; 9. Suggestions to streaming application developers.

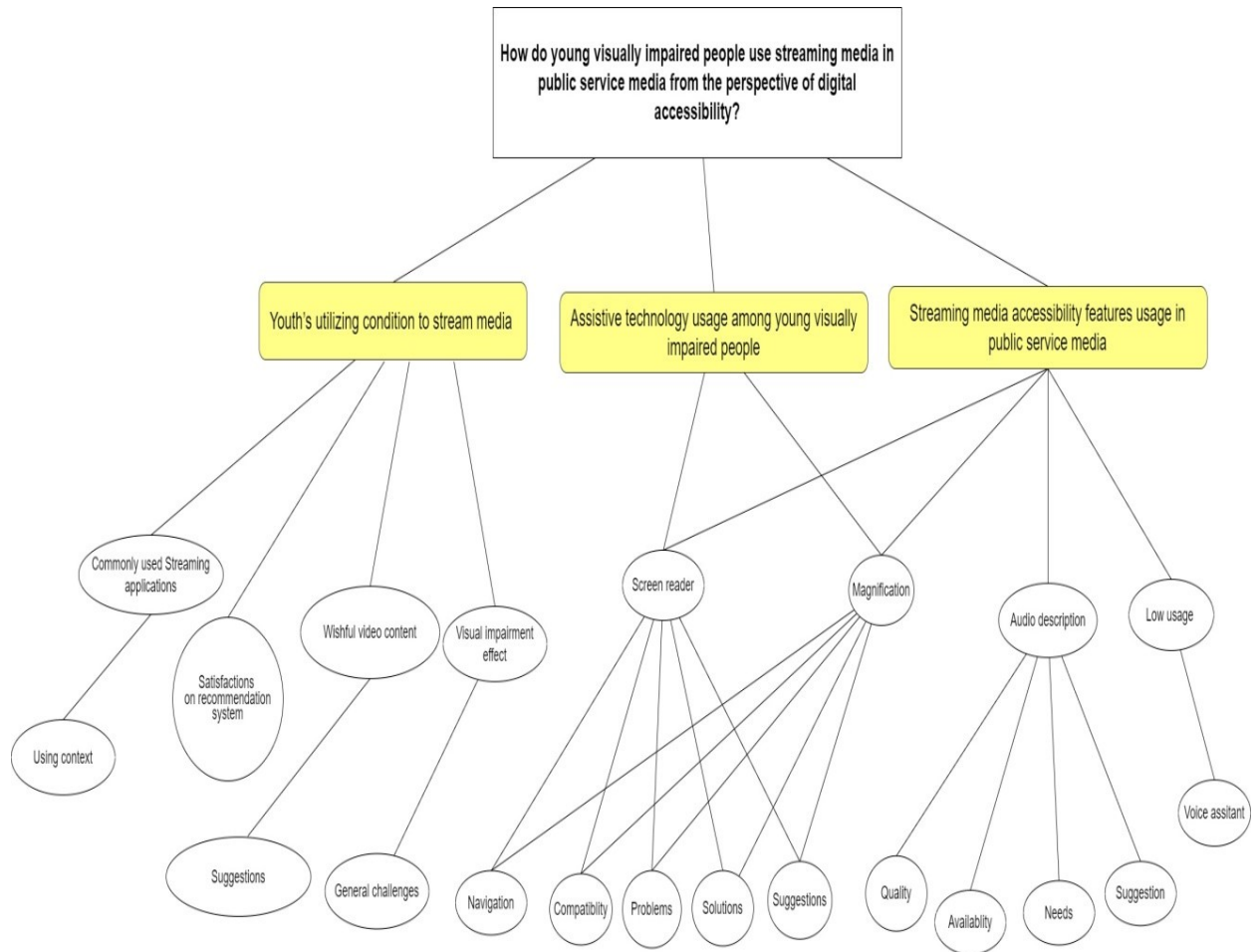


Figure 1. Thematic map

The fifth step involved naming and identifying the themes. The central idea of each theme was established via this approach, along with the specific features of the data that each theme represented. Additionally, they contributed as a framework for the composition of the Findings section.

Writing and producing the report is the sixth step. Vivid and understandable quotations of data extracts with themes and analysis were provided in the following Findings of the study.

4. FINDINGS

The findings in this research are divided into five sections to present, following the conceptual framework to answer the research question, "How do young visually impaired people use streaming media in public service media from the perspective of digital accessibility?"

4.1 Youth's utilizing condition to streaming media

Streaming media choices and using context

Four participants in the interview chose YouTube and Netflix as the commonly used streaming applications in their daily lives. Three participants stated that YouTube had a high frequency of use, and one participant primarily used Netflix.

Among the three participants, one exclusively chose YouTube to watch videos and said, "*I use only YouTube because the accessibility of the other is not good.*" (P2).

All participants indicated that the YLE Arena was used, and one (P4) also used Ruutu, MTV Katsomo, founded by other Finnish streaming services.

The context of using YouTube, Netflix and YLE Arena concentrated on participants' free time and schoolwork. During their leisure time, participants watched fun and relaxing videos and videos that were associated with their interests on YouTube. Regarding the schoolwork, P1, P2, and P3 found information and learning videos on YouTube and YLE Arena. In terms of video viewing types on different platforms, Netflix served as the platform for watching movies and TV series, which was identical to YLE Arena.

In addition, P1 and P3 watched documentaries on YLE Arena. Except for the mentioned video viewing types, audio videos on YouTube were one of the participant choices:

"And YouTube, I like to listen to audiobooks or other videos. I listen to them often when I go to sleep. But sometimes I just watch the videos as well." (P3).

Challenges in using streaming applications

All participants had different degrees of visual impairment, which posed impacts on utilizing streaming applications. P1's visual impairment resulted in born prematurely with second-degree cerebral haemorrhage, bringing nystagmus and refractive errors. It impaired the participant's capacity to view distant objects. The participant cannot see the video subtitles concerning the challenges of employing streaming applications.

P3 had congenital cataracts, which caused low vision and light sensitivity and missing eye lenses with smaller eyes. The condition of P3's eyes differed:

"My right eye is quite useless, limiting my visual field. My left eye, though, sees a lot better, and I use electronics quite visually, but with magnification and other visual adaptations." (P3).

As for the effect of visual impairment, it limited P3's ability to read subtitles to a lesser degree, and she needed to focus on it more with the help of accessible websites and platforms. P3's challenges in using streaming applications were inaccessible and incompatible issues:

"For example, I cannot make the text bigger on Netflix on my laptop. So, like the text that describes the series, that is quite annoying, and that also happens in many other applications. Usually, it is the text or the settings menus and everything that are not very accessible, or sometimes the websites do not really work with my magnification, and it gets stuck." (P3).

P2 and P4 were blind but had slight differences. P2 had no vision of seeing anything, and neither did P4, except for seeing some lights. Both participants indicated they could not access images and highly relied on the audio descriptions to understand the content on screen because of the effect of being blind. Therefore, their most significant challenges were the deficiencies of audio descriptions:

"If we think about a TV series or movie or something, there are often these moments where it is totally silent, and then, surprisingly, someone starts to scream, and then I cannot see the screen. I have no idea what happened if there is no audio description. So the biggest problem is that I am not on the same line as the others, who are watching the videos or movies or something. So I do not get the same information without the audio description." (P2).

P4 mentioned another challenge occurred if assistive technologies such as the screen reader were not well-suited to websites and services:

" If the subtitles are only within the image, so there are not a text file or the subtitle file then it is not possible to listen to the subtitles which screen reader read so that can be challenging if that video is in a foreign language." (P4)

Recommendation system and video content suggestions

Four participants were generally satisfied with the recommendation system and indicated that the current video content in streaming applications meets their viewing needs. P2 discovered exciting and fun content through the recommendation system. However, P3 and P4's use frequencies were relatively low since P3 was used more to search for the category she was finding directly. P4 occasionally used the recommendation system to find new video content.

In allusion to the suggestion of wishful content in streaming applications, P2 was expected to have more audio-described video content towards the young audience in YLE Arena:

"I would like to have more TV series and movies for young people with the audio description because for the moment it feels like it is for the most for older persons and not maybe for my age." (P2)

P3 suggested that the content supply in YLE Arena could be more expanded. In addition, video content should increase the retention of applications: *" I think it could keep the content a bit longer because sometimes they disappear pretty fast" (P3).*

P4 wished all the streaming platforms would elevate the availability of the audio description in videos because some videos without the audio description might be problematic for him.

4.2 Assistive technology usage among young visually impaired people

Screen reader usage in streaming applications

Four participants navigated the application on the computer and mobile devices through the screen reader with different degrees of usage. P1 and P3 chose the screen reader as an alternative tool since they had the vision to select and watch video programs instead of solely depending on audio compared to P2 and P4. P1 used NVDA software on the computer to read small text that could not be seen. P3 selected Talkback, the Android version of the screen reader, when her eyes were tired of seeing the text. P2's situation differed from that of the other three participants regarding the choice of device for streaming applications. She only used the Voiceover on the phone because she thought few screen readers were designed for various websites on computer and mobile devices that were more accessible to navigate.

P4 navigated the streaming applications by utilizing NVDA, Jaws and Linux Orca on the computer and Voiceover on the phone. He used the keyboard shortcuts of the computer built for the operating systems, web browser and screen reader to navigate the webpage without using the mouse since he could not see the mouse cursor. The keyboard shortcuts directly choose the particular area the participant aimed to access, such as the play button on the video player:

" With keyboard shortcuts, I can quickly, for example, this video streaming websites, I kind of quickly jump to the specific parts of the screen, headings or search field or like that." (P4).

Concerning mobile devices, P2 and P4 employed gesture commands following the voice guidance, such as double tapping activate items and swapping left or right on the screen. Moreover, P4 mentioned that the Voiceover on the iPhone was helpful in reading subtitles:

"If there are subtitles with the video and they are in a proper format, then a screen reader also reads these subtitles. If I have enabled this setting on the screen reader, this subtitle thing works better with IOS, so Voiceover has good support for subtitles. On Windows, it is not as good. More it can be that subtitles are not read or read properly." (P4)

Regarding the compatibility between the screen reader and the streaming applications, P2 and P4 selected YLE Areena. Besides that, P4 thought YouTube was compatible due to the excellent accessibility resources Google supported. P2 chose YLE Areena as the most compatible application with the screen reader since all the buttons and menus were named for the Voiceover to read and appropriately developed for the screen reader, which was straightforward to use. She also shared that some streaming applications lacked clear and accurate descriptions to understand, leading to confusion while using:

" The problem for the most with streaming applications is that there is very many like buttons that only called, and that is a problem when there is like you have ten buttons on the line and you do not know what is happening." (P2)

As for the screen reader problems in streaming applications, P2 and P4 had no problem with the alternative text for the image. However, P2 found it challenging to navigate TIKTOK with the Voiceover during the first few weeks she started to use it because it was entirely video-based for sighted people and had few features to consider blind people and the screen reader. P3 found that sometimes Talkback could not recognize the text on the mobile screen. P4 also encountered a similar accessibility problem: the content was unreadable by the screen reader. Therefore, he tried the character recognition or OCR (optical character recognition) feature in the screen reader to scan the text to read:

"So if, for example, some text subtitles or some other text is all only as an image that the screen reader cannot read, then I can try to read with this read feature. Sure, but it does not always work, and the accuracy can vary quite a lot. So with these tools, I can try to solve the problem." (P4)

In addition, if the keyboard shortcuts in the screen reader could not activate the buttons on the web pages, which the mouse could only access. In this situation, he applied other keyboard commands to simulate the mouse click with uncertain success chances. However, he indicated that if some problems exceeded his ability to solve, he would send the feedback to the developers of the platforms.

Magnification usage in streaming applications

P1 and P3 used different types of screen magnification on the computer and mobile devices to navigate. P1 applied the Dolphin Supernova and the zooming feature in Apple to see small text, look at pictures, and watch videos in the applications by enlarging the screen with the software and touch gestures. P3 used the magnification features of Windows to make the whole website bigger through the ctrl + command keyboard shortcuts or amplified a part of the screen with overlay magnification to scroll through it in a way going back and forth on the screen. As for the mobile device, she turned on the magnification feature in Android and triple-tapped to zoom the screen to see the titles and thumbnails of the videos in the application.

P1 selected YLE Arena as the most compatible streaming application with magnification since it was equipped with a clean format and a well-formatted design to magnify and find things. As it perfectly matches the magnification settings in the computer and the phone, YouTube was chosen by P3 as the most suitable application:

"YouTube aligns straight with the Google phone settings and with my computer settings. So, the text is already bigger, and it also works well with Windows magnification because everything has clear lines. So it is easy to navigate even when it is really big." (P3).

Regarding the magnification problems with streaming applications, the small text that describes the information of the video program could not zoom in to see troubled P1 when she selected videos on Netflix websites. P1 attempted a few solutions, such as using the screen reader to read the text. She would find information from other resources or directly watch the video if it did not work. Besides the small text problem, P1 felt inconvenient to constantly zoom the video to see the details while watching it. However, P3 held a different opinion: she was accustomed to the zoom gestures since

she had done it for many years. P3 had the page display problem in streaming applications after using magnification:

"If I use the magnification and the page is very confusing, or I do not know where things are, and I only see one 10th of the page because it is magnified, then it is hard to find things." (P3)

Moreover, she further explained that some buttons or texts on the page were over-crammed and over-zoomed to not visible, which was a common problem for all streaming platforms on websites and mobile devices besides YouTube. P3 attempted a different approach to magnification when the problem occurred.

4.3 Streaming media accessibility features usage in public service media

Audio description experience

P2 and P4 were generally approved for the quality of audio descriptions to better access the video content supported by streaming applications. However, P4 argued that some descriptions were poorly written: *"For example, if they are very old videos and old descripts can be not so helpful." (P4).*

According to P2 and P4, the audio description did not fully cover videos in streaming applications. During the interview, P2 affirmed that the audio description content was well-made and functioned effectively in YLE Areena. At the same time, she indicated that some videos lacked audio descriptions to access:

"But of course, there is the most part of the programs and videos, and stuff that is only YLE Areena does not have the audio description so that I think that is a bit sad." (P2).

P4 also revealed that the video with Finnish audio descriptions was centered in YLE Areena, and other streaming services rarely supported it compared with English audio descriptions.

P2 faced another problem: figuring out which program supported the audio description:

"For example, on YLE Areena, which program has the audio description, and how to get it on." (P2).

The situation was different with P4 because he knew the method to find the video content with audio description on YLE Areena:

"From Areena, there is a website, which lists all audio described content so I can check from there if some content is audio described and also because I am in mailing lists which are for visually impaired people, so there can also be an announcement from YLE if some program is audio described. So it is quite easy." (P4).

However, P4 found that locating the audio description for the video material took much work on YouTube. The biggest reason could be that different publishers created the video content, and their approaches to implementing the audio description varied. In addition, YouTube did not have the feature to enable audio description, causing great difficulties in identifying audio-described video content. Therefore, P4 would contact and suggest that the content publisher of the platform create the content described in the future and try the OCR tool to read the video-provided subtitles if he did not find audio-described videos.

Concerning the need for the audio description, P2 would like the audio-described content to involve more descriptions of persons, nature, surroundings, and youth views to help her further understand the details on the screen. P4 also expected that the visual information should be included more in the audio description than merely obtained from the audio of the video.

Low usage of voice assistant

All participants expressed that they did not use the voice assistant to access streaming applications for diverse reasons. P1 and P3 believed that assistive technologies such as the screen reader and magnification satisfied their needs and functioned much better with streaming applications, which were accustomed to their habits. Regarding P2's conditions, she was also not used to voice assistants, so she had not considered using

them when accessing streaming platforms. Furthermore, P3 and P4 argued that the voice assistant was not practical and precise since it might have issues like mishearing things or not being compatible with applications:

"For example, I share some videos from YouTube with Siri, but it often recognizes the name wrong or there is some problem, and I think it is related to Siri and voice recognition, not to the media service." (P4).

4.4 Suggestions for digital accessibility improvement in public service and streaming media

Future assistive technologies and accessibility features

P1 anticipated that the streaming application could provide features for visually impaired people to adjust the font size of the subtitle in the video, empowering their autonomy to accommodate their needs to adjust font size on the computer and mobile devices while watching. Alternatively, visually impaired people could enlarge the subtitles on the screen without entering the settings to change them and use external assistive technologies to amplify them. Regarding P2, she envisioned that the automatic audio description feature could be applied to streaming services, such as the picture recognition function based on machine learning and artificial intelligence to recognize and describe visual information automatically when turning on the feature.

P3 would like streaming applications to be directly synchronized to the computer or phone accessibility settings with the easy method to customize visually impaired people's needs:

"If your phone is in dark mode, for example, then YouTube will also be in dark mode and things like that. It takes the settings already, but it could take more accessibility settings in the same way and just transfer them to the app." (P3).

P4 hoped the screen reader support in the applications could be enhanced to make it easy to navigate and reduce efforts to fix issues.

Suggestions to streaming application practitioners and developers

P1 and P3 did not share much information about developers to improve accessibility other than to elevate their abilities to develop the function of adjusting subtitles font size and synchronization between computing devices and applications settings.

P2 suggested that content creators on YouTube should raise more digital accessibility awareness and consider audiences with disabilities when making and publishing videos:

"So I would like to see more alt texts used in streaming applications for pictures and things and then, of course, the audio description for videos." (P2).

P4 indicated that the developers need to involve visually impaired people in the application development process to discover potential accessibility issues:

"If there are some problems with apps, they can be fixed before, for example, releasing an update, which is always easier than afterwards."(P4).

4.5 Summary of the findings

One of the primary findings of this study is that young visually impaired participants choose YouTube, Netflix and YLE Areena as the commonly used streaming services. The reason for selecting YLE Areena to watch videos may be that it supports different kinds of videos for audiences instead of merely transferring Finnish television content to online platforms. An interesting finding is that young visually impaired respondents rarely rely on the recommendation system in streaming services to make choices since the search engine can help them locate the desired content. The study presented the difficulties youth with blindness and low vision encountered while using streaming services, consisting of missing audio descriptions, the incompatibility of assistive technologies and the streaming application, and the challenge of perceiving subtitles. In addition, this thesis observed that youths' demands were expanding video supplies, extending video preservations and making video content accessible in streaming applications.

This research found that the four young visually impaired informants used the screen reader to access streaming applications. The new finding is that the screen reader is applied by youth with low vision if the magnification cannot enlarge the small text and the eyes are tired. The study demonstrated that youth with blindness employed keyboard shortcuts with the screen reader to navigate streaming websites and double tap and swipe hand gestures following the Voiceover speech guidance on mobile devices. Moreover, the findings of this research indicate that clear and accurate labels of buttons and icons on the application interface can achieve better compatibility between streaming applications and the screen reader. This study discovered some problems in using the screen reader with streaming applications, which were unrecognized content by the screen reader on the application interface and exclusively required mouse clicks to access.

This study revealed that magnification software on computers and features on mobile devices were utilized by youth with low vision to navigate the streaming applications by magnifying the screen with keyboard shortcuts and hand gestures. This investigation has found that the streaming application has a neat and well-organized layout design and synchronizes automatically with computing device magnification settings, which can enhance compatibility with the magnification. Concerning the magnification problems with streaming applications, the current study showed that the small font size on the application could not be accessed through the magnification, and over-magnified text and buttons increased the difficulty in finding items on the application.

The findings of the audio description experience mainly cover the need for youth with blindness to find and enable audio descriptions in streaming applications quickly. In addition, the quality and availability of the audio description should be strengthened. Another unexpected finding in this study is that young visually impaired participants do not use the voice assistant to navigate streaming applications. The reasons are that the voice assistant has problems with the voice input not being recognized correctly and that the screen reader is more accustomed to use in streaming applications.

This study found that the suggestions for improving digital accessibility in streaming services raised by youth with low vision were empowering people with more options to customize the font size in applications and developing the function of automatic adaption with the computing device accessibility settings and the application.

In addition, the study demonstrated that the participant envisioned that the automatic audio description feature in streaming applications could automatically identify and describe visual information. This research also discovered that video content creators and developers for streaming services should increase digital accessibility awareness.

5. DISCUSSION

This chapter outlines the primary findings of the study and discusses them with the academic literature. These findings are categorized as the topics involving the streaming media usage of youth with visual impairments, the utilization of the screen reader and magnification, the experience of the audio description and voice assistant, and the improvement of digital accessibility topics.

5.1 Streaming media utilization among youth with visual impairment

According to the findings of this thesis, YouTube and Netflix are considered the standard streaming services for young respondents, corresponding to Singh's (2020) studies on young college students' viewing preferences for streaming platforms. Moreover, this research indicated that YLE Areena belongs to the widely used streaming platform among young participants. The finding contradicts Kotsakis's (2021) results, which stated that compared with YouTube, the frequency of choosing online TV services from traditional broadcasting networks for favored viewing video options among youth was the lowest. The reason can be that the video content in YLE Areena is not restricted to programs from traditional Finnish TV channels. As the findings presented, the participants can watch various video types on YLE Areena.

Concerning the consumed video content, participants in this study shared that different streaming platforms satisfied their diverse needs for entertainment and education, aligning with Matsiola's (2021) and Pires's (2019) surveys about young people's viewing content choice in Netflix and YouTube, discussed in the second chapter. In addition, according to young respondents, the YLE Areena also functions in the same usage as Netflix and YouTube in watching TV series and learning videos.

As for young participants' attitudes toward the recommendation system in streaming applications, the finding is contrary to Kaur's (2023) study that the high dependency on discovering video content on Netflix through algorithms. Instead, the recommendation system was not dominant in helping respondents in this study make decisions, and they

occasionally considered its suggestions. Matsiola's (2021) study demonstrated the same finding in investigating youth's viewing habits impacted by recommendation systems. One of the respondents explained that the intended content could be found through the search engine in the streaming application without the recommendation system.

The study also revealed the challenges youth with different visual impairments face when using streaming applications, including the difficulties of seeing subtitles, inaccessible issues between assistive technologies and applications, and the absence of audio descriptions. These results support additional thoughts about visually impaired people's digital service usage and video accessibility. Moreover, the participants expressed their needs regarding the supply, preservation, and accessibility of video content in streaming applications. It extends the discussion about online content improvement in public service media in Debrett's (2009) and Iosifidis's (2011) studies.

5.2 Digital accessibility in streaming and public service media

The following findings are divided into two sections to discuss the usage of assistive technology and accessibility features among youth with visual impairment, which further reveals the current digital accessibility situation of streaming services, including the accessibility barriers and problems.

5.2.1 Screen reader and magnification usage

As Kleinman (2007) stated in his study, the screen reader was utilized by people who were blind and partially sighted to navigate on computing devices, which is in accord with the investigation of the assistive technology choice of all young participants in this research while navigating in streaming applications. The current study showed that respondents with low vision and moderate visual impairment used screen readers on the computer and mobile devices as a substitute method to solve minor text problem that can not be seen by magnification and reduce eye strain. This new finding enriches why the screen reader prompted individuals with low vision to use it, which is not presented in Robinson's (2015) studies. Regarding the computing device choice to use streaming services, one participant solely used the Voiceover feature on the phone and believed it supported better navigation with its accessibility function. The respondents' perception is consistent with Alajarmeh's (2021) research, which found that most visually impaired

people favored Voiceover on the IOS platform. The study at hand also revealed that the Voiceover was beneficial in comparison with the screen reader on the Windows computer system since it was equipped with a reading subtitle feature to ensure the subtitles in the videos were read correctly.

The finding about the screen reader navigation approach with streaming websites is utilizing keyboard shortcuts to locate the search field and play button on the screen, which corresponds to Borodin's (2010) study that visually impaired people used shortcuts such as Shift keys to move between components of headings, links and buttons. Alajarmeh (2021) and Smaradottir (2018) argued that the Voiceover on mobile devices provided double tap and swipe hand gestures with instantaneous speech feedback to help visually impaired individuals interact with the touch screen. It conforms to respondents with blindness narration of how they executed the gestures on the interface of streaming applications in this study.

According to Cetin's (2015) and Kuber's (2012) findings on the usability problems of screen readers, the conflict between screen readers, websites and third-party mobile applications appeared during visually impaired people's daily usage, raising discussions with participants in the current study about the compatibility between screen readers and streaming applications. This research discovered that buttons and icons on the application interface must offer precise and unambiguous labels for the screen reader to deliver, optimizing the compatibility of the application with assistive technology. Otherwise, it generated confusion in navigating. Likewise, as Whitaker (2020) stated, the design of the application should consider that each element could be understood independently with concise descriptions by visually impaired people through the Voiceover since they only comprehend the context under the presently chosen element, unlike sighted people. Moreover, the outstanding accessibility resources in streaming platforms can achieve better compatibility with screen readers, as the participant reported.

The current master thesis offers new findings on some problems employing streaming applications with the screen reader, which are seldom highlighted in Kleinman's (2007) and Chiou's (2022) research about evaluating the problems of screen readers on computers and mobile devices. Based on young participants' elaborations in this research, the problems were that the screen reader could not recognize some content on the screen, such as text or the text as an image lacking the description, which was

likely caused by the poor interface design of the application without following the accessibility guidelines and insufficient considerations of visually impaired people's screen reader usage (Chiou, 2022). Another problem discovered in this study was that some elements on web pages were exclusively accessed through the mouse and activated by the other shortcuts of screen readers to simulate the mouse click, as the respondent noted. Borodin (2010) argued that this browsing tactic was ineffective and complicated for visually impaired people utilizing regular keyboard shortcuts to access content.

The literature in the second chapter indicates that individuals with low vision tend to apply screen magnification to access content by enlarging the text and visual sizes on the screen (Arrue, 2020; Gilbert, 2019). It is proved by the informants with low vision in this study that they use magnification software and features to navigate streaming applications. Schwarz (2020) and Feiz (2020) explicitly introduced common magnification tools for people with low vision, including Dolphin Supernova software, Windows Magnifier on computers, and the zoom feature on Apple and Android magnification, which matches the responses of respondents with low vision in this research to their magnification tool choice to navigate streaming applications. In addition, this research discovered how participants utilized these magnification tools to navigate the streaming applications, including enlarging the screen to see pictures and watch videos and using Windows keyboard shortcuts to magnify the display of the website. Following Pusateri's (2014) introduction to magnification features on Android, the respondents applied a triple-tapping gesture to zoom the screen to see thumbnails in the application and video titles.

This study demonstrated two aspects of reaching compatibility between the streaming application and magnification from participants with low vision. Firstly, a clean and well-formatted layout design in the application helps people with low vision to use magnification to obtain content. This finding is supported by the inclusive and accessible design guidelines in the UK government for people with low vision, which state that layout design should be organized and logical to guarantee that the information can be accessed after magnification. Secondly, automatic synchronization in the application with the participant's computing device magnification settings can significantly improve compatibility since it already magnifies the text on the screen and is accustomed to the participant's practice of employing magnification. The automatic adjustment of content on computing devices could benefit people with low vision and

reduce their challenges in adapting to different graphic interfaces of applications (Hashash, 2016).

Moreno (2021) indicated that small font sizes on the website page posed challenges for people with low vision accessing information. Gilbert (2019) also raised that small font sizes should be avoided during design. However, one respondent of the current study encountered this problem when trying to see the video content descriptions on Netflix websites, even after using the magnification and the screen reader. Prior studies also discussed that panning and zooming movements with multiple gestures were inconvenient for individuals with low vision when accessing the mobile interface or watching videos (Szpiro, 2016; Aydin, 2020). One of the participants confirmed that it was frustrating to zoom in to see the details of the video repeatedly. Another participant's situation is contrary to prior studies since she had become habituated to performing zoom gestures for many years without annoying feelings. It brings a new perspective to Szpiro's (2016) and Aydin's (2020) research. This study also found that the magnification problem was not discussed in the literature review. It was that the buttons and texts on streaming applications were over-magnified after using magnification, making the content challenging to navigate to find things. Hallett (2015) argued that the screen magnifier would limit the field of view and increase the difficulties of discerning context as magnification levels expand.

5.2.2 Audio description and voice assistant experience

Concerning the audio description usage among participants with blindness in this research, one participant indicated that the quality of audio descriptions in old videos might not be beneficial. It broadens the content of Lopez's (2018) investigation on visually impaired people's wishful audio description quality improvement. The availability of the audio description sparked much discussion in this study among respondents with blindness. One finding is that the coverage of audio descriptions in YLE Areena was insufficient, which aligns with Miguelez's (2023) research that the video content with audio descriptions was sparse, with a small amount of data, on surveying the accessibility of streaming platforms in Europe. In addition, Miguelez (2023) presented that English was supported in the audio description for more than half of the languages, and the situation was particularly concerning for other languages. It is

associated with one of the respondents' experiences that the availability of Finnish audio descriptions was lower than that of English in streaming services.

Finding the audio-described videos was tricky for participants with blindness in different streaming applications. For instance, one of the participants with blindness was unaware of the YLE Areena, which offered audio descriptions of which programs. However, another respondent easily identified audio-described videos on YLE Areena through announcements on mailing lists and websites, except for on YouTube, since it did not have a uniform feature to enable audio description. These findings demonstrate that offering a straightforward method for visually impaired people to locate and activate audio descriptions in streaming applications is significant, adding a new approach to Figiel's (2019) studies of elevating audio descriptions in online streaming services. Moreover, this master thesis discovered that respondents would like the content of the audio description to incorporate more visual information and youth views into the narration, which accords with Walczak's (2017) studies that creative audio description style was favorable to people with blindness.

Regarding applying the voice assistant to streaming services, all participants expressed that they did not use it. This finding differs from Alajarmeh's (2021) research that voice commands through voice assistants were the second most commonly used accessibility feature by visually impaired people. Moreover, it conflicts with Oumard's (2022) investigation of voice user interfaces among people with blindness, which discovered that voice assistants were most frequently used in auditory entertainment, including audio film and TV media. In allusion to the factors contributing to the low usage of the voice assistant, some participants in this study identified problems with incorrectly recognizing the voice input. The same finding can be found in Abdolrahmani's (2018) study, which showed that people with blindness experienced this usability problem. Other respondents mentioned that screen readers were habituated to their routines and performed well while navigating streaming applications, conforming to the screen reader user survey in WebAIM, which showed that most visually impaired people chose the screen reader over voice assistant because it brought familiarity to use for most reasons.

5.3 Enhancement of digital accessibility in the streaming service of public service media

Medina (2022) introduced two primary categories as approaches to accomplish web interface adaption to satisfy the diverse needs of people with low vision, which were user-oriented to provide options to change the features of the system and the ability of the interface to gather user information, the usage context and utilize that information to alter itself continuously. The suggestions from participants with low vision in this research to improve digital accessibility are consistent with Medina's (2022) statement, involving envisioning the feature of changing the font size on the applications that could be more customizable. This advice was also demonstrated in Szpiro's (2016) study, which presented that people with low vision hoped the application would provide more selections for customizing text. Another informant in the current study wished more streaming applications could be immediately linked with the accessibility settings on phones or computers without manual operation. This finding is associated with the automatic adaption concept mentioned in Medina's (2022) research.

One participant in this study suggested that the automatic audio description feature generated the description through recognition of visual information, which could be integrated into streaming applications to elevate the convenience of watching videos. This notion has been discussed and conducted in several previous studies regarding discovering audio description innovation. Wang's (2021) studies were close to this conception that the raised automatic audio description generation system supported predicting its insertion time, generating the AD by evaluating the audiovisual material of the video and optimizing the grammatically incorrect AD content. Han's (2023) automatic AD increased the movie character description in content and researched when to generate AD in time intervals. However, Ribeiro's (2023) AD script machine generation was based on the original script in the movie, the video analyzer and the speech synthesizer.

Besides envisioning new accessibility features, improvements from developers' and content creators' perspectives are also discussed by respondents in this research. For example, the creators on the YouTube platform should ensure that every individual can access the video content by elevating the availability of alt-text and audio descriptions. Spina (2021) also noted that incorporating accessibility into the video creation process was crucial for creators to reach an extensive pool of possible audiences. Furthermore,

the participant mentioned that application developers could invite visually impaired people to participate in the development process to make the product more inclusive, such as by promptly identifying potential problems before release to reduce extra renovation. This finding echoes Gilbert's (2019) inclusive and accessibility design research that encouraged developers and designers to hold usability tests with people with diverse disabilities since it could discover interaction problems that internal testing could not detect and improve overall user experience.

6. EVALUATION

6.1 Trustworthiness of the research

This chapter examines the trustworthiness of this investigation following the criteria Lincoln and Guba (1985) raised, which are the most commonly utilized guidelines for assessing qualitative research (Cope, 2014). The standard involves credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985).

Credibility

The research process shows that the findings in this thesis can be trusted and accurate. Firstly, the conceptual framework for the research was devised through academic and peer-reviewed articles and books with credible databases, such as Tampere University digital library service and Google Scholar, involving diverse fields in digital accessibility, young visually impaired people and streaming and public service media. Secondly, as the methodology chapter demonstrated, the interpretive paradigm and qualitative research method were selected as the theoretical support for designing the research. In addition, the participants were verified with the selection criteria of the study, which ensured the findings were authentic and reinforced the prior research.

Transferability

The transferability of this research is constrained due to the small number of respondents. However, the research findings can be employed to multiple scenarios because the participants' selection information and research context are comprehensively and thoroughly explained for other researchers to assess and implement in other settings. Even though the study was conducted in Finland and targeted young visually impaired Finnish people's streaming media usage in public service media, the findings are transferable in some European countries with similar conditions in public service and streaming media landscape and digital accessibility.

Dependability

The methodology chapter explicitly presents the online interview process to collect data from the interview preparation to the proceeding of the interview. Moreover, the thematic analysis process is revealed step by step. Similar findings can be discovered with replicated data collection and analysis procedures. Nevertheless, the limited number of participants in this research may also impact the dependability of the study.

Confirmability

The author's biases are avoided in this thesis to ensure that the data collection and findings presentation are neutral. During the interview, the questions asked of the participants were rooted in the previous literature, and the questions from the interviewer's subjective viewpoints were prohibited. The extracted data in the findings chapter are the participants' original responses from the recording transcription, as the abundant quotes presented. Furthermore, the author did not have an individual connection with the research topic. Therefore, the findings were less affected by personal perspectives.

6.2 Ethical considerations

The study adheres to the European Code of Conduct for Research Integrity (2023), following accountability, respect, reliability, and honesty in every research phase. During the study preparation, the author started to learn about research ethics knowledge through the thesis seminar from the thesis supervisor mentoring and research integrity guidelines to ensure appropriate training.

According to the research integrity code, the consent agreement from the participants should be obtained before the data collection. In addition, the primary objective and data anonymity of the research must be informed to participants (Mirza, 2023). While proceeding with the study, the author clarified the information about the research topics, interview methods and length in the invitation (Appendix 1). The oral consent from each participant was acquired after the interviewer introduced the information and the data confidentiality of the study at the beginning of the interview (Appendix 2). Only the participant voluntarily agreed to the interviewer's requests to

access and analyzes the data; the interview started and recorded. In the process of interacting with participants, the interviewer excluded the language that could generate discrimination and stereotypes under the United Nations Disability Inclusive Communications Guidelines, which equally respects each participant irrespective of their ability (Mirza, 2023). After each interview, the recording and the transcription were stored in the TAU Microsoft One Drive cloud service as a secure place to preserve data. The collected data was only allowed to be accessed by the author without other parties involved. When the thesis is completed, all the data will be permanently deleted. Moreover, the participants' private information was hidden in the study, besides the crucial information related to the study, such as the visual impairment description. The participant's names were not disclosed and presented as "P (numbers)" in the thesis.

Concerning the writing of the thesis, each reference was appropriately cited using the APA style and the Turnitin originality checker was utilized to ensure the study did not violate plagiarism. This study applied AI tools, including Grammarly and Quillbot, to check grammar errors and enhance the expression of the concepts. These tools were not used to produce the fundamental and core ideas of the thesis except for the language embellishments. Furthermore, other master's theses provided the structure for the author to learn and employ.

7. CONCLUSION

7.1 Summary

This study is conducted in the context of establishing streaming services by public service media to adapt to the digital age. It is also inspired by the development goal of the Finnish Public Broadcasting Company (YLE) in youth and accessibility. Thus, this thesis attempts to investigate the expectations and challenges young visually impaired people have when using streaming services in public service media. The research design is based on the interpretivist paradigm and applies the qualitative research method to answer the research question, "How do young visually impaired people use streaming media in public service media from the perspective of digital accessibility." Four participants with different visual impairments were recruited to join the semi-structured and email interviews and shared their experiences using streaming services. Thematic analysis was then utilized in this thesis to assess the interview data.

The main findings of this study support the prior academic studies on different topics. Regarding streaming media utilization, the streaming platforms selection and viewing content choice of youth participants with visual impairment conforms to research on young people and streaming media. Concerning assistive technology usage, the navigation approach of young respondents in the streaming applications corresponds to the previous studies on screen readers and magnification with visually impaired people. Accessibility problems, such as the incompatibility between assistive technologies and streaming platforms and insufficient audio descriptions, are confirmed in academic investigations. In addition, the suggestions from young respondents in elevating digital accessibility connect to the preceding research.

The findings contradict the previous studies that are also identified in this research. It involves young participants actively using the streaming service founded by the public broadcasting company and the low frequency of usage of voice assistants and recommendation systems. In allusion to the new findings in this thesis, the challenges

young visually impaired people experience when utilizing streaming services are demonstrated, which is rarely discussed in prior related research. Moreover, the current study found new reasons for individuals with low vision to use screen readers and provided new directions for improving the audio description service in online streaming platforms.

7.2 Implications

The findings of this research comprehensively presented the experience of youth with different visual impairments when using streaming services in public service media, bringing implications for various fields. From the viewpoint of academic studies, it provides intersections with accessibility, visual impairment, streaming media, youth and public service media topics, which are rarely discussed in the previous research. Moreover, this thesis may generate new ideas for the following study. For instance, accessibility and media researchers in Finland will probably conduct a study targeting older age groups with visual impairments to understand their streaming media usage in public service media.

Concerning the ramifications for the Finnish public service broadcasting company, this study can help elevate the accessibility of its streaming services by thoroughly investigating how youth with visual impairment navigate streaming applications, hidden accessibility problems, such as the incompatibility between assistive technologies and applications, and explicit suggestions. Streaming service developers may update the products by solving problems and researching and developing new technologies to benefit visually impaired individuals. In addition, the findings of this research enable the practitioners in further understanding youth's viewing habits to consolidate the connection between public service media and young people.

This research may promote improving media policies regarding accessibility and disability worldwide. For example, the findings from the participants with visual impairment can boost the European Accessibility Act to encompass the accessibility requirements of audiovisual media regulations with detailed descriptions of the visual impairment section, implementing the new directives in European countries. Furthermore, this study could encourage some Asia countries, such as China, to

consider formulating meticulous accessibility media policies based on the needs of individuals with disabilities in digitalization, primarily because the barrier-free services in China focus on the physical environment.

7.3 Future work

Due to the challenges of recruiting participants with visual impairments, this research provides a limited sample size to study streaming media usage. Therefore, future studies may expand the scope of the study by following a nuanced division of visual impairment and inviting other Finnish researchers to participate to diminish the possible language barriers in proceeding with the study and prompt more Finnish youth with visual impairment to join. In addition, the context of this study can extend to other European countries to compare young visually impaired people's different utilizing conditions of streaming services in public service media.

Future investigations should also consider including face-to-face and online interview forms in the data collection since the author in this study found that some verbal descriptions of the online interviews related to navigating the streaming applications were not intuitive and straightforward to understand during data analysis. Thus, face-to-face interviews enable the author to witness how participants access the applications in person. Moreover, participants in this study discussed enhancing digital accessibility in streaming services from their perspectives so that future studies could involve web developers and media practitioners to share how to achieve digital accessibility in products.

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9. APPENDICES

9.1 Appendix 1 Email invitations to participants

Hi, I'm Mengying, a second-year student in the sustainable digital life program at Tampere University. I'm working with YLE and writing a master's thesis titled: **The streaming content usage of young visually impaired people in public service media: the perspective of digital accessibility**

The study adopts the online interview method to understand young visually impaired users' needs and problems when using streaming media. The interview will be in English and take approximately thirty minutes to one hour through Teams or other preferred online conference applications. The study needs seven young visually impaired people aged seventeen to thirty to join. Please email me if you are interested in this topic and want to participate. Your experiences and perspectives would be beneficial in studying how to elevate digital accessibility.

Thanks for reading.

Best,

Mengying.

9.2 Appendix 2 Thesis interview framework

Beginning:

Thank you for accepting the invitation. First, let me briefly introduce myself. I'm Mengying, a second-year student in the sustainable digital life program at Tampere University.

Before starting the interview, I need to tell you about the research's information. It studies the streaming media usage of young visually impaired people in public service media and digital accessibility through interviews. According to the ethical rules, I will be the only person with access to all study data, and the information will be anonymous in the thesis. Can I record the interview and take notes for the following study?

Interview Questions:

Media usage of the youth participants

What streaming video applications are you commonly using? (The streaming video applications are considered as Netflix, Youtube, and Tik Tok)

What context do you use them?

Do you use the streaming application (like YLE Arena) by public service media? If not, why?

What is your visual impairment?

How does the impairment affect your media usage in general?

What kinds of challenges occur when using media? Please give an example.

Assistive technology usage

What assistive technology do you use when you are using streaming applications? Do you use them on the web or mobile version?

How do you use assistive technology to navigate the app (selecting TV programs, searching videos)?

How do you use assistive technology to watch videos?

Which streaming application is the most compatible with assistive technology? Why?

What are the problems when you use assistive technology to access streaming applications?

E.g. Screen reader: Is the screen reader compatible with the streaming application?

Is the alt-text sufficient?

Screen magnification: Is the design of the streaming application website zoomable?

Is it inconvenient to zoom the video constantly?

Are they common problems for all streaming applications or just for specific ones? How do you overcome the difficulties?

Accessibility features

Do you use built-in accessibility features in mobile devices when using streaming applications? If so, what are they? (Such as accessibility features in iPhone or Android settings)

How do you use built-in accessibility features to navigate the app and watch videos?

What are your issues when you use accessibility features to access streaming applications? How do you overcome the problems?

How about your experience with accessibility features such as audio description and voice assistant?

E.g., Audio description: Do current applications support enough audio description?

How is the quality of the audio description? Does it help you understand the content more accessible and combine well with the video?

Do you have specific needs about it?

Voice assistant: Do you use voice assistant to navigate streaming applications?

Viewing experience

How about your experience with the recommendation system? (Do you find new exciting content through a recommendation system or have a bad experience?)

Does the current video content choice meet your viewing needs in the applications?

What content would you want to see more in the streaming applications?

Suggestions

What new accessibility features and assistive technologies do you envision in future for creating better user experience in streaming applications?

What would you suggest to practitioners and developers to improve accessibility in streaming applications?

Background information of the participants

What is your age?

What is your gender?

Where is your hometown?