

# Assessing Current Information Delivery for the Visually Impaired

## Supplemental Materials

An Interactive Qualifying Project submitted to the Faculty of WORCESTER POLYTECHNIC INSTITUTE in partial fulfillment of the requirements for the degree of Bachelor of Science

**By:**

Jason Bugarin  
Kaye Dandrea  
Kazim Hyder Nizam Shaikh  
Nelson Ndahiro  
Silvio Torres Betancur

**Date:**

27<sup>th</sup> April, 2017

**Copenhagen, Denmark Project Center**

Report submitted to:

John Heilbrunn

**Danish Association of the Blind**

Lauren Mathews and Vincent Manzo

**Worcester Polytechnic Institute**

*This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see <http://www.wpi.edu/Academics/Projects>.*

## Table of Contents

1.0 Background	1
1.1 The Visually Impaired Population	1
1.2 CD Mailing System	1
1.3 The Danish eGovernment and Digitization	2
1.3 PostNord	3
1.4 Nota	4
1.5 Current Information Systems	4
1.5.1 Radio Systems	4
1.5.2 Iceland Assistive Technology (AT) System	5
1.5.3 NFB-Newsline	6
1.6 Assistive Technologies Currently Available to the Visually Impaired	7
1.6.1 Braille	7
1.6.2 Screen Magnifiers	8
1.6.3 Screen Readers	9
1.6.4 Voice-Over Technology	10
1.6.5 Optical Character Recognition	11
1.6.6 Talking Books are eBook Readers Specifically Designed for the Visually Impaired	11
1.6.7 The DAISY Standard for User-Friendly Assistive Technologies	12
1.6.8 DAISY Players: The Technology and Devices	12
1.5.9 Financial Barriers of Assistive Technology Devices	16
2.0 Methodology	17
2.1 Investigate Barriers Surrounding Current Information Access and Delivery to the Visually Impaired	17
2.1.1 Semi-Structured Interviews with Organizations for the Visually Impaired	18
2.1.2 Semi-Structured Interview with the Danish Agency for Digitization	20
2.1.3 Semi-Structured Interviews with Private Assistive Technology Retailers	21
2.1.4 Semi-Structured Interviews with Information Distribution Organizations	22
2.2 Evaluate Assistive Technologies as an Approach for Current Information Delivery to the Visually Impaired	24
2.2.1 Assistive Technology Device Evaluation	24
2.2.1.1. Descriptions of Devices Used in Evaluation	25
2.2.1.2 Device Evaluation Procedure	26

3.0 Results	35
3.1 Investigate Barriers Surrounding Current Information Access and Delivery to the Visually Impaired	35
3.1.1 Semi-Structured Interviews with Organizations for the Visually Impaired	35
3.1.1.1 Danish Association of the Blind (DAB)	35
3.1.1.2 The Institute for the Blind and Partially Sighted (IBOS)	36
3.1.2 Semi-Structured Interview with the Denmark Agency for Digitization	37
3.1.3 Semi-Structured Interviews with Private Assistive Technology Retailers	38
3.1.3.1 Low Vision International (LVI)	38
3.1.3.2 Instrulog A/S	38
3.1.4 Semi-Structured Interviews with Information Distribution Organizations	39
3.1.4.1 The National Federation for the Blind (NFB)	39
3.1.4.2 Nota	39
3.2 Evaluate Assistive Technology as an Approach for Current Information Delivery to the Visually Impaired	40
3.2.1 Assistive Technology Device Evaluation	40
4.0 Discussion and Considerations: Limiting Factors of Our Project	46
4.1 Information Distribution Systems	46
4.2 Evaluation of Information System Approaches	46
6.0 References	48
Appendix A. Verbal Consent Form for Participation in Semi-Structured Interview	51

## 1.0 Background

This section provides detailed background information relevant to our project, focusing on the visually impaired, the Danish postal system, digitization in Denmark, The compact disk (CD) mailing system information distribution systems, assistive technologies (AT), and barriers associated with AT.

### 1.1 The Visually Impaired Population

Estimates indicate that over three hundred million people worldwide are blind or partially sighted, making visual impairments a prevalent disability around the globe<sup>1</sup>. The term “partially sighted” refers to an impairment in which a person’s sight has been decreased to a degree in which usual means of treatment, such as glasses, are not effective enough to restore full vision<sup>2</sup>. The term “blind” is used for complete or nearly complete vision loss<sup>3</sup>. We are using the term “visually impaired” to include both people who are blind and those who are partially sighted. Partial sight and blindness are conditions that are strongly associated with ageing. According to John Heilbrunn, Vice President of the Danish Association of the Blind’s (DAB), there are 8,000 blind or visually impaired people who are registered in DAB, and 80% of them are more than 65+ years<sup>4</sup>.

### 1.2 CD Mailing System

In the past, around 70 local bulletins and circulations have been distributed daily to visually impaired citizens in various cities in Denmark, as audio-recorded narratives. The recordings are circulated on CDs through the national post every day, free of charge. The Danish government’s effort to implement digitization throughout the country has resulted in large budget cuts in the physical mail sector thereby greatly downgrading the postal system. The mail circulation time now takes 3-5 days longer for a customer to receive a package, in this case the CDs. Many visually impaired individuals in Denmark relied on the CD mailing system for current information updates are now limited to getting news only occasionally per week. All newspaper CDs from Monday to Thursday are received the next Tuesday, while CDs with news from Thursday to Sunday are received the next Wednesday<sup>5</sup>. In fact, some people receive multiple

---

<sup>1</sup> Brinker, 2003.

<sup>2</sup> Ibid.

<sup>3</sup> Maberley, 2006.

<sup>4</sup> J. Heilbrunn, personal communication, February 13, 2017.

<sup>5</sup> Peter Seyfarth, personal communications, 21 April, 2017.

CDs all at once from the days between each delivery cycle. There is a quicker 1-day delivery option known as “first-class” which is 30% more expensive and there is no government compensation for the charge<sup>6</sup>. This service would also require the CD to be delivered at a special designated service spot for the incoming mail<sup>7</sup>. This change in policy from the Digital Agency has led to an information gap for the visually impaired.

### 1.3 The Danish eGovernment and Digitization

In an effort to reduce paper waste, digitalization of government forms and processes have taken place in Denmark, creating an eGovernment. In a testimony before the U.S. Congress in 2000, David McClure, Associate Director of the U.S. General Accounting Office, defined the term eGovernment as a government that has its officials and services available to the people through the internet<sup>8</sup>. The introduction of the public sector government system was established in 1983 with the “modernization programme”, creating Information Technology (IT) solutions to services involving Government organizations<sup>9</sup>. This eGovernment continued to develop up to 2011 adding NemID (a national identification number for each person), Virk.dk (a public health form portal and business services), and the Digital Post (digital self-service for all government documents and public sector personal mail)<sup>10</sup>. This digital self-service is managed by a private company called e-Boks, which is equally owned by two information distributors, PostNord and Nets<sup>11</sup>. PostNord is a Swedish and Danish merged postal system that serves both nations<sup>12</sup>. Nets is a private company that manages secure payments among “companies, authorities, shops and citizens”<sup>13</sup>. The developments in the Danish eGovernment technology has created a strong public sector information distribution foundation for streamlining government services.

The agenda for digitization of the government in Denmark in 2014 – 2020 is to have fully digital and online services for the public sector. The agency managing this digitization is the Digitaliseringsstyrelsen, which is a government agency established in 2011 in the Ministry of Finance<sup>14</sup>. The digital self-service and public sector email were made mandatory to all Danish citizens as of 2014 within the two Danish laws: L 159 and L 160<sup>15</sup>. In addition to these laws, an

---

<sup>6</sup> PostNord, 2016.

<sup>7</sup> J. Heilbrunn, personal communication, February 13, 2017.

<sup>8</sup> Layne & Lee, 2001.

<sup>9</sup> European Commission, 2014.

<sup>10</sup> Danish Ministry of Finance, 2016.

<sup>11</sup> IT Politisk Forening, 2012.

<sup>12</sup> PostNord, 2017.

<sup>13</sup> Nets, 2017.

<sup>14</sup> Digitaliseringsstyrelsen, 2017a.

<sup>15</sup> IT Politisk Forening, 2012.

Executive Order was created by the Danish government to make certain citizens exempt from the digital mail system. Individuals are exempt from using this system if they have a disability making online services difficult for them to use, do not have access to a computer, are homeless, have language difficulties, and /or have issues obtaining a NemID<sup>16</sup>. According to the technology information reporter Derek du Preez, the Danish government has 80% of its transactions done digitally and over 60 million letters have been delivered through the digital self-service system<sup>17</sup>. Furthermore, Perez states that Denmark is expected to save \$217 Million (1.5 billion DKK) a year with this change to digital correspondence<sup>18</sup>. Denmark continues to strive for complete eGovernment and Digital Post services by 2020 to decrease paper waste and boost communication efficiency.

### 1.3 PostNord

PostNord is a company that handles the mailing, communication, other mailing logistics and e-commerce services to people and businesses in Denmark and Sweden. They also provide the CD mailing system for the visually impaired in Denmark. This company was established in 2009 after the Danish company Post Danmark A/S and Swedish company Posten AB merged. Though PostNord is considered a company by law, as it has a CEO and a president, it is actually under the Danish and Swedish states in their governance structure. The Ministry of Enterprise and Innovation in Sweden and the Ministry of Transport in Denmark, along with PostNord's president and CEO are the ultimate decision-making parties<sup>22</sup>.

The digitization reform in Denmark has caused a sharp decline in the amount of physical mail being delivered. Due to this decrease in mail volume, especially in Denmark, PostNord has been incurring losses since 2010, making a deficit of \$179 million (1.239 billion DKK) in net income during 2016<sup>19</sup>. To counter these large losses, an economic reform was initiated within PostNord in 2013, under order from the Ministry of Transport, to streamline all the mailing processes. Some of the cost-cutting measures include delivering standard mail only occasionally per week, introducing a "first class mail" option where, at a higher price, mail will be delivered on a daily basis<sup>20</sup>. In addition to this, according to trade unions in the sector, PostNord has "laid-off over 4,000 employees between 2010 and 2014"<sup>21</sup>.

The future plans of PostNord revolve around further cutting down their 32000 person workforce. Some of the Danish workers have public service contracts, which would ensure the

---

<sup>16</sup> Digitaliseringsstyrelsen, 2017b.

<sup>17</sup> Preez, 2015.

<sup>18</sup> Ibid.

<sup>19</sup> PostNord, 2016.

<sup>20</sup> Copenhagen Post, 2016.

<sup>21</sup> Rychla, 2016.

workers three years of salary even after being laid off. PostNord estimates that for the company to succeed in their reform for the next few years would cost \$340 million (3 billion DKK)<sup>22</sup>. Due to this, the government has been searching for an alternative approach to provide mail and news to people who depended on PostNord's services.

#### 1.4 Nota

The organization in charge of producing and distributing the CD newspapers in Denmark is known as Nota, the Danish Library for people with print-disabilities. Nota provides content such as books, magazines, newspapers in a format accessible to visually impaired and dyslexic people. They produce, sell, and lend these products to their members, free of charge under funding from the Danish Ministry of Culture. Nota employs 30 readers to audio-record newspapers, magazines, and other current information onto CDs. Those CDs are sent to PostNord who then delivers the CDs to the visually impaired. They also have a website where they post books and current information content as soon as it is made accessible to the print-disabled in audio or Braille format. More than 80% of the visually-impaired members of Nota are above 65 and have little experience with technology. As a result, nearly all of Nota's 14,000 visually impaired members use the CD system rather than the website<sup>23</sup>. Since the start of the decline of the postal service in Denmark in 2010, Nota has continued to produce CDs everyday which only reach their users after a few days. Given the inevitable fate of physical mail in Denmark, the lack of substantial changes Nota's distribution system has driven the gap in current information between visually impaired and sighted people in Denmark.

#### 1.5 Current Information Systems

There are many potential solutions to replace the former CD mailing system for the visually impaired. Various systems have been implemented in other countries around the world including radio services, phone news lines, online services and Assistive Technology systems.

##### 1.5.1 Radio Systems

One of the ways to deliver current information is over the radio. Radio reading services for the visually impaired require a narrator to broadcast local and national news as well as magazines and other print material. An example of this type of service is Gatewave, based in New York City. The user can access this service on the Internet, through applications on smartphones, on a Gatewave radio device, or by calling the radio station itself<sup>24</sup>. The news is broadcasted

---

<sup>22</sup> Jensen & Merriman, 2017.

<sup>23</sup> Nota, 2017.

<sup>24</sup> Gatewave, 2017.

throughout the day, with six new hours of content each day<sup>25</sup>. This news content is on a set time schedule with different publications being broadcast every hour<sup>26</sup>. This audio service relies on volunteers willing to help the blind community by reading the content from the Internet, newspapers or magazines to the audience. Access to the audio service is limited to people who are legally blind or partially sighted. The radio station is free of charge, but Gatewave relies on donations to financially support the organization and to continue its service. In addition to Gatewave, the Los Angeles Radio Reading Service (LARRS) is a radio service with similar capabilities. They broadcast daily newspapers, magazines, as well as also local advertisements and comics<sup>27</sup>. In order to receive the signals from this radio station, one has to purchase a special radio device from the organization. Alternatively, it can also be accessed online on their website using a user ID and a password, which is given to the user once they subscribe. Another example of a radio service is Hello Doon which broadcasts different type of shows including “drama, poems and folk stories”<sup>28</sup>. The radio station is run by around 15-20 visually impaired people instead of relying on other volunteers<sup>29</sup>.

Overall it is important to note that though these services have been successful in the past, radio use in general is declining. Though these systems offer add beneficial mobility while accessing current information, radio services have declined in content availability in the development of computer technology.

### 1.5.2 Iceland Assistive Technology (AT) System

In Iceland, they have created an information distribution system using an at-home AT device from the Netherlands called Orion Webbox. AT in this case is an audio player that the visually impaired can use to obtain current information. AT will be discussed in more detail below in Section 1.6 of the Supplemental Materials. The manufacturer of this device is Solutions Radio (SR) who makes closed audio systems that are used to create music playlists for stores/events and they specialize in solutions for the visually impaired<sup>30</sup>. The creator of the online data base and audio file distribution for the Orion Webbox was Ivona, a company that specializes in text-to-speech software and services for communication systems<sup>31</sup>. Blindraelagid, the Icelandic Organization of the Visually Impaired (IBOVI), manages the system for information distribution by using the device from SR to distribute information and the software from Ivona to create the

---

<sup>25</sup> Rainbow Broadband, 2015.

<sup>26</sup> Gatewave, 2017.

<sup>27</sup> Los Angeles Radio Reading Service, 2017.

<sup>28</sup> Hindustan Times, 2010.

<sup>29</sup> Ibid.

<sup>30</sup> Solutions Radio, 2017b.

<sup>31</sup> Ivona, 2017.



DAISY files, a format accessible for the visually impaired<sup>32</sup>. The Webbox is a device that can output audio files of newspapers, magazines, radio and/or television voice-subtitles, and books<sup>33</sup>. The service works by extracting information from each provider's site such as a daily newspaper, converting the information to a DAISY formatted file through a computer program, and then then uploading the file to Webbox servers<sup>34</sup>. Users of the Webbox can download the DAISY content from this site through email links sent directly to the subscribed users, eliminating the issue of users losing out on information content due to little experience with technology<sup>35</sup>. The Icelandic AT system can easily and efficiently deliver information to the visually impaired with push notifications

### 1.5.3 NFB-Newsline

The National Federation of the Blind (NFB) in the United States has created a news service for visually impaired individuals called “NFB-Newsline”. Visually impaired individuals can use this service by phone, mobile app, an online portal, or by downloading content to talking-book players<sup>36</sup>. NFB Newsline has over 400 publications including national and local ones<sup>37</sup>. Each service allows the user to save content for later use and the interfaces are designed to accommodate all levels of experience with accessibility software or accessibility technology<sup>38</sup>. The service promotes user choice by allowing users to browse through different general topics and articles. The visually impaired subscribe to the “Newsline” calling service and then they can dial a certain number and browse through topics by voice and listen to news through an automated system. The fact that this service is on a cellphone means that it can be accessed virtually anytime and anywhere. In addition, NFB-Newsline’s free phone app available for the iPhone and iPad allows subscribed users to listen to news articles as soon as they are published in audio form by the newspaper/magazine company. Subscribers can also use the “Global Search” option that lets them look for specific topics or articles. The app also features an emergency weather alert function that notifies users based on their phone’s GPS. In addition, NFB uses a software that can download articles directly to popular DAISY players such as the Victor Reader Stream II. This enables users to easily navigate through the content, play it back as well as keep the files for later use<sup>39</sup>.

---

<sup>32</sup> Einarsson, 2014.

<sup>33</sup> Solutions Radio, 2017a.

<sup>34</sup> Engelen, & Paepen, 2015.

<sup>35</sup> Ibid

<sup>36</sup> National Federation for the Blind, 2017.

<sup>37</sup> National Federation for the Blind, 2017.

<sup>38</sup> Ibid.

<sup>39</sup> Ibid.

The NFB-Newsline program is used nationally in the United States but the state governments fund each state section. Though this method is free of charge for the visually impaired, it is expensive for the individual state governments to provide. Because of this, there have been cases of budget cuts, making this service unreliable. For example, during 2010 in Michigan, a budget cut in NFB-Newsline from the State Department of Education drastically limited access to information on international affairs for the visually impaired<sup>40</sup>.

## 1.6 Assistive Technologies Currently Available to the Visually Impaired

Overall, the use of assistive technology (AT) is a promising direction for information distribution considering the strong push for digitization of information in Denmark. According to the Assistive Technology Industry Association (ATIA), AT is any device, piece of equipment or any software that is used to maintain or improve the motor or bodily capabilities of disabled people<sup>41</sup>. These products can vary from a simple wheel chair to software that enables the visually impaired to browse the Internet. One of the most important areas of AT in the modern world is the progression of computer and communication technologies for the visually impaired<sup>42</sup>. The present AT solutions for communication are braille, screen readers, screen magnifiers, Optical Character Recognition (OCR), voice-over technology, and talking books. In addition, the iPhone can be considered an assistive technology through the use of its built in accessibility software<sup>43</sup>. Utilizing a combination of these devices along with an online capabilities yields a potential solution for distributing timely information to the visually impaired.

### 1.6.1 Braille

Braille is a form of written language for the visually impaired in which characters are represented by patterns of raised dots that are felt with fingertips<sup>44</sup>. They are arranged in a combination of six dots, aligned in two columns and three rows, known as a Braille Cell. An example of a Braille cell can be seen below in Figure 1. The combinations of dot placement and the number of dots can be deciphered by readers through touch. However, according to Mike Cataruzolo, head of the Volunteer Program at the Perkins School of the Blind, only 5-10% of the visually impaired population is literate in Braille<sup>45</sup>. Mr. Cataruzolo added that this is because

---

<sup>40</sup> PR-Newswire, 2010.

<sup>41</sup> Assistive Technology Industry Association, 2017.

<sup>42</sup> Williamson, Wright, Schauder, & Bow, 2001.

<sup>43</sup> Apple Inc. 2017a.

<sup>44</sup> Braille Works, 2017.

<sup>45</sup> M. Cataruzolo, personal communications, February 16, 2017.

Braille can be challenging to learn and requires professionals to teach the skill, usually at a young age<sup>46</sup>. Most of printed material can be converted through Braille by a printer either in the home or through a company. However, though this is an effective way to communicate with visually impaired individuals, only a small number of them are actually literate in the language.

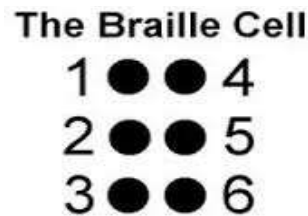


Figure 1. The Braille Cell<sup>47</sup>

The figure above is an example of a Braille Cell with all six dots filled in the cell.

### 1.6.2 Screen Magnifiers

Screen magnifiers are another type of AT and aid partially sighted individuals. There are many software options available to the user and they can magnify computer screens up to 20 times the original size<sup>48</sup>. The most common screen magnifiers are imbedded in Windows and Mac operating systems<sup>49</sup>. Windows and Mac have a full screen magnification methods that zoom in on content but it can be disorienting because the user only sees a limited proportion of the page. However, some computer software possess a lens feature, which zooms in on a single area of the screen, but still allows the user to see the original web page screen as seen in Figure 2 and Figure 3<sup>50</sup>. This magnifier is easier to continue to navigate the page after the user has read the desired content. Screen magnifiers are a useful AT device for partially sighted individuals to improve their access to text on computers.

---

<sup>46</sup> Ibid.

<sup>47</sup> Braille Works, 2017.

<sup>48</sup> Hersh, 2008.

<sup>49</sup> Syamail, 2013.

<sup>50</sup> Hersh, 2008.



**Figure 2. Picture before Using the Zoom Feature.**

The figure above shows an original size image of a Windows background screen.



**Figure 3. Zoom Feature in Windows, on the Windows Logo.**

The figure above shows the same windows background screen in Figure 2 with a magnified section using the lens feature on the Windows logo.

### 1.6.3 Screen Readers

Screen readers are pieces of software intended for individuals with complete vision loss that use text-to-speech (TTS) technology on computers and on mobile devices. TTS uses speech synthesis to change on-screen text information into synthetic audio/voice output allowing the user to read what is displayed on the screen<sup>51</sup>. Screen readers can be difficult to use

<sup>51</sup> Williamson, Wright, Schauder, & Bow, 2001.

because of the limitations of keyboard shortcuts and the voice playback technology involved<sup>52</sup>. The blind must use on keyboard controls to operate a computer, so actions are a combination of keyboard clicks instead of moving a mouse to content. The use of screen readers can also be problematic if the webpage does not follow WCAG guidelines. Web Content Accessibility Guidelines 1.0 (WCAG), which they argued should be followed during the creation of an accessible website<sup>53</sup>. These guidelines describe the specific rules that govern how a web page must be developed to be accessible to the AT devices used by the visually impaired, such as screen readers. There are specific WCAG guidelines but many fall short in terms of proper formatting in depth<sup>54</sup>. As a result, when screen readers are used on improperly formatted websites, it produces confusing dictation<sup>55</sup>. In addition the WCAG documents are hard to locate, the development process is inaccessible to anyone who does not speak English, the guidelines can be confusing and hard to understand by the web authors, and it is a lengthy process<sup>56</sup>. Because of this, developers have shown a lack of drive to implement these guidelines due to the majority of the population not needing these features anyhow. This disconnect with the Internet can be a major challenge faced by the visually impaired. Presently, webpages are becoming more and more involved in their design such as including hyperlinks, graphics, and embedded videos. Screen readers can have difficulty interpreting these elements especially if they are inaccurately labeled or lacking labels entirely<sup>57</sup>. Therefore, this AT is widely used because audio transcription is easily relatable to the individual and the technology is intuitive<sup>58</sup>. Although screen readers are not perfect, the visually impaired population can use computers as an information resource with the aid of this software.

#### 1.6.4 Voice-Over Technology

A modern example of screen reading technology is Apple's VoiceOver, a built-in accessibility setting on the iPhone and iPad. This allows the user to navigate and interact with items on the screen using audio descriptions provided by the software<sup>59</sup>. VoiceOver uses gestures on iPhone and iPad, utilizing the touchscreen, which can be more intuitive than screen readers and non-touchscreen computers. Examples of programmed gestures include tapping on an item or app on the screen to hear a description and double-tapping the item to select it<sup>60</sup>. Though VoiceOver

---

<sup>52</sup> Hersh, 2008.

<sup>53</sup> Murphy, Kuber, McAllister, Strain, & Yu, 2008.

<sup>54</sup> Ibid.

<sup>55</sup> Murphy, Kuber, McAllister, Strain, & Yu, 2008.

<sup>56</sup> Clark, 2006.

<sup>57</sup> Murphy, Kuber, McAllister, Strain, & Yu, 2008.

<sup>58</sup> Williamson, Wright, Schauder, & Bow, 2001.

<sup>59</sup> Apple Inc. 2017b.

<sup>60</sup> Ibid.

communicates a great deal of information to the user, input of information from the user himself, such as giving commands and browsing, is still limited. In addition, using this software may be difficult if the user is unfamiliar with touchscreens.

### 1.6.5 Optical Character Recognition

Optical Character Recognition (OCR) is a feature of assistive technologies in which a camera scans printed material followed by a software converting the data into an audio playback that can be saved as a file. The OCR system follows three main steps when interpreting information. More specifically, these steps are scanning the printed material, analyzing the scanned content, and saving the analyzed data through speech synthesis as an audio file<sup>61</sup>. Speech synthesis is the means of creating artificial human speech, from text. In general, OCR systems fit into one of two categories, accessories to personal computers or standalone devices. The choice of device type depends on if the user has access to a computer. The computer OCR accessory is less expensive and file management for the future is easier if the system is linked to a computer. Computer based OCR devices can cost 10,500 DK (\$1,490) and standalone devices can cost 35,300 DK (\$5,000)<sup>62</sup>. Both systems rely on a scanning camera to interpret text so there are limitations in regards to the accuracy of letters<sup>63</sup>. This means that similar letters can be misinterpreted if the image is blurry. For example, the software may mistake an “e” for a “c” in a picture that is not clear. However, the accuracy of the OCR technology is usually not a significant limiting factor because the relatively low rate of error. Overall, OCR technology assists the visually impaired to read printed documents independently and the popularity of the technology has caused OCR to enter the mobile technology spectrum.

### 1.6.6 Talking Books are eBook Readers Specifically Designed for the Visually Impaired

Talking books and audio feedback technology have emerged as leading AT resources for the visually impaired. Originally, these devices were developed as a way to store audio-books and magazines in order for the visually impaired to have access to the same print material available to sighted people<sup>64</sup>. The number of features in these devices have increased over time to include the ability to download documents over Wi-Fi, have full file storage systems, full accessibility for the visually impaired as well as supporting multiple software formats<sup>65</sup>. Talking books have the capability to meet all of the needs of a visually impaired user for gathering and

---

<sup>61</sup> American Foundation for the Blind 2017b.

<sup>62</sup> Ibid.

<sup>63</sup> Hersh, 2008.

<sup>64</sup> American Foundation of the Blind, 2017c.

<sup>65</sup> Library of Congress, 2014.

storing published information in an intuitive device.

### 1.6.7 The DAISY Standard for User-Friendly Assistive Technologies

Due to the significant variation in features for AT designed for the visually-impaired, a global standard was necessary to ensure that the needs of the individuals were being met. The Digital Accessible Information System (DAISY) is a technical standard for reading devices, digital books, periodicals, and other media types for the blind, partially sighted, and otherwise print-disabled individuals, such as those affected by dyslexia<sup>66</sup>. This standard was put in place by the DAISY Consortium, a coalition of libraries and companies that provide accessible library services worldwide<sup>67</sup>. DAISY accessible library services include books, newspapers, magazines, available online or offline. There is a list of 12 minimum technological requirements needed for a reading system to be considered “DAISY OK” and to be able to serve a satisfactory experience to the user. This list can be seen in Appendix C.

### 1.6.8 DAISY Players: The Technology and Devices

Talking book handheld devices that follow the DAISY standard are collectively known as “DAISY players”. The DAISY players have the capability to make print material easily accessible to the visually impaired<sup>68</sup>. DAISY players come in the form of desktop players or handheld mobile players. Desktop devices are specifically made for at home use while portable players are created to be used anywhere. A complete list of desktop DAISY devices can be referenced in Table 1 and a list of portable DAISY players can be references in Table 2 below. These players have large tactile buttons and work on audio feedback technology to assist the visually impaired through different content levels including book chapters and news pages<sup>69</sup>.

The current AT market is full of portable DAISY devices that can assist the visually impaired in independent living. The most successful portable DAISY player technology among the visually impaired are from the companies PlexTalk, Human Intervention Motivation Study (HIMS), Humanware, Victor Reader, Independent Living Aids, American Printing House for the Blind (APH), and Solution-Radio. These manufacturers offer devices with varying levels of features in basic models to full featured models. The standard of these devices is to support NLS digital talking books, compliant with DAISY standards, have Wi-Fi capabilities, and internal storage in the device<sup>70</sup>. The basic models are the Victor Reader Stream II, Book Port Plus, PlexTalk Pocket,

---

<sup>66</sup> DAISY Consortium, 2017.

<sup>67</sup> Leith, 2006.

<sup>68</sup> Hersh, 2008.

<sup>69</sup> Ibid.

<sup>70</sup> Library of Congress, 2014.

and the Milestone 312 Ace. The features of the basic portable DAISY players can be illustrated in the Victor Reader Stream II that can perform voice recording and have bookmarks for media in addition to the standard technology<sup>71</sup>. The Blaze ET is an example of a full featured model with FM/AM radio capability, OCR technology, expandable storage, voice recording, and an advanced file manager<sup>72</sup>. DAISY players are pushing the boundaries of making all in one devices that can make the visually impaired completely independent for obtaining information.

Among users, one of the most attractive characteristics of Portable DAISY players is the mobility of these devices. The user has the option to take the device with them and access the information outside of the home. Key components that contribute to the portability of electronics are device dimensions (weight and size). These devices are intended to be as accessible as books for reading and even smaller to fit in pockets around town<sup>73</sup>. As these devices have become a refined technology, the physical characteristics of the devices have been taken into more significant consideration<sup>74</sup>. For example, the Victor Reader is “about the size of a deck of cards”<sup>75</sup> with dimensions of 114 x 62 x 18 mm<sup>76</sup>. In addition, slim devices with minimalist button designs have emerged in the Milestone that can perform all the same features as the Victor Reader but is at a fraction of the size.

**Table 1. Portable Daisy Players<sup>77</sup>**

<b>Portable DAISY Player</b>	<b>Manufacturer</b>	<b>Cost DKK (USD)</b>	<b>Manufacturer Origin</b>	<b>Features</b>	<b>Supported Software</b>
Blaze ET Player <sup>78</sup>	Human Interaction Motivation Study	5.551,96 (795.00)	Korea	OCR software, FM/AM Radio, Bluetooth, Wi-Fi, color test, voice recording, advanced file manager(copy, paste, zip), alarm, calculator, web radio, bookmarks, and a SD card	Learning Ally, NLS digital talking books, Bookshare, and DAISY Wi-Fi

<sup>71</sup> Humanware, 2017.

<sup>72</sup> Human Interaction Motivation Study, 2017.

<sup>73</sup> Hersh, 2008.

<sup>74</sup> Ibid.

<sup>75</sup> American Foundation of the Blind, 2017a.

<sup>76</sup> Humanware, 2017.

<sup>77</sup> Library of Congress (2014). National library service programs: digital audio players. Retrieved from <https://www.loc.gov/programs/national-library-service-for-the-blind-and-physically-handicapped/about-this-service/resources/audiobook-players/>.

<sup>78</sup> Human Interaction Motivation Study (2017.) OCR and book players: Blaze ET Multit Player. Retrieved February 27, 2017, from <https://hims-inc.com/products/blaze-et>.



Portable DAISY Player	Manufacturer	Cost DKK (USD)	Manufacturer Origin	Features	Supported Software
Blaze EZ Player <sup>79</sup>	Human Interaction Motivation Study	4.155,24 (595.00)	Korea	OCR, FM/AM Radio, Bluetooth, Wi-Fi , voice recording, color test, alarm, web radio, bookmarks, and a SD card	Learning Ally, NLS digital talking books, Bookshare, and DAISY
PlexTalk Pocket <sup>80</sup>	Shinano Kenshi	2.594,14 (368.00)	Japan	Voice recording, SD card, Wi-Fi , bookmarks, sleep timer, and web radio	Audible, NLS digital talking book, Bookshare, and DAISY
Victor Reader Stream II <sup>81</sup>	Victor Reader	2.601,19 (369.00)	Canada	Wi-Fi, FM/AM radio, bookmarks, voice recording, Web radio, and SD card	NLS digital talking books, Learning Ally, Bookshare, and DAISY
Milestone 312 Ace <sup>82</sup>	Bones	3.165,14 (449.00)	United States	SD card, voice recording, alarm, FM/AM transmitter, FM/AM radio, calendar, bookmarks	Audible, Learning Ally, NLS digital talking books, and DAISY
Book Port Plus <sup>83</sup>	American Printing House for the Blind	2.396,76 (340.00)	United States	SD card , Wi-Fi, web radio, voice recording, and bookmarks	Audible, Bookshare, Learning Ally, NLS digital talking books, and DAISY

<sup>79</sup> Human Interaction Motivation Study (2017.) OCR and book players: Blaze EZ Mult Player. Retrieved February 27, 2017, from <https://hims-inc.com/products/blaze-ez/>.

<sup>80</sup> Shinano Kenshi (2017). Products: PlexTalk Pocket. Retrieved February 27, 2017, from <http://www.plextalk.eu/en/top/products/ptp1/feature/>.

<sup>81</sup> Humanware (2017). Blindness: Victor reader talking book players stream. Retrieved February 27, 2017, from <http://store.humanware.com/hus/victor-reader-stream-new-generation.html>.

<sup>82</sup> Bones (2017). Products: Milestone 312 Ace. Retrieved February 27, 2017, from <http://www.bones.ch/milestone312.php>.

<sup>83</sup> American Printing House for the Blind (2017). Daily living: Book Port Plus. Retrieved February 27, 2017, from [http://shop.aph.org/webapp/wcs/stores/servlet/Product\\_Book+Port+Plus\\_1-07191-00P\\_10001\\_11051](http://shop.aph.org/webapp/wcs/stores/servlet/Product_Book+Port+Plus_1-07191-00P_10001_11051).

**Table 2. Desktop DAISY Players<sup>8485</sup>**

Desktop DAISY Player	Manufacturer	Cost DKK (USD)	Manufacturer Origin	Features	Supported Software
Orion Webbox <sup>86</sup>	Solutions Radio	4.633,74(664.26)	Iceland	FM/AM radio, Wi-Fi, TV subtitles (spoken), SD card, and bookmarks	DAISY
Victor Reader Status <sup>87</sup>	Victor Reader	3.173,99(455.00)	Canada	CD player, SD Card, and bookmarks	NLS digital talking books, Learning Ally, and DAISY
PlexTalk Linio <sup>88</sup>	Shinano Kenshi	3.662,29(525.00)	Japan	Wi-Fi, CD player, Bluetooth, web radio, voice recording, and bookmarks	Audible, NLS digital talking book, Learning Ally, and DAISY
PlexTalk PTN2 <sup>89</sup>	Shinano Kenshi	3.592,54(515.00)	Japan	CD Player, SD card, voice recording, sleep timer, and bookmarks	Audible, NLS digital talking book, Learning Ally, and DAISY
Book Port DT <sup>90</sup>	American Printing House for the Blind	2.783,34(399.00)	United States	Wi-Fi, web radio, Bluetooth, voice recording, Bookmarks, SD card, and CD Player	Bookshare, Learning Ally, NLS digital talking books, and DAISY

<sup>84</sup> Instrulog (2017) Produkter: DAISY lydbooksafspiller [Products: DAISY audio book player] Retrieved April 4, 2017, from <http://www.instrulog.dk/produkter/daisy-lydbogsafspiller>.

<sup>85</sup> Library of Congress (2014). National library service programs: digital audio players. Retrieved from <https://www.loc.gov/programs/national-library-service-for-the-blind-and-physically-handicapped/about-this-service/resources/audiobook-players/>, n.d.

<sup>86</sup> SenioreWebshop [Seniors Webshop] (2017). Audio: Orion Webbox 2. Retrieved April 4, 2017, from <http://www.seniorenwebshop.com/orion-webbox-2.html>.

<sup>87</sup> Humanware (2017). Blindness: Victor reader talking book players stratus. Retrieved April 4, 2017, from <http://store.humanware.com/hus/victor-reader-stratus12-m-daisy-mp3-player.html>.

<sup>88</sup> Shinano Kenshi (2017). Products: PlexTalk Linio. Retrieved April 4, 2017, from <http://www.plextalk.eu/en/top/products/linio-ptx1/>.

<sup>89</sup> Shinano Kenshi (2017). Products: PlexTalk PTN2. Retrieved April 4, 2017, from <http://www.plextalk.eu/en/top/products/ptn2/feature/>.

<sup>90</sup> American Printing House for the Blind (2017). Daily living: Book Port DT. Retrieved April 4, 2017, from [http://shop.aph.org/webapp/wcs/stores/servlet/Product\\_Book%20Port%20DT%20-%20ON%20SALE\\_1-07200-00P\\_10001\\_11051#addinfo](http://shop.aph.org/webapp/wcs/stores/servlet/Product_Book%20Port%20DT%20-%20ON%20SALE_1-07200-00P_10001_11051#addinfo).

### 1.5.9 Financial Barriers of Assistive Technology Devices

Visually impaired individuals must first fill out an application and submit it to their local municipality in order to obtain an assistive device. Their municipality will then provide devices to choose from. However, we run into several problems during this process. Assistive devices are generally provided at no cost. Although, at times, the individual may want something that is also considered a consumer good. In recognition of the Social Services Acts, the municipality will then cover up to fifty percent of the cost<sup>91</sup>. Also, there are ninety-eight municipalities in Denmark and although they all run under the general country laws, each individual municipality runs on their own accord and are not properly supervised by the government<sup>92</sup>. One municipality may have devices according to popularity amongst sales while another municipality may only offer the cheapest devices they decided to obtain<sup>93</sup>. This may limit the amount of options an individual has if they have no previous knowledge of other assistive devices available.

For those that have previous knowledge of other assistive devices, they may still run into inconveniences. Many visually impaired choose to purchase their devices directly from the retailer as some have had to wait over half a year waiting for the device to be sent to them from their municipality<sup>94</sup>. Having to go out and buy their own device may cause strain on them financially. There aren't many companies currently producing assistive devices for the visually impaired as the market itself is considered a "niche market" according to Johnson and Moxen, social services researchers<sup>95</sup>. This small market makes it difficult for companies to produce cheap products as there may only be two to three hundred of one item in the entire country<sup>96</sup>.

---

<sup>91</sup> The Ministry of Social Affairs and Integration, 2011.

<sup>92</sup> Bue Vester-Anderson, personal communications, March 27, 2017.

<sup>93</sup> Ibid.

<sup>94</sup> Anders, Personal communications, (2017).

<sup>95</sup> Johnson & Moxon, 1998.

<sup>96</sup> Bue Vester-Anderson, personal communications, March 27, 2017.

## 2.0 Methodology

This project aims to assist the Danish Association of the Blind to recommend approaches for the timely distribution of current information to the visually impaired in Denmark. Our objectives are to:

1. Investigate the technological and economic barriers of distribution and access of current information to the visually impaired.
2. Evaluate AT features for accessing current information for the visually impaired.

### 2.1 Investigate Barriers Surrounding Current Information Access and Delivery to the Visually Impaired

Our first objective was to investigate the barriers that the visually impaired encounter when accessing current information in Denmark as well as gain a greater understanding of the technological and economic factors that limit such access. These factors can be defined as the limitations surrounding assistive technology (AT) practicality and cost as well as limitations in distributing accessible documents to all. We conducted interviews with representatives from the organizations for the visually impaired, private retailers of AT, information distribution service providers, and the digitizing government agency of Denmark. In order to accomplish this goal, we conducted several semi-structured interviews with various stakeholders. Semi-structured interviews allowed us flexibility in conversation during the interview since apart from a structured set of questions that were asked in the interview, there was also room for us to address other issues not originally planned for<sup>97</sup>. We used purposive sampling to ensure concentration on people with particular characteristics who will better be able to help us with our interview research. Through this sampling method, we interviewed higher ranked associates of each organization because they have a wide perspective on the issues faced by the visually impaired. Though this sampling method is not random, it helped us to gain willing participants within the small population<sup>98</sup>. At the start of each interview, a consent form was read out loud to the make sure the interviewee understood the purpose and procedure of the interview. This consisted of either the verbal consent form in Appendix A or the written consent form in Appendix B. Table 3 below outlines the representatives we interviewed as well as their affiliation, position within the organization, and date the interview was conducted.

---

<sup>97</sup> Rubin & Rubin, 2005.

<sup>98</sup> Heckathorn, 2017.

**Table 3. Outline of Semi-Structured Interview Participants**

<b>Name</b>	<b>Organization</b>	<b>Position</b>	<b>Date of Interview</b>	<b>Description</b>
John Heilbrunn	The Danish Association of the Blind	Vice-president	March 28th, 2017	Section 2.1.1
Ask Abildgaard	The Danish Association of the Blind	Executive Committee Chair	April 3rd, 2017	Section 2.1.1
Daniel Gartman	The Institute for the Blind and Partially Sighted	Information and Communication Technology Consultant	March 29th, 2017	Section 2.1.1
Hans Rasmussen	The Institute for the Blind and Partially Sighted	Former Information Technology Consultant from DAB and IBOS	April 6th, 2017	Section 2.1.1
Peter Houmann	Digitaliseringsstyrelsen	Digital Communications Accessibility Officer	March 24th, 2017	Section 2.1.2
Henriette Eskelund-Hansen	Digitaliseringsstyrelsen	Communications Consultant	March 24th, 2017	Section 2.1.2
Bue Vester Anderson	Low Vision International	Technical Consultant	March 27th, 2017	Section 2.1.3
Johannes Nørgaard	Instrulog A/S	Sales and Support Associate	March 20th, 2017	Section 2.1.3
Michael Nilsson	Instrulog A/S	Service and Support of Computer Solutions	March 20th, 2017	Section 2.1.3
Tammy Albee	The National Federation of the Blind	Assistant to the Director of Sponsored Technology Programs	March 30th, 2017	Section 2.1.4
Stine Duus Svendsen	Nota	Team Leader of Audio Production	April 21st, 2017	Section 2.1.4
Peter Seyfarth	Nota	Team Leader of the Technical Support Team	April 21st, 2017	Section 2.1.4

### 2.1.1 Semi-Structured Interviews with Organizations for the Visually Impaired

We conducted interviews with the advocacy organization, the Danish Association of the Blind (DAB), and the resource center for visually impaired individuals, the Institute for the Blind and Partially Sighted (IBOS). DAB is an NGO that aims to create equal rights and inclusion of their 8,000 members visually impaired members in Denmark. IBOS is a rehabilitation center in Denmark that offers counseling, training, education, and workshops for the visually impaired. We contacted associates from the organization through email to organize a time to conduct the

interview. These interviews were conducted to learn the current methods of acquiring current information, the preferences of the visually impaired for obtaining current information, limiting factors or barriers with the present methods, and the important features that should be included in the future systems. Overall we aimed to gain insight on the limitations of information distribution to for the visually impaired in Denmark. The questions asked in the interviews are listed below.

### **Interview Questions for John Heilbrunn and Ask Abildgaard**

- 1) What are the main methods the visually impaired currently use/used to obtain current information?
  - a) Current information can be news, shopping deals, and local events.
- 2) How accessible are the methods suggested above by the entire visually impaired blind population? Why or why not?
  - a) Do you observe any age group trend among these methods?
  - b) Does vary by municipalities
  - c) What are the most troublesome aspects of learning new technology for the visually impaired?
    - i) What are the past or future solutions that address these limiting factors?
- 3) What are the successes and drawbacks of using each method?
  - a) These could be cost, training, features, and functions.
- 4) Which functions/features of the methods/devices are the most important for the visually impaired?
  - a) What other factors apart from the feature should be accounted for when designing a method for information distribution?
  - b) Example: ergonomics, color contrast for the partially sighted etc.
- 5) Which method(s)/device(s) do you think are the most effective for gathering current information? Why?
  - a) How do you think the visually impaired population would respond to a solution such as newswire or phone service? This way they would be able to call in using a technology they are already familiar with and obtain news that way.
  - b) Would an assistive technology be better in the long run to a system such as this? Why or why not?
- 6) Can you give us a very brief description on how the municipality system works on disseminating current information and how Daisy and AT devices fall into play?
  - a) What is your stance on the amount of free control each individual municipality has over disseminating AT devices?
- 7) Where do you think the bigger issue is? On the distribution side? Or on the user's side where people have difficulty accessing the current information?

- a) Do they not have access to the technology?
- b) Do they not know how to use what they have?

### **Interview Questions for Daniel Gartman and Hans Rasmussen**

- 1) How has the decline of the CD mailing system affected the visually impaired population?
- 2) What are the main methods the visually impaired currently use/used to obtain current information?
  - a) Current information can be news, shopping deals, and local events.
- 3) How accessible are the methods suggested above by the entire visually impaired blind population? Why or why not?
  - a) Do you observe any age group trend among these methods?
  - b) Does it vary by municipality?
  - c) What kind of difficulties do you think the visually impaired face while learning a new technology?
    - i) What are the past or future solutions that address these limiting factors?
- 4) Which functions/features of the methods/devices are the most important for the visually impaired?
- 5) What other factors apart from the feature should be accounted for when designing a method for information distribution?
  - a) Example: ergonomics, color contrast for the partially sighted etc.
- 6) What are your thoughts on having a calling service as the main means to distribute current information to the visually impaired?
  - a) This system would require the use of a landline or another phone and a menu would be present to select a given area of current information
- 7) What are your thoughts on having an Assistive Technology system to distribute information to the visually impaired in Denmark, in the near future?
  - a) Do you think this is feasible?
- 8) Do you think the budget allocated to the disability sector/visually impaired sector is adequate for the subsidization of Assistive Technology? Why?

#### **2.1.2 Semi-Structured Interview with the Danish Agency for Digitization**

To gain a better understanding of possible digitized services for the visually impaired in Denmark, we had an interview with representatives of the agency for digitization in Denmark, Digitaliseringsstyrelsen. This government agency is in charge of changing most communication media into a computerized system in Denmark. Digitization has indirectly led to the decline of the mailing system, drastically reducing the use of print communication. An interview interest email explaining the purpose of our project and the reason of conducting the interview was sent out to Digitaliseringsstyrelsen. We arranged this interview in order to identify the most effective methods for the distribution of digital information, the advantages and the challenges

faced during digitized communication, and the government's role in information distribution for the visually impaired in Denmark. The questions from our interview are included below.

### **Interview Questions for Digitaliseringsstyrelsen**

- 1) Why did Denmark become digitized in the first place? What are the advantages and disadvantages?
- 2) How are these systems funded and ran?
- 3) What is their prognosis for snail mail? What will happen to the process? Will they recommend changing to digitized systems (speed of handling communication between authorities and citizens)?
- 4) How does the exemption category work? Do many people actually get exemption when they request it?
  - a) How many visually impaired individuals are exempt from using the system?
  - b) Are the elderly the main demographic in the exemption category? Do you have a percent?
- 5) What is currently being done to advance the system in place?
  - a) To fix disadvantages or make the system better
  - b) Any for people with disabilities and/or visually impaired individuals specifically?
- 6) Does the digitization trend actually help or is it alienating people? Will groups be left behind? Electronic illiterate? Education?
- 7) What are your thoughts on having an Assistive Technology system, such as in Iceland, meet most of the current information needs of the visually impaired in Copenhagen, in the near future?
  - a) Information is sent to the devices instead of put on a CD
  - b) Do you think this is feasible?
- 8) Do you think the budget allocated to the disability sector/visually impaired sector is adequate for the subsidization of Assistive Technology? Why?
- 9) Are there any additional challenges or considerations for a digitized communication system?

### **2.1.3 Semi-Structured Interviews with Private Assistive Technology Retailers**

We conducted interviews with representatives of Low Vision International (LVI) and Instrulog A/S to have a better overall perspective on AT devices. LVI and Instrulog A/S are the main suppliers of AT to local municipalities that, in turn, are distributed to the visually impaired. We met both of these companies at their respective offices. We decided to interview these companies in order to gain information on the success of different DAISY products in the market. Furthermore, we wanted obtain insight on the distribution process of AT devices by the municipalities to the visually impaired. The questions from our interview are listed below.

### **Interview Questions for LVI and Instrulog A/S**



- 1) What devices for distributing current information are the most popular in sales?
  - a) What key features do these devices include?
- 2) What other factors do you believe are involved with the popularity and sales of your products?
  - a) This can include things such as prices, and ergonomics
- 3) What are the most useful features in Assistive Technologies for the visually impaired?
- 4) What do you think are the main considerations when developing AT devices for the visually impaired?
  - a) Specifically for the visually impaired
- 5) How are the needs of visually impaired population taken into account in the development of assistive technologies? How does the attitude of the visually impaired population towards new technology affect the sale of these products?
- 6) What are the barriers when selling an AT device?
  - a) For example, limited market exposure to AT devices? If yes, how big a role does it play in the sales?

#### 2.1.4 Semi-Structured Interviews with Information Distribution Organizations

We conducted an interview with an associate of the National Federation of the Blind (NFB) and Nota. To understand the main factors of importance for an information distribution system we spoke to NFB. NFB provides an electronic newspaper system called the NFB-Newsline which distributes audio versions of publications to the visually impaired in the USA over the phone, using online services, through mobile applications, or pushing information to Assistive Technology devices. More information can be referenced for this system in Section 1.5.3 of the Supplemental Materials. Our questions entailed the NFB-Newsline system itself as well as considerations to take when setting up and managing an information system for the visually impaired. The NFB-Newsline utilizes many platforms and we interviewed them to guide us in finding a possible system solution for distributing current information.

We also held an interview with Nota, the Danish library for the visually impaired, to learn about their information dissemination methods. More information on Nota and its services can be referenced in Section 1.4 of the Supplemental Materials. We interviewed Stine Duus Svendsen, and Peter Seyfarth who were both well aware of all the services offered at Nota. We hoped to learn about information delivery services that Nota provides to the visually impaired, the measures they have taken to transition to a more digitized information, and the challenges they have faced during this transition. Moreover, because Nota is in charge of producing, recording, and distributing current information on compact discs (CD), we also inquired about the effects on the system due to the decline in the postal service. Lastly, we inquired about the use of AT as a solution to the current information issue. The questions from our interviews are below.

### **Interview Questions for NFB**

- 1) According to your website, NFB offers 400 publications to choose from (like Wall Street Journal, ESPN etc.). Who is responsible for the conversion from text to audio?
- 2) We read that NFB-Newsline is compatible with AT devices (example: Victor Reader Stream II), how do they work on those devices?
- 3) What are the advantages of using a telephone dial-in system over any other method for delivering current information to the visually impaired?
  - a) Examples: radio reading service, audio recorded CDs, assistive technologies.
  - b) How fully-fledged is this system, are there enough publications for users to rely on Newsline?
- 4) What are the attitudes of the users toward this service?
  - a) Any complaints by the users?
- 5) What are the barriers and the limiting factors of the telephone dial-in system?
  - a) For the user
  - b) For the company/service provider
- 6) What is the budget for the NFB newsline?
  - a) We read an article mentioning how expensive NFB-Newsline is to fund
  - b) Does the cost make the service difficult to maintain?
- 7) Is there potential for this system to become outdated or outshined by other methods such as assistive technologies? Why or why not?
- 8) How has the number of users of NFB changed over the years?
  - a) Is this system increasing or decreasing in usage and why?
- 9) Is there any age group trend among your users?
  - a) Depending on if data is present
- 10) Are the emergency weather updates only for the NFB-NEWSLINE iOS app?
  - a) If yes, how do users with DAISY players get those updates?

### **Interview with Nota**

- 1) Can you give us a brief overview of what Nota's role is in current information/news distribution to the visually impaired individual?
  - a) What current information distribution system is currently present?
- 2) What are the advantages of using Nota over other services that provide the visually impaired with access to current information? (TV, radio, family members)
- 3) What advantages has the shift towards a digitized model created for the visually impaired to obtain current information?
  - a) What kind of problems the visually impaired have to encounter since digitization?
- 4) What are the attitudes of the users toward this service?

- a) Is there any age group trend among your users?
- 5) What are the barriers and the limiting factors of Nota?
- 6) We are researching different current info methods, specifically AT, is there potential for a distribution system compatible with DAISY readers?
  - a) Wi-Fi push-notifications?
- 7) What is NISO (accessible format for the visually impaired that Nota uses) and why is it more convenient for Nota if many devices worldwide use DAISY?
- 8) Is there a specific allocated budget by the government?
  - a) Is it enough in your opinion?

## 2.2 Evaluate Assistive Technologies as an Approach for Current Information Delivery to the Visually Impaired

Our second objective was to evaluate the use of assistive technology (AT) as a potential system for current information distribution. We chose to investigate AT based on our research on the variety of functions for the user and the similarity of important features in AT devices compared to features in radio and calling systems. In addition, we did not have the resources to evaluate a radio or calling system. These technologies are also relatively straightforward and generally familiar the entire population. The aim of this objective was to identify if AT is a feasible medium for distributing information to the visually impaired based on user-friendliness and which features are preferred by the participants. A device and its associated features are considered “user-friendly” if they are easy to learn, to understand, and to interact with<sup>99</sup>. This objective was accomplished through a device evaluation using current assistive technologies with members of the Danish Association of the Blind.

### 2.2.1 Assistive Technology Device Evaluation

Our AT device evaluation included a three step process consisting of a semi-structured pre-interview, product trial, and a semi-structured post-interview. We used convenience and respondent driven sampling to find our participants for our device evaluation. Christian Ludgaard assisted us in reaching out to members in DAB and from these members we asked for recommendations for other individuals who would be interested in participating. This method was used to find a mixed pool of participants for our device evaluation in order to have a representative population of the visually impaired in Denmark. These interviews were carried out with the same methodology as in our first objective in terms of location, structure, and overall procedure. Before beginning each interview, a verbal consent form (Appendix A) was read out loud to the make sure they understood the purpose and procedure of the interview.

---

<sup>99</sup> User-friendly, 2017.

We conducted semi-structured individual interviews with six members of DAB. In this device evaluation we used the Blaze ET Multi Player, Milestone 312 Ace, and the Victor Reader Stream II, that can be seen in the image below. These devices were provided by Instrulog A/S and LVI. The devices vary in price and usability, but are commonly utilized within the visually impaired community.



**Image 1: AT devices used in the Product Trial**

The device shown in the image, from left to right are: the Victor Reader Stream II, the Milestone 312 Ace, and the Blaze ET Multiplayer. Further physical description of these devices are within the following section.

#### **2.2.1.1. Descriptions of Devices Used in Evaluation**

All three devices can obtain current information loaded on the device through a SD card, which is similar to the process of the distributed CD idea currently used. Information can be downloaded to the device through computer. In addition, these devices have other means to get current information, most notable over Wi-Fi push notification and using an external CD drive. The devices are offered in Danish and English versions as well as having two different price points. The Victor Reader Stream II and the Milestone 312 Ace have a similar price point at about \$500 (3500 DKK) and the Blaze ET Multi Player is more expensive at \$840 (5900 DKK). More information on these devices provided by Instrulog and Low Vision International is included in Table 2 in 1.6.8.

The first device is the Milestone is a physically minimal basic DAISY player with many similar functions to the Victor Reader II and Blaze ET. The device is thinner profile and with significantly fewer buttons when compared to other assistive technologies. These characteristics make the device easier to carry and store. However, since the device has only six buttons, specific combinations must be used to navigate through the device and perform its many functions. For

example, when adjusting the volume the user must hold down the bottom function button while simultaneously pressing the arrows on the front face. These buttons are not designated solely for adjusting the volume and can also be used in other combinations to accomplish tasks such as navigation through menus. Because of this, the user must remember these combinations and functions as opposed to standalone buttons with one or few functions. In addition, this device does not have Wi-Fi capabilities and information is usually loaded onto the device via an SD card. FM/AM radio can be another source of information by connecting to radio stations with the device.

The Victor Reader II is a popular model due to its simplicity of navigation making the device user friendly. The Victor Reader can store information on a SD card, use FM/AM radio, and gather push notifications as well as download DAISY files over Wi-Fi. The device has many buttons but a simple layout with most buttons having a specific main function. This is different in comparison to the Milestone. For example, when adjusting the volume on this device, the arrow keys on the left side of the device are all that is needed. However, if used in combination with the power button, functions such as speed and tone of the playback can be adjusted. Though this combination deems the arrow buttons multi-functional, these settings are adjusted less frequently.

The Blaze ET has the same features as the Victor Reader and Milestone but includes an additional feature that is useful to a visually impaired individual. Optical Character Recognition (OCR) software uses a camera on the device to take an image of a printed document. The image is then analyzed text to speech (TTS) technology to make an audio file that can be listened to and saved by the user. This feature allows the individual to obtain current information in real time from print information around them. Similar to the victor reader stream, the button layout for the Blaze ET mainly has single function buttons as opposed to the multi button process in the Milestone.

#### 2.2.1.2 Device Evaluation Procedure

The pre-interview asked questions about their personal experience with the current information distribution in Denmark and their opinions on different information distribution methods. Through this interview we also surveyed their knowledge of the specific devices used in our product trial. This information helped us gauge on an individual basis how much teaching would be required in the tutorials. These interviews were followed up with the product trial described below.

For the product trial itself, we first conducted a brief tutorial based on how familiar the participant was with the device according to the pre-interview. We then asked the individual to perform a series of tasks. The tasks include turning the device on, making/retrieving a voice

recording, controlling the volume, and finding a DAISY book. We selected these tasks because they are the most frequently used functions according to our research and interviews with stakeholders and therefore we were looking for confirmation of user-friendliness of the device especially in basic modes. In addition, we tested the use of optical character recognition (OCR) by the participant when interacting with the Blaze ET, as it was the only player with this function. However, it can be a very useful feature and it is important that it is tested for user-friendliness. In order to record and organize the results of our evaluation we completed an “Assessing “User-Friendliness” of Devices” table for each participant’s interaction with each device. The user-friendliness was evaluated through noting the individual's level of success upon completing each task and noting how familiar the individual was with the device. Within our evaluation we considered a function pathway “user-friendly” if the individual was able to complete the task with few or no mistakes following the short tutorial. Overall, this device trial was implemented to gain first-hand interaction with visually impaired individuals, observe how easy the devices were to learn and use, as well as understand the needs and preferences of these individuals in regards to accessing current information.

Following the evaluation with all three devices, we conducted a post-interview. These questions gauged the viability of the use of DAISY players as a method for delivering current information. We asked questions about the physical characteristics, device features, and for comparisons with other information delivery systems. In addition we asked the participants to rank the importance of certain features of the devices to yield their preferences on features of the devices. We asked about features such as vertical and horizontal navigation, OCR, recording, menu buttons, radio, DAISY books, sleep timer, number of overall buttons, and multi-function buttons and completed an “Importance of Features to Participant” table. Vertical navigation is the navigation in a menu for genre of content while horizontal navigation is the navigation through an article itself. Figure 4 and Figure 5 will give additional information on these terms. Through the combination of our pre-interview, product trial, and post-interviews we were able to investigate how easy to use AT was in general for the visually impaired in order to determine if it would be an effective platform for delivering current information. The “General Procedure for the Device Evaluation” as well as the evaluation rubrics “Importance of Features to Participant” table and “Assessing “User-Friendliness” of Devices” are included below.

Specific considerations were made to limit bias and maintain an equal field when comparing participants. Bias can be introduced if the person is already familiar with the device or one similar. Within the pool of individuals included in our device evaluation, some of them have had experience with assistive devices. Within the selection process, keeping this bias as low as possible was a priority. In order to account for bias we noted if the participant was familiar with the device in our assessment of how well they completed the task. When assessing the importance of features of the device itself, we looked at navigation, OCR, recording, menu

buttons, radio, Daisy books, sleep timer, number of buttons in general, and multi-function buttons. These aspects were determined through our interviews with stakeholders as well as visually impaired individuals and general major functions of the assistive technologies.

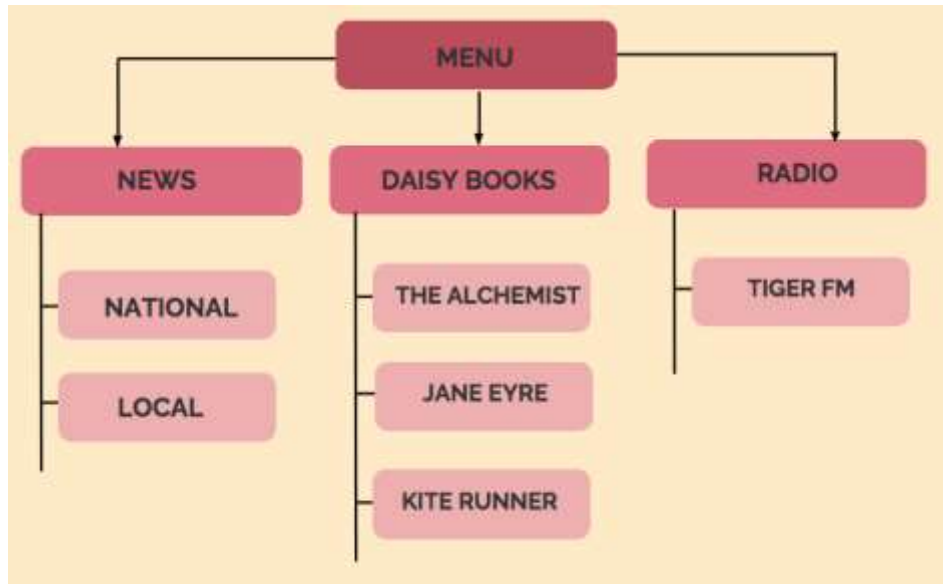


Figure 1. Vertical Navigation

The figure above shows a representation of vertical navigation. In the figure there are three menu options stemming from the main menu and under each menu option there is a list of categories or genres.

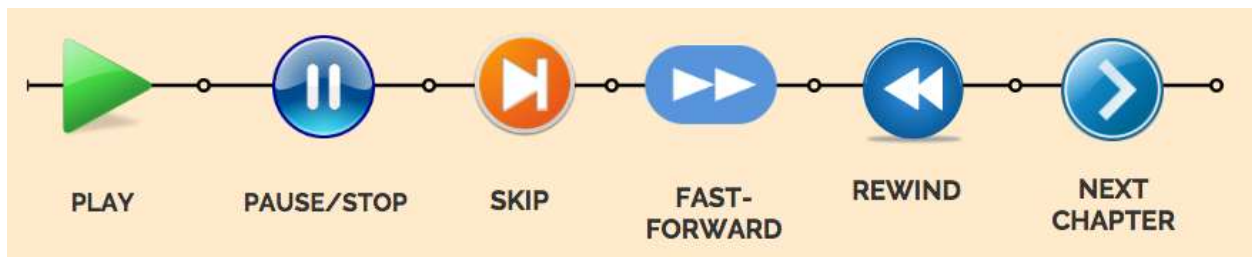


Figure 2. Horizontal Navigation

The figure above shows a representation of horizontal navigation. In the figure, features used in media content are images connected horizontally including: play, pause/stop, skip, fast-forward, and rewind, and next chapter.

## General Procedure for the Device Evaluation



The following list indicates the general steps taken for the device evaluation. Steps #2-5 were completed for each device per individual. Steps #1 and #6 were only completed once per individual.

1. Conduct pre-interview
  - a. What does the term current information mean to you?
  - b. What type of current information do you seek?
    - i. Let them be aware of the types of current information: political news, sales, shopping, weather, house rents etc.
  - c. How important is it for you to have access to current information?
  - d. What is your current method of acquiring current information?
  - e. Have you ever used the CD mailing system?
  - f. Were you affected by the digitization of information and the decline of the postal service? Why or why not?
  - g. Why did you choose the method that you use?
    - i. What features (cost, mobility, how fast they receive updates, etc.) are important for an information source?
  - h. Do you feel that all your information needs are being met?
  - i. What are the direct costs you pay for getting information and any associated costs?
  - j. Do you have any issues with the method that you use? If so, what are they?
  - k. What are the other methods of acquiring current information that you know of?
    - i. Do you know AT? See if they know about any AT devices.
    - ii. If they are already using AT devices, this will just help gather info on why they chose AT.
  - l. How confident are you in your use of technology?
  - m. How comfortable are you when learning a new technology?
    - i. What challenges do you think you might face while using new technology?
2. Ask participant "have you used this assistive device before?"
  - a. If yes, for how long?
3. Tutorial
  - a. If the person is familiar with buttons (3.d) proceed to step 3
  - b. If the person is semi-familiar with the device answer any questions on function buttons and general navigation (3.d)
  - c. If the person is not familiar with the device show general function and navigation buttons (3.d)
  - d. Navigation and function buttons
    - i. Milestone: selector (menu), five keys on front face



- ii. Victor reader: menu (1), selecting keys (2,4,6,8), play, pause, fast forward, rewind, volume keys
  - iii. Blaze ET: home, OCR, selector (arrow buttons and “ok” button), volume
- 4. Tasks (for more detail see “Detailed Task Pathways” in Appendix F)
  - a. Turn device on
  - b. Make a Recording
  - c. Retrieve a Recording
  - d. Adjust Volume
  - e. Find a DAISY book
    - i. Milestone: The Book Thief
    - ii. Victor Reader: The Book Thief
    - iii. Blaze ET: Second Danish book
  - f. For Blaze ET Only: OCR function-Tested for ease of use but not used in scoring at the end
- 5. Fill out column in “Assessing “User-Friendliness” of Devices table
- 6. Post-Interview (Conduct after the participant has utilized all devices)
  - a. How do these devices differ from your usual method of accessing current info? (if they do not use AT)
    - i. Can specifically talk about the individual devices, or compare all the AT devices to their usual method.
  - b. If you could add any feature to a device what would it be?
  - c. What are some things you disliked about any of the devices?
  - d. Would you use an AT device on a daily basis?
  - e. Would you rather use a radio service which broadcasts at a specific time every day?
  - f. Would you rather have a calling service which would use a landline or portable phone to call a number and browse through information by voice?
  - g. Fill out Importance of Features to Participant table

## Evaluation Rubrics

Below are two tables in order to evaluate assistive devices. The first, “Assessing ‘User-Friendliness’ of Devices”, was used to demonstrate how intuitive and easy to use a device is. The tasks are listed within each row and the devices are across the top. We decided to keep the devices within the table even if the participant was familiar with it in order to show that the device does in fact have a simple pathway that can be learned and remembered. Each of the tasks are described in steps above and have at most four steps, many with just two. This table was filled out by the interviewer based on how well the individual completed the task. A note was also made if the person as already familiar with the device. The key follows the table. An example cell could be “IC-Unfamiliar”. This would mean that the participant was unable to complete the task and they were also unfamiliar with the device before this product trial. In addition, the table following titled “Importance of Features” describes devices and information delivery systems in general, whether that be AT or a calling system for example. The participant was asked to rank these features on a scale of 0-4. An answer of four would indicate a very important or critical feature while an answer of zero would indicate an unimportant feature. This table is to be used to compare features and display which characteristics are the most important to the participant.

**Table 5. Assessing “User-Friendliness” of Devices**

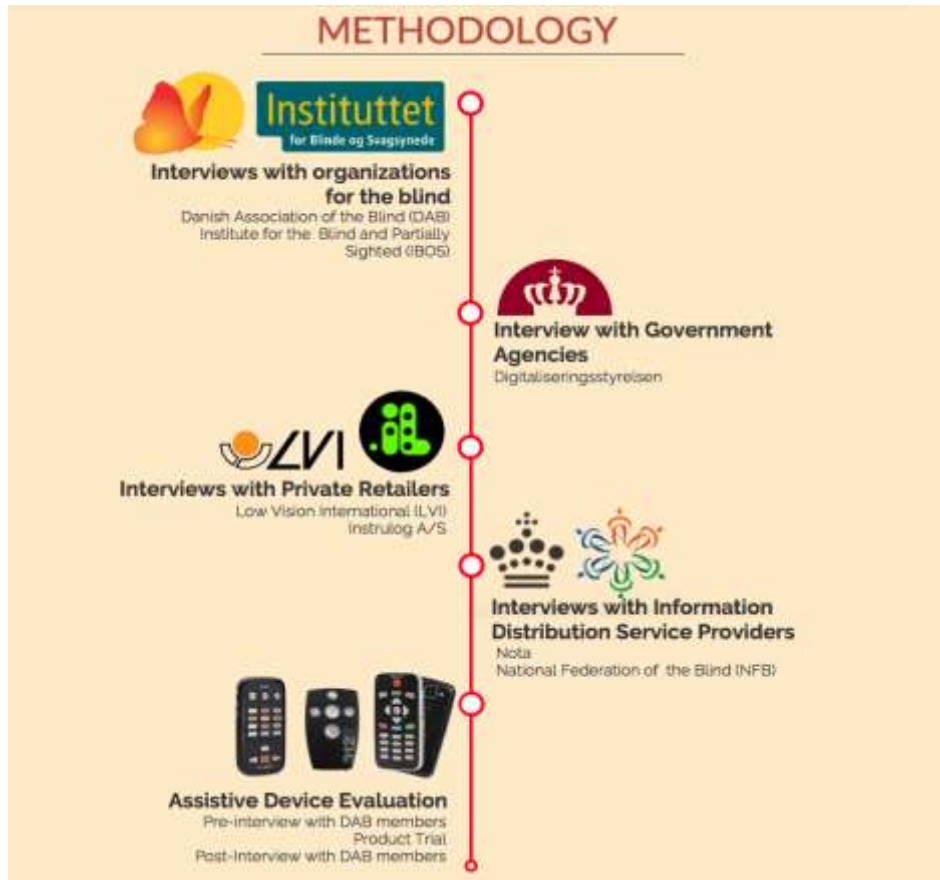
<b>Tasks</b>	<b>Milestone 312</b>	<b>Victor Reader</b>	<b>Blaze ET</b>	<b>Notes</b>
Turn Device ON				
Make Recording				
Retrieve Recording				
Adjust Volume				
DAISY Book				
<b>TOTAL</b>				

<b>Key</b>	<b>Familiarity with device</b>	<b>Description</b>
IC	Familiar	The participant is unable to do the task
PC	Familiar	The participant is able to do the task but makes a few mistakes before finding the right buttons
C	Familiar	The participant is able to do the task without mistakes
IC	Unfamiliar	The participant is unable to do the task
PC	Unfamiliar	The participant is able to do the task but makes a few mistakes before finding the right buttons
C	Unfamiliar	The participant is able to do the task without mistakes

**Table 6. Importance of Features to Participant**

Feature	Score
Navigation within book/article: “fast forward, rewind, time jump, chapter”	
OCR	
Recording	
Standalone Menu Button	
Radio	
DAISY Book	
Sleep Timer	
Fewer Buttons	
Many Buttons	
Buttons with only one function	

Key	
0	Not Important at All
1	Somewhat not important
2	Indifferent
3	Somewhat important
4	Very Important



**Figure 6. Methodology Overview**

The above figure summarizes our project’s methodology to address our research objectives, and to recommend approaches for the timely distribution of current information to the visually impaired. We interviewed two organizations of the blind: Danish Association of the Blind (DAB) and Institute for the Blind and Partially Sighted (IBOS), the digitizing agency of Denmark: Digitaliseringsstyrelsen, two private retailers of the DAISY players: Low Vision International (LVI) and Instrulog A/S, and two information distribution service providers: National Federation of the Blind (NFB) in the US and Nota in Denmark. We also carried out an Assistive Technology device evaluation with the visually impaired members of DAB, which consisted of a pre-interview, a product trial of the DAISY players, and a post-interview.

## 3.0 Results

This section will discuss in detail our results of the semi-structured interviews and the assistive technology (AT) device evaluation conducted during our project. Through these interviews we investigated the barriers to current information delivery and retrieval from the perspectives of various stakeholders.

### 3.1 Investigate Barriers Surrounding Current Information Access and Delivery to the Visually Impaired

Through these semi-structured interviews conducted with organizations for the visually impaired, private retailers, government agencies, and information distribution service providers we gained a greater understanding of the limitations of current information distribution to the visually impaired. Overall, we discovered that delivery system restraints can arise as a result of the distributor or the visually impaired individuals themselves as well as from an overall lack of uniformity in distributing content and assistive technology devices. Specific questions and responses can be seen in Appendix D.

#### 3.1.1 Semi-Structured Interviews with Organizations for the Visually Impaired

From our interviews with the Danish Association of the Blind (DAB) and the Institute of the Blind and Partially Sighted (IBOS) we obtained relevant information on the issue of current information distribution in Denmark. These areas consisted of politics, accessibility to information, distribution of information, and important considerations to information distribution for the visually impaired. Through these interviews we also gained personal perspectives on these ideas as all interviewees were visually impaired themselves.

##### 3.1.1.1 Danish Association of the Blind (DAB)

During our interview with John Heilbrunn, we learned that Individuals use radio, internet, and applications on smartphones, Internet radio, compact disc (CD) mailing system, and television. Often times, a visually impaired individual will use a combination of devices in order to meet their current information requirements. We learned that navigation through articles is critical to information distribution for the visually impaired. The use of headers to navigate a large articles and the ability to pause, fast-forward or rewind can create a better experience for the individual using the device. It is important for the individual to be able to easily navigate through different menus and genres (vertical navigation). Features such as fast-forward, rewind, and pause are known as horizontal navigation and benefit the users because they do not have to listen to an entire article if they prefer not to. Smaller factors to consider are weight of the device, the quality of the audio playback voice, the portability of the device, and a variety of functions is helpful. Being able to adjust the speed of the playback is also important because the listener is able to read through an article at a pace they prefer. We also learned about the limiting factors of current information stem from delivery which stem from the distribution side

as well as actually retrieval of the information by individual. Distributors do not always make their information available in accessible formats. This can cause issues when the individual uses a screen reader and other text to speech software. For example, an embedded YouTube video makes it difficult for a visually impaired individual to judge the length of the video and to choose to make any adjustments to the video while listening. In addition, within a webpage, a visually impaired individual may not be aware of the exact search terms or options are for categories of publications. This can be difficult to browse through works and to find the intended information. The visually impaired are also limited in learning new computer programs due to software updates. For example, a visually impaired individual would have to wait to use a new computer program until the screen reader functionality is developed for that program. Another similar issue is in the advancement of technology. New devices and programs are difficult for the visually impaired to adjust to because they tend to require new commands and skills. Lastly, it is important that in future systems, the information is displayed in an accessible format and can be easily navigated through.

We also interviewed Ask Abildgaard, one of the executive committee members in DAB. He discussed that radio and television are the main methods of accessing current information after the decline of the CD mailing system, but the problem with these methods is the lack of freedom while navigating from one section to another. Ask emphasized that easy self-navigation while accessing current information is one of the most important factors while choosing a method for getting information. Within a radio station, the individual is unable to fast-forward, rewind, or pause the audio. In addition, they are limited in selection of content because only one topic can be broadcasted on a given station at a given time. Oftentimes, local content is an issue when using a radio system because local events and advertisements may not be broadcasted on a radio system. Therefore, the news broadcasted is not that localized and the individual will need another source for current information for local news. When asked about AT devices as one of the potential methods for delivering current information, he said that DAISY players are very widespread in Denmark, but they are mainly used for listening books. He supported his argument by discussing how the factor of habit comes into consideration. The blind and partially sighted population is habituated to using radio as the main method for getting current information. Because of this, their thoughts on changing to a new method may be limited.

### 3.1.1.2 The Institute for the Blind and Partially Sighted (IBOS)

In our interview with Daniel Gartman we discussed how it is hard to remain up-to-date using the CD mailing system because of the delay in information delivery. The visually impaired are more inclined towards using the television or radio to obtain current information. This is because they are familiar with the technology and have used it for a long time. Moreover, they

prefer a method where they can easily navigate and jump back and forth from one section to another. It is important to be able to jump back and forward between menus and well as within the article. When asked about the use of a phone line service to distribute information and he was not in favor of it. This was because it may lack in navigation and the users would be unable to save articles for later use. He did comment that some individuals may prefer this system if it was offered. Lastly, he mentioned that the visually impaired are either granted an AT device for free, or for half-price, depending on their respective municipality, as rules differ from one municipality to another in Denmark.

We also interviewed Hans Rasmussen, who used to work at IBOS and DAB as an information technology (IT) expert. He stated that people who have lost sight over the course of their lives tend to be less open to learning AT devices and other methods to access information. This is because they have become habitual in their lives to using radio and television sources for acquiring current information. When they begin to lose their sight, they do not immediately search for an assistive device. Visually impaired individuals tend to lack incentive to learn other methods to obtain current information. Hans stated that whatever technology the visually impaired learn must be “logical and easy-to-use”<sup>100</sup> to be accepted by the visually impaired.

### 3.1.2 Semi-Structured Interview with the Denmark Agency for Digitization

Upon interviewing representatives from Digitaliseringsstyrelsen we found that it is more efficient to distribute information over the internet because it is less expensive and faster than sending information through physical mail. However, problems can arise when the information distributed is not accessible to people with print disabilities. We were informed that it is difficult to make digital post universally accessible due to the large number of different agencies, officials, and other contributors that send documents into their system. Over 100 different agencies contribute to this system and it would be extremely difficult to check every piece of information for accessibility. In addition, on the Internet overall, website designers are not inclined to follow the WCAG standards. It should be followed in order to increase accessibility for all but it oftentimes is not because it can be “too tedious to follow”. In addition, mass emails and forms are sent out to the public making it difficult for all electronic correspondence to be accessible and easy to interact with for all users. It is important to note that in the case that an individual is unable to use a computer for any reason, they can get assistance learning the system or apply for exemption from the Digital Post system. The municipalities provide services specifically to educate the visually impaired in learning new technology as well the libraries and resource centers have services to specifically help the visually impaired learn the Danish online system. The Digital Post exemption results in receiving

---

<sup>100</sup> Hans Resmussen, personal communications, 2017.



documents through the physical mail service instead of accessing the mail online.

### 3.1.3 Semi-Structured Interviews with Private Assistive Technology Retailers

Through our interviews with representatives from Low Vision International (LVI) and Instrulog were able to understand current information delivery from the perspective of assistive technology (AT) distributors. We gathered the features that are important to the visually impaired as well as the lack of uniformity in distributing AT devices to the visually impaired. Important features uncovered from these interviews include navigation, tactile buttons, and technologies that are easy to understand and utilize.

#### 3.1.3.1 Low Vision International (LVI)

LVI noted that the AT market in Denmark is controlled individually by the 98 municipalities in terms of distributing AT devices to their specific visually impaired population. This means that each municipality has control over which devices they offer, creating a lack of uniformity across Denmark. Every municipality has unique criteria when deciding what AT devices to buy in bulk from retailers such as LVI. Two municipalities may have completely different sets of AT devices. However, after the devices are purchased, they are then offered free of charge to the visually impaired in that municipality. Visually impaired individuals oftentimes purchase devices that are not offered by their municipality, but they often come at a high cost because of how small the AT market is. An individual may be driven to purchase their own device if the devices offered by their municipality do not include specific features that they want. The municipalities do provide the training on how to use the AT device that they procure.

#### 3.1.3.2 Instrulog A/S

Instrulog is in favor of information distribution moving toward Wi-Fi push notifications over sending physical compact discs (CD). The representative we interviewed indicated Nota as the main controller of this information distribution. The most popular device is the desktop player Victor Reader Stratus followed by the portable player Victor Reader Stream. The company has found that simplicity, and ease of navigation in devices is what makes AT devices popular and the most helpful. Devices such as the Milestone 312 Ace that have fewer buttons are significantly more difficult to navigate due to using button combinations instead of single function buttons. Other smaller factors were, battery life, the tactile feel of the buttons, and the button positions. The features that interact with the senses of touch and hearing are the most important to the visually impaired. The limiting factors for learning technology for the visually impaired is motivation and the attitude of a person toward learning technology. During the interview, the representatives did not feel age as a significant factor limiting technology understanding, but more as a trend in all age groups. We also learned that the distribution of

AT in Denmark can be disorganized. The 98 different municipalities have their own criteria for deciding what AT to buy in bulk for its residents, be it price, or a specific feature. Because of this, not all the needs of the visually impaired are met in terms of AT devices, this discourages them to use the device.

### 3.1.4 Semi-Structured Interviews with Information Distribution Organizations

Interviewing the National Federation of the Blind (NFB), an American information provider, as well as Nota, a Danish provider, allowed us to understand the specific processes of current information distribution to the visually impaired. We also learned that it is possible to create an information delivery system that utilizes multiple technologies, and on a large scale. Both organizations deliver current information to many people. However, NFB provides information across a significantly larger land area.

#### 3.1.4.1 The National Federation for the Blind (NFB)

From this interview we were able to understand more about the logistics and details regarding a national newsline calling service. The service must be set up in format to make navigation and finding specific publications easy for the visually impaired individual. The service uses a computer to translate around 400 publications into accessible documents. This gives the users a variety of information on a relatively easy to use interface. The service is also available on multiple platforms including a calling service, smartphone applications, and assistive technology devices. However, retrieving the information from a vast number of sources, the documents are not always in a format that can be converted to an accessible one. Because of this, a person in charge of the service must manually copy over the document. It can be difficult to keep the service running when funds end, are lowered or removed from the state. There have been instances of budget cuts and problems keeping the system available in certain states.

#### 3.1.4.2 Nota

This interview highlighted that it is easier, faster and cheaper for Nota to produce online material, rather than distributing audio information through the compact disc (CD) mailing system. Most visually impaired people are elderly and the CD mailing system is easy for them for to use. They have used this system for a long time and have become habituated into using it. Small changes in their methods of acquiring current information will be a huge change for them, therefore they tend not to shift to new methods. Experience with technology can also act as a barrier. Computers and mobile phones have been in market for over 30 years, yet the current visually impaired population scarcely uses or possesses them. This supports that they may be reluctant to try new methods. In this interview, the DAISY Online Delivery Protocol (DODP) was also discussed. DODP is a web service application programming interface (API) that facilitates the delivery of digital content from service providers to end users. However, running

a DODP can be costly. In addition, few DAISY players, like the Victor Reader Stream II and PlexTalk Linio, support the DODP system. Many individuals are unaware of this system and therefore do not use it even if they have a compatible device. Local municipalities have been providing their members with various DAISY players throughout the years, many of which do not support the DODP system. Therefore, they are not in a favor of paying extra for the new DAISY players with the DODP system. Nota is also working on an upcoming smartphone application, which will have audio books available to stream and download via Wi-Fi. One of the positive things about smartphones is that many visually impaired individuals are familiar with phones, unlike DAISY players.

### 3.2 Evaluate Assistive Technology as an Approach for Current Information Delivery to the Visually Impaired

Our second objective was to evaluate the approaches to current information delivery. We accomplished this through an assistive technology device evaluation to understand the most important features for accessing information for the visually impaired.

#### 3.2.1 Assistive Technology Device Evaluation

Through the AT product trial we learned which devices that the visually impaired prefer to use, the features that are the most favored or most useful for obtaining current information, and the individuals preferences of using AT devices over their current method for obtaining current information. We completed the product trial with six Danish Association of the Blind members. Overall the five members who reported they use the CD mailing system were limited by the speed of mail delivery to them. These members do not rely on this service for current information, they use the service occasionally when the CD is delivered. All participants stated they prefer to use television and radio as their main method to gain current information compared to using the CD mail system. We found that five out of the six individuals had experience with a DAISY player but it has only been to access books or magazines. The individuals we worked with found it important to be up to date with information but one individual did feel that using new technology to gain information is intimidating. All individuals interviewed were hesitant to change from their current method because they feel the methods they use are good enough for their lifestyle and accessing information. However, after speaking and working with them, they were more receptive to the devices and able to learn and complete the tasks.

During the product trial, we observed how the individuals interacted with the three devices. When using the milestone, the individuals had the most difficulty accessing a recording as well as adjusting the volume. When retrieving a recording, two of the six were unable to do the task

at all. To adjust the volume, they needed to utilize a button combination. Three of the six members either made a few mistakes before completing the task or were unable to complete it at all. When utilizing the Victor Reader Stream, all but one of the individuals were familiar with the device. They were all able to accomplish the five tasks. The one exception was that the one participant unfamiliar with the device had trouble retrieving her recording but was able to accomplish it after a few mistakes. Lastly, all participants were unfamiliar with the Blaze ET and all members were able to complete four of the six tasks asked (including OCR). In terms of making a recording, only one person made a mistake before completing the task. However, it was difficult for the individuals to retrieve the recording and only one person successfully completed this task. Overall, the Blaze ET was the device with the highest number of completed tasks by participants who were unfamiliar with the device.

### **Summaries of Individual Participants**

Summary paragraphs from each participant are included below. Following these descriptions is the average ranking of important device features among the individuals. Specific questions, responses, and task completions are outlined within Appendix E.

Participant one is an individual with extremely limited partial sight. Her main methods of accessing current information include listening to the television, talking on the phone, and using her magnifier to read newspapers and magazines. Her main genre of information is national politics in order to stay up-to-date on what is happening in Denmark and the world. She does not own any assistive devices. She does not feel confident in her use of technology and is overwhelmed by new devices. However, once interacting with the three devices, she was more open to learning new skills. Her favorite device was the Blaze ET. She enjoyed this device because there were many buttons and the ergonomics and appearance is similar to a television remote. She felt that because the device looked familiar, she was less intimidated by it. In addition, the AT device that scored the highest on “user-friendliness” was the Victor Reader Stream because it was easier than the other two to make and retrieve a recording. In general she enjoyed devices with less buttons and buttons with only one function. Other important features are the ability to navigate around within the articles and being able to read DAISY books.

Participant two is a 65 year old individual with complete vision loss. She is a member of the Danish Association of the Blind and is very active within the community. Her main methods of obtaining current information are from the computer, Victor Reader Stratus, Victor Stream, iPhone Podcasts, and telephone. The Victor Reader Stratus was provided from the government with subsidies. However, she purchased the Stream on her own. She accesses news several times a day and it is a necessity to her because she feels that it is important to stay up-to-date on current affairs. She used to rely on the CD mailing system, however the postal service has

slowed down. She still reads them but does not rely on them for immediate news. When learning a new technology, she comments that it is initially overwhelming but it gets better over time and is worth it in the end. She states, “I am not afraid to learn a new technology, it just takes me some time”. In the product trial we were unable to test the Blaze ET with Hanne due to technical difficulties with the device effecting its operation. Among the two devices used, Hanne liked the Victor Reader Stream better because it had more buttons. Though she was also familiar with the device she commented that it was more intuitive than the Milestone 312’s fewer buttons. Features important to her when considering an assistive device are DAISY books, navigation, and a sleep timer that is easy to access.

Participant three, aged 32, is one of the members of DAB who is legally blind. She mainly relies on the radio and TV for accessing current information like politics and sales at local shops. She also uses her iPhone for listening to podcasts. For reading books, she uses a Victor Reader Stream that was provided to her by her local municipality. She was open to learning new devices and found herself very confident in her use of technology. For her, navigation within the menu or books, recording audio notes and having buttons with only one function were important features of a DAISY player. She did not prefer having few buttons on a device like the Milestone 312. When asked about her opinions on using a radio device or a calling service for accessing current information, she did not like the idea and would rather not use it.

Participant four is a member of the Danish Association of the Blind, in his forties, with complete vision loss. He is mostly interested in current information with national scale and importance, namely Danish national news and politics. He accesses current information multiple times a day using his iPhone, his personal computer where he is subscribed to an accessible online Danish newspaper. He occasionally used the current information CDs that were mailed to him whenever they were available. As far as the devices he uses, he mentioned that he bought an iPhone and Victor Reader Stream mostly because many people he knew used them. He previously used a PlexTalk but he switched to Victor Reader because it was easier to use according to him and he primarily uses the device for listening to audiobooks. He then said that though AT devices are hard to learn, he has now become used to them through practice and he is not afraid of trying new technologies. He was competent at using the Victor Reader since he owns one but had never used the Blaze ET or the Milestone devices. The Milestone was particularly hard for him to use because of how small it was. Orienting him using words like “top button” was difficult for him because how compact the device is. It is very thin and the top menu button is small and hard to distinguish as a button. Though communication was smooth during the interviews and trial but there was a language barrier which slowed the interview process. Hans Rasmussen, one of our interviewees from IBOS, acted as a translator to ease the interviews.

Participant five, aged 32, is also one of the members of DAB. Seeking current information on a daily basis is a part of his life because he believes it is important for the visually impaired to stay up-to-date. As he has never used the CD mailing system, he mainly relies on radio and the Victor Reader Stream for accessing current information. He is also subscribed to a service that provides him news updates about Danish IT and local supermarkets through his iPhone. He purchased his DAISY player himself from Instrulog A/S, instead of relying on his local municipality since his application for requesting a DAISY player took months to process. He also downloads music and podcasts on his iPhone as another option for acquiring current information. When asked about the issues he faces while using these methods, he highlighted how non-WCAG standard websites are hard to access on his smartphone. Overall, learning new technology was not challenging for him. He performed very well during the device evaluation. While interacting with Milestone 312, he commented how he did not like its menu structure as it leads to a difficult navigation. He was impressed by the OCR feature in Blaze ET and wanted that feature in his Victor Reader Stream. When asked about using a calling service as a potential method for acquiring current information, he commented how he imagines that it may not be popular since the news may not be updated as fast as other methods. However, he did not provide support for this statement. For him, having an OCR feature, recording audio notes, and having many buttons are the preferred features in a DAISY player.

Participant six is an individual with complete vision loss. His main methods of accessing current information include listening to the television, using his iPhone, Danish Radio, American Radio, Sonos media stream device, and browsing the internet using his computer. His main genre of information is national, local, and international politics in order to stay up-to-date on what is happening in Denmark and the world. He also owns a Victor Reader to assist him. He is a technology enthusiast and feels comfortable and confident in devices and learning new devices as well. He did not express preference of one device over another. However, he was more confident with the Victor Stream because of prior experience. He found certain features Milestone and Blaze ET, such as OCR, unnecessary because they can be accomplished through a computer or iPhone. Other important features that he liked were internet radio, DAISY books and the ability to navigate around within the publications.

	Milestone 312		Victor Reader Stream 11		Blaze ET*	
	Unfamiliar	Familiar	Unfamiliar	Familiar	Unfamiliar	Familiar
<b>Turn Device ON</b>	5-Complete	1-Complete	1-Complete	5-Complete	5-Complete	N/A
<b>Make Recording</b>	3-Complete 2-Incomplete	1-Complete	1-Complete	5-Complete	4-Complete 1-Partially Complete	N/A
<b>Retrieve Recording</b>	3-Complete 2-Partially Complete	1-Complete	1-Partially Complete	5-Complete	1-Complete 4-Incomplete	N/A
<b>Adjust Volume</b>	3-Complete 2-Partially Complete 1-Incomplete	1-Complete	1-Complete	5-Complete	5-Complete	N/A
<b>DAISY Book</b>	2-Complete 3-Partially Complete	1-Complete	1-Complete	5-Complete	5-Complete	N/A
<b>OCR</b>	N/A	N/A	N/A	N/A	5-Complete	N/A

\*only 5 participants interacted with the Blaze ET

**Table 7. Average Importance of Features to Participant\***

DAISY Compatibility	3.83 ± 0.41
Navigation (horizontal and vertical)	3.67 ± 0.51
Sleep Timer	3.20 ± 0.84
Recording	3.17 ± 0.75
Standalone Menu Button	3.17 ± 0.41
More Buttons	3.17 ± 1.17
Multi-Function Buttons	2.5 ± 0.84
Radio	2.5 ± 1.38
Optical Character Recognition (OCR)	2.2 ± 1.30
Fewer Buttons	1.17 ± 1.47

\*The numbers in this table were not analyzed for statistical significance because our participant pool was too small. However, this was included to show a general culmination and comparison between the results of the post-interview.



## 4.0 Discussion and Considerations: Limiting Factors of Our Project

During our project we encountered some limiting factors that shaped the way we conducted our methodology and that had some effects on our results. Overall, we believe these factors did not hinder the project in its entirety and that we have substantial evidence to support our recommendations. However, we included this section because we believe it is important to explain some of the barriers of our project and associated research. The first problem we faced involved specific gaps in our information distribution systems research. There were some areas in which we were unable to find information or further detail on distribution systems such as calling, radio, and assistive technology. Other limiting factors we encountered were within our device evaluation including the small pool of respondents as well as language barriers.

### 4.1 Information Distribution Systems

The greatest issue for researching information distribution systems was the lack of available information for the cost and time required for managing each one of these systems on a large scale. In research before our work in Denmark and in our interviews in Denmark, we could not gather concrete information on established systems. Because of this, we can only make assumptions that the price and time it would take to implement these system is feasible. In addition, it is only an assumption that those factors would be relatively similar for calling, assistive technology, and iPhone systems to distribute information. This type of information is typically not noted on public web pages and organizations that are involved with information systems were reluctant to share this information. The comparisons in our discussion and recommendations were limited to the present establishment of these three systems in Denmark.

### 4.2 Evaluation of Information System Approaches

In regards to our evaluation of assistive technology (AT) as a delivery system, we were only able to test three AT devices, given the short amount of time we had in Denmark. In the beginning stages of our work we had to narrow our evaluation of systems to one (AT) due to the short 7 week time frame. It would have been unreasonable attempt to test multiple systems in consideration with the other interviews and work conducted during the term. We used the AT device evaluation because we could find devices to borrow from AT retailers in Denmark and we believe the information on features for gathering current information is relevant to the other systems we researched. The device evaluation was further limited by the small pool of respondents we had for our product trial with the Copenhagen area. The six participants interviewed gave us good feedback to inference from on the device features and information systems in general but this data is not very large with only six data sets. In addition, some

interview information in our results are slim because of language translation. Participant three, Participant four and Participant five were not proficient in English, therefore Hans Rasmussen, a retired Information Technology (IT) expert who used to work at IBOS, acted as the translator. During our device evaluation, Hans translated our interview questions and device usage instructions from English to Danish, and translated their answers and concerns from Danish to English to us. The translation and communication was smooth, but this language barrier led to a slower process and reduced the overall detail in responses that we could gather. Overall, an assumption was made that Copenhagen is an accurate representation of the visually impaired population. Before further action is taken towards our recommendations, more information may want to be collected on the visually impaired population in Denmark.

## 6.0 References

- American Foundation for the Blind (2017a). Visionaware: Audio players and talking books. Retrieved 27 January, 2017 from <http://www.visionaware.org/info/everyday-living/essential-skills/reading-writing-and-vision-loss/audio-players-and-talking-books/1234>
- American Foundation of the Blind (2017b). Living with vision loss: Optical character recognition systems. Retrieved 27 January, 2017 from <http://www.afb.org/info/living-with-vision-loss/using-technology/assistive-technology/optical-character-recognition-systems/1235>
- American Foundation of the Blind (2017c). Living with vision loss: Talking books for people who are blind or visually impaired. Retrieved 27 January, 2017 from <http://www.afb.org/info/living-with-vision-loss/reading-and-writing/talking-books-933/235>
- Apple Inc. (2017a). Accessibility - iPhone. Retrieved April 26, 2017 from <https://www.apple.com/accessibility/iphone/>
- Apple Inc. (2017b). Navigate using cursor wrapping:VoiceOver getting started guide. Retrieved 7 February, 2017 from <https://help.apple.com/voiceover/info/guide/10.12/#/vo2733>
- Assistive Technology Industry Association (2017). About page. Retrieved 7 April, 2017 from <https://www.atia.org/about-atia/>.
- Braille Works (2017). Braille, Large Print, Audio and 508 Compliance. Retrieved 21 January, 2017 from <https://brailleworks.com/>
- Brinker, Berry den. (2003). EBU policy statement on low vision. *EBU Commission on Human and Social Rights*. Retrieved from [www.euroblind.org/media/eplica/EBU\\_Policy\\_Statement\\_Low\\_Vision.doc](http://www.euroblind.org/media/eplica/EBU_Policy_Statement_Low_Vision.doc)
- Copenhagen Post. (2016, October 28). First class shake-up at PostNord to blame for third class results. Retrieved from <http://cphpost.dk/news/first-class-shake-up-at-postnord-to-blame-for-third-class-results.html>
- Clark, Joe (2006). Accessibility: To hell with WCAG 2. *A List Apart*. Retrieved from <https://alistapart.com/article/tohellwithwcag2>
- DAISY Consortium. (2017). Nota - Danish National Library for Persons with Print Disabilities. Retrieved 19 April, 2017, from <http://www.daisy.org/member/81/Nota%20-%20Danish%20National%20Library%20for%20Persons%20with%20Print%20Disabilities>
- Digitaliseringsstyrelsen (2017a). About the Danish Agency for Digitization. Retrieved 20 March, 2017 from <http://www.digst.dk/ServiceMenu/English/About-the-Danish-Agency-for-Digitisation>
- Digitaliseringsstyrelsen (2017b). Policy and strategy: Mandatory Digital Post. Retrieved 20 March, 2017 from <https://www.digst.dk/ServiceMenu/English/Policy-and-Strategy/Digital-Post-from-public-authorities>
- Einarsson, Kristinn Haldor (2014, March 5). Access to information. *Blindrafelagid*. <http://www.blind.is/media/frettir/Report-on-access-to-information-project-in-Iceland-ver1.pdf>
- Engelen, J., & Paepen, B. (2015, February 12-14,). Media Access: Automatic Generation of Daily Newspapers in Audio Daisy Format. *International Conference ICEAPVI, Enabling Access for Persons with Visual Impairment*, 76.
- European Commission (2014, June). Joinup: eGovernment in Denmark. 16, 1-41. Retrieved 17 Marc, 2017 from <https://joinup.ec.europa.eu/sites/default/files/7f/1d/a4/eGov%20in%20DK%20-%20June%202014%20->

[%20v.16.pdf](#)

- Gatewave (2017). Stay connected with GATEWAVE - Audio for Independent Living. Retrieved 20 March, 2017 from <http://gatewave.org/>
- Heckathorn, D. D. (1997). Respondent-driven sampling: a new approach to the study of hidden populations. *Social problems*, 44(2), 174-199.
- Hersh, M. A., & Johnson, M. A. (2008). Disability and assistive technology systems. In *Assistive Technology for Visually Impaired and Blind People* (pp. 1-50). Springer London
- Hindustan Times (2010, December 21). A radio service for the blind, by the blind. Retrieved 27 March, 2017 from <http://www.hindustantimes.com/india/a-radio-service-for-the-blind-by-the-blind/story-cZFpLPvF6oJgkAXFtg7mHI.html>
- Human Interaction Motivation Study (2017). OCR and book players: Blaze EZ Multi-Player. Retrieved 27 March, 2017 from <https://hims-inc.com/products/blaze-et/>
- Humanware (2017). Blindness: Victor reader talking book players (stream & stratus). Retrieved 27 March, 2017 from <http://store.humanware.com/hus/victor-reader-stream-new-generation.html>
- IT Politisk Forening (2012). Home: New Danish law will make digital communication with the public sector mandatory. Retrieved 27 March, 2017 from <https://itpol.dk/notater/mandatory-digital-communication-with-public-sector-in-Denmark>
- Ivona (2017). About us. Retrieved 26 April, 2017 from <https://www.ivona.com/us/about-us/company/>.
- Jensen, T., & Merriman, J. (2017, March 08). PostNord to cut up to 4,000 jobs in Denmark. Retrieved from <http://www.reuters.com/article/postnord-jobs-idUSL5N1GL4QG>
- Johnson, L., & Moxon, E. (1998). In whose service? Technology, care and disabled people: The case for a disability politics perspective. *Disability & Society*, 13(2), 241-258
- Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. *Government information quarterly*, 18(2), 122-136
- Leith, Lynn (2006). Reading the DAISY way. *DAISY*. Retrieved 27 April, 2017 from <http://www.daisy.org/publications/docs/20070315155100/intro-article1.html>
- Library of Congress (2014). National library service programs: digital audio players. Retrieved 22 January, 2017 from <https://www.loc.gov/programs/national-library-service-for-the-blind-and-physically-handicapped/about-this-service/resources/audiobook-players/>
- Los Angeles Radio Reading Service. (2017). Retrieved 27 March, 2017 from <http://www.larrs.org/>
- Maberley, DA (March 2006). "The prevalence of low vision and blindness in Canada." *Eye (London, England)*. 20 (3): 341–6. doi:10.1038/sj.eye.6701879
- Murphy, E., Kuber, R., McAllister, G., Strain, P., & Yu, W. (2008). An empirical investigation into the difficulties experienced by visually impaired Internet users. *Universal Access in the Information Society*, 7(1-2), 79-91. doi:10.1007/s10209-007-0098-4
- National Federation for the Blind (2017). Products and technology: NFB-NEWSLINE. Retrieved 23 March, 2017, from

<https://nfb.org/audio-newspaper-service>

Nets (2017). Nets Share [Net Share]. Retrieved 27 March, 2017 from <https://www.nets.eu/dk-da/l%C3%B8sninger/distribution-digital-kundedialog/nets-share>

PostNord. (2016, May 31). Post Danmark tager B af brevene og lancerer nyt quickbrev [PostNord takes B letters and launches new quick letter]. Retrieved April 24, 2017, from <http://www.postnord.com/da/presse/pressemeddelelser/postnord-danmark/2016/post-danmark-tager-b-af-brevene-og-lancerer-nyt-quickbrev/>

PostNord (2017). Om os: Virksomheden [About us: The business]. Retrieved March 20, 2017, from <http://www.postnord.dk/da/om-os/Virksomheden/Sider/virksomheden.aspx>

Preez, Derek du (2015, 22 October). Denmark has made digital mandatory for government-citizen interactions. *Diginomica*. Retrieved from <http://diginomica.com/2015/10/22/denmark-has-made-digital-mandatory-for-government-citizen-interactions/>

PR-Newswire. (2010, September 29). Critical funding shortage threatens NFB-Newsline in Michigan. The Street. Retrieved from <https://www.thestreet.com/story/10875068/1/critical-funding-shortage-threatens-nfb-newsline-in-michigan.html>.

Rainbow Broadband (2015, November 17). Gatewave, Radio Reading Service For The Blind: Chooses Rainbow Broadband's High-Speed Internet For Transition To Times Square. Retrieved from <https://www.rainbowbroadband.com/news/2015/11/17/gatewave-radio-reading-service-for-the-blind-chooses-rai>

Rubin, H. J. & Rubin, I. S. (2005). *Qualitative interviewing (2nd ed.): The Art of Hearing Data* Thousand Oaks, CA: SAGE Publications Ltd doi: 10.4135/9781452226651

Rychla, Lucie. (2016, September 30<sup>th</sup>). Sending an express letter in Denmark to double in price. Retrieved from <http://cphpost.dk/general/sending-an-express-letter-in-denmark-to-double-in-price.html>

Solutions Radio (2017a). Welkom bij de Webbox [Welcome to Webbox]. Received March 22, 2017, from <http://www.orionwebbox.org/>

Solutions Radio (2017b). Welcome to solutions radio website: The webbox. Retrieved on 26 April, 2017 from <http://www.solutionsradio.com/>

Syamaal, C (February 1, 2013). Assistive Information and Communication Technology For Visually Impaired People. National Conference on E-Resources and E-Learning: Challenges and Opportunities for Libraries, 14.

The Ministry of Social Affairs and Integration. (2011). *Social policy in Denmark*. Received 3 April, 2017 from <http://socialministeriet.dk/media/14947/social-policy-in-denmark.pdf>.

Welsh, O. (2014, November 23). World of Warcraft was a defining game of its generation. Retrieved April 27, 2017, from <http://www.eurogamer.net/articles/2013-10-29-games-of-the-generation-world-of-warcraft>

Williamson, K., Wright, S., Schauder, D., & Bow, A. (2001). The Internet for the blind and visually impaired. *Journal of Computer-Mediated Communication*, 7(1), 0-0.

## Appendix A. Verbal Consent Form for Participation in Semi-Structured Interview

### **For use if the participant is visually impaired**

We are students at Worcester Polytechnic Institute in Worcester, Massachusetts. We are conducting a research project on behalf of Danish Association of the Blind (DAB) to determine the barriers for the visually impaired when accessing current information in Denmark. As part of this project we are conducting a series of interviews with key individuals. We have asked you to participate because we believe you have unique knowledge of these issues that will be valuable to the project.

Before we begin, we would like to thank you for taking the time to participate in the interview which will last about 30 minutes. Your participation is entirely voluntary. You may refuse to discuss any question or terminate the interview at any time. With your permission we would like to record the interview. The tapes, notes, and subsequent transcripts of the interview will be kept confidential, and will be accessible by only the members of the team and our immediate faculty advisors. With your permission we would like to use your name in subsequent reports or publications unless otherwise stated. If you consent to be interviewed and recorded at this time, we would ask that you indicate your agreement by stating aloud, "I agree to participate in the interview".

If you consent to be interviewed but not recorded at this time, we would ask that you indicate your agreement by stating aloud, "I agree to participate in the interview but do not consent to being recorded".

## Appendix B. Written Consent Form for Participation in Semi-Structured Interview

### For use if the participant is not visually impaired

We are students at Worcester Polytechnic Institute in Worcester, Massachusetts. We are conducting a research project on behalf of the Danish Association of the Blind (DAB) to determine the barriers for the visually impaired when accessing current information in Denmark. As part of this project we are conducting a series of interviews with key individuals. We have asked you to participate because we believe you have unique knowledge of these issues that will be valuable to the project.

Before we begin, we would like to thank you for taking the time to participate in the interview which will last about 30-40 minutes. Your participation is entirely voluntary. You may refuse to discuss any question or terminate the interview at any time. With your permission we would like to record the interview. The tapes, notes, and subsequent transcripts of the interview will be kept confidential, and will be accessible by only the members of the team and our immediate faculty advisors. With your permission we would like to use your name in subsequent reports or publications unless otherwise stated.

If you consent to be interviewed at this time, we would ask that you indicate your agreement below.

\_\_\_\_\_

Participant Name

I agree to participate in the interview

\_\_\_\_\_

\_\_\_\_\_

Participant Signature

Date

Please initial for permission to record

\_\_\_\_\_

Initials

\_\_\_\_\_

Interviewer signature

\_\_\_\_\_

Date

## Appendix C. DAISY OK Requirements for Reading Systems and Books

"Online Documentation"

*Provide a link to the reading system description on your web site.*

Reading System developers must provide a link to the reading system description on their company/organization's web site.

(\*1.) "NCC and/or NCX navigation"

*Support NCC and/or NCX navigation and nested levels, that is, render DAISY 2.02 and/or DAISY/NISO books*

(\*2.) "Page navigation"

*Support sequential navigation by page, forward & back (when pages are present in the Digital Talking book (DTB)).*

(\*3.) "Remembers last reading position"

*Retain the location of last reading point*

(\*4.) "Reads book title"

*Provide access to the book title*

(\*5.) "Reads sequentially"

*Render the book in the correct reading sequence, as defined within the DAISY DTB by the DAISY producer*

(\*6.) "Next event movement"

*Support navigation by next/previous SMIL event, that is, support SMIL level navigation; next audio in same par or to another par, depending upon the book; this may be by text reference (sentence by sentence)*

(\*7.) "Stop and resume"

*Allow stop and start, that is, pause/resume functionality which maintains the last reading position.*

(\*8.) "Forward and Reverse"

*Supports rapid forward and reverse movement in time through audio in the DTB.*

(\*9.) "Stable playback"



*Incorporate as much robust playback as possible, rendering valid DTBs as intended by the producer without crashing under normal circumstances.*

(\*10.) "Where am I"

*Report current reading position*

(\*11.) "Bookmarks"

*Support insertion and navigation of user defined bookmarks within the current reading session.*

(\*12.) "User manual"

*Provides accessible basic user manual*

## Appendix D. Specific Responses to Interview Questions with Stakeholders

### Further Description of Results Section 3.1

For each participant we include the questions and answers involved during our interview. The numbered bullets indicate the questions asked, and the lower case roman numerals and italicized text indicate the responses of the participants.

#### John Heilbrunn (DAB)

**Date:** March 28th, 2017.

**Location:** Blekinge Blvd. 2, 2630 Taastrup

**Interviewer:** Jason Bugarin

**Interviewee:** John Heilbrunn

**Note-taker(s):** Kaye Dandrea

1. **What are the main methods the visually impaired currently use/used to obtain current information?**
  - a. **Current information can be news, shopping deals, and local events.**
    - i. *Radio*
    - ii. *Internet on computers if the individual can access it.*
    - iii. *Smartphone and specific apps for accessing publications.*
    - iv. *Internet radio.*
    - v. *Local and national newspapers recorded on CD and through NOTA, the library for the print-disabled in Denmark.*
    - vi. *Television*
    - vii. *Podcasts*
2. **How accessible are the methods suggested above by the entire visually impaired blind population? Why or why not?**
  - a. **Do you observe any age group trend among these methods?**
  - b. **Does vary by municipalities**
  - c. **What are the most troublesome aspects of learning new technology for the visually impaired?**
    - i. **What are the past or future solutions that address these limiting factors?**
    - ii. *The elderly population tend to use radio, sometimes television.*
    - iii. *Younger people use iPhone, social media, electronic media, less spoken media for the partially sighted and Voiceover for the blind.*
    - iv. *No significant variation of current information access, except in big towns or cities-use where more technological-savvy are, social media is used more often.*
    - v. *People have trouble learning a new programs for connectivity such as Windows and Outlook.*

- vi. *Visually impaired have to wait until compensating software, screen readers, are updated to be compatible with current technologies.*
  - vii. *The visually impaired population get used to a program and then a few years later, a new thing comes out and the new commands or skills required are changed.*
- 3. What are the successes and drawbacks of using each method?**
- a. These could be cost, training, features, and functions.**
    - i. *For radio one cannot pause, fast forward or rewind it is an ageing system.*
    - ii. *For podcasts one can listen to content once but cannot be saved.*
    - iii. *Certain websites do not always abide by the WCAG standard and so are not accessible on AT devices.*
    - iv. *Even with standards, the visually impaired cannot always navigate through content as easily as a sighted person.*
    - v. *For example trying to access a playlist on YouTube or one cannot fast-forward through a video to the last time point that was accessed.*
    - vi. *DAISY players can be more independent, useful, user-friendly*
- 4. Which functions/features of the methods/devices are the most important for the visually impaired?**
- a. What other factors apart from the feature should be accounted for when designing a method for information distribution?**
  - b. Example: ergonomics, color contrast for the partially sighted etc.**
    - i. *The features in an information source depends on what type of current information you are looking for*
    - ii. *They should be able to stream, download, access podcasts, have control over content (pausing, skipping) and browsing/searching capabilities.*
    - iii. *AT devices should be:*
    - iv. *Lightweight*
    - v. *Rugged*
    - vi. *Voice response to tell you what each button does, verbal feedback*
    - vii. *Mobile*
    - viii. *Battery and AC adapter power*
- 5. Which method(s)/device(s) do you think are the most effective for gathering current information? Why?**
- a. How do you think the visually impaired population would respond to a solution such as newswire or phone service? This way they would be able to call in using a technology they are already familiar with and obtain news that way.**
  - b. Would an assistive technology be better in the long run to a system such as this? Why or why not?**
    - i. *They would need to be taught how to use the system.*
    - ii. *Being able to browse by voice would be very convenient.*
    - iii. *Accessible digital format and text-to-speech technologies are the most flexible, easy, inexpensive way to obtain current information.*
    - iv. *Being DAISY format enables players to navigate around content.*

6. Can you give us a very brief description on how the municipality system works on disseminating current information and how Daisy and AT devices fall into play?
- a. What is your stance on the amount of free control each individual municipality has over disseminating AT devices?
    - i. *Visually impaired people must meet with a consultant to explain what needs they have in terms of their social life, work or leisure.*
    - ii. *There are lists of available devices or solutions that exist within each municipalities. These lists are subject to change depending on updates.*
    - iii. *Then, the municipality determines if a DAISY player is needed by talking to the individual about their technological experience and their need for the device. This is also to determine whether training is needed in order to learn the AT device.*
7. Where do you think the bigger issue is? On the distribution side (NOTA not being able to distribute info well)? Or on the user's side where people have difficulty accessing the current information (don't have tech or don't know how to use?)
- i. *The visually impaired individual person doesn't always get to decide what information they obtain, this is usually decided by the provider. Lack of information sources with browsing capabilities.*
  - ii. *Not enough publications compared to sighted people.*
  - iii. *Lack of awareness of different current information sources.*
  - iv. *For the distribution side, NOTA is main information distributor in Denmark and it is not good at providing full or fair DAISY structure*
  - v. *Lack of uniform format*
  - vi. *Library offers brief sections of publications of what they think individuals should know.*
  - vii. *Nota serves the print-disabled but members mostly consist of dyslexic individuals who also use the DAISY format. Nota focus a lot of their resources and have not taken care of the failing CD system.*

## Ask (DAB)

**Date:** April 3rd, 2017.

**Location:** Blekinge Blvd. 2, 2630 Taastrup

**Interviewer:** Nelson Ndahiro

**Interviewee:** Ask Abildgaard.

**Note-taker(s):** Kazim Hyder.

1. **What are the main methods the visually impaired currently use/used to obtain current information?**
  - a. **Current information can be news, shopping deals, and local events.**
    - i. *Radio and TV (audio). Not the best options, but TV is the most accessible type for news.*
    - ii. *For the elderly, it's the same as above. Local news may not be on radio so that may be one of the problems.*
2. **How accessible are the methods suggested above by the entire visually impaired blind population? Why or why not?**
  - a. **Do you observe any age group trend among these methods?**
  - b. **What are the most troublesome aspects of learning new technology for the visually impaired?**
    - i. *The visually impaired can't really browse through themselves on radio and TV on the specific news they need.*
    - ii. *Blind people don't have the same opportunity for navigation of news as compared to the ones reading newspapers.*
    - iii. *CD mailing system has a barrier of delay. For news, time is very critical.*
3. **What are the successes and drawbacks of using each method?**
  - a. **These could be cost, training, features, and functions.**
    - i. *Visually impaired are not really used to self-selection so it doesn't really matter. The thing that's important is pre-selection, that is, jumping from one level to another.*
    - ii. *User interface should be taken into consideration, easy to be broken down into different sections so that the user can easily navigate.*
4. **Which functions/features of the methods/devices are the most important for the visually impaired?**
  - i. *Content is the key. If variety of content same as everyone else, it's perfect. Summary: same content, just accessing in different way.*
  - ii. *New technology may not be a big deal for young people with disability.*
5. **What other factors apart from the feature should be accounted for when designing a method for information distribution?**
  - a. **Example: ergonomics, color contrast for the partially sighted etc.**
    - i. *Cost issues.*
6. **Which method(s)/device(s) do you think are the most effective for gathering current information? Why?**

- a. How do you think the visually impaired population would respond to a solution such as newswire or phone service? This way they would be able to call in using a technology they are already familiar with and obtain news that way.
  - b. Would an assistive technology be better in the long run to a system such as this? Why or why not?
    - i. *AT devices are very widespread in Denmark. DAB assists their members to get a DAISY device.*
    - ii. *Smartphones is less used by older population.*
    - iii. *Even though they have AT devices, they rely more on radio and TV for current information.*
    - iv. *Ask personally uses smartphone with a radio application on it. From AT devices, he uses Victor Reader Stream II for reading books.*
    - v. *When people buy AT devices, their aim is to read book through it, not mainly for accessing current news.*
    - vi. *Factor of habit comes in importance when it comes to what you prefer.*
7. Can you give us a very brief description on how the municipality system works on disseminating current information and how Daisy and AT devices fall into play?
- a. What is your stance on the amount of free control each individual municipality has over disseminating AT devices?
    - i. No answer.
8. Where do you think the bigger issue is? On the distribution side (NOTA not being able to distribute info well)? Or on the user's side where people have difficulty accessing the current information?
- i. *NOTA is interested in digitization since it's cheaper.*
  - ii. *They want to move users from physical format to "wireless" formats.*
  - iii. *NOTA produces some local newspapers (around 8) but they get paid from the municipality.*
  - iv. *No general system for providing current information.*
  - v. *Solution would be to have them have a distribution platform.*

**Daniel Gartmann**

**Date:** March 28th, 2017.

**Location:** Blekinge Blvd. 2, 2630 Taastrup

**Interviewer:** Nelson Ndahiro

**Interviewee:** Daniel Gartman

**Note-taker(s):** Kazim Hyder, Jason Bugarin

- 1. How has the decline of the CD mailing system affected the visually impaired population?**
  - i. There's a delay in the postal system, it takes more time for the visually impaired to get up to date to current information including current affairs in local areas. The CDs are also abbreviated versions of the actual publications.*
- 2. What are the main methods the visually impaired currently use/used to obtain current information?**
  - a. Current information can be news, shopping deals, and local events.**
    - i. They use radio, television and Braille to some extent.*
    - ii. Most are inclined towards audio based information sources.*
    - iii. There are online sources such for those who can use Voiceover on computers and smartphone.*
    - iv. There is no talking newspaper over the radio in Denmark.*
- 3. How accessible are the methods suggested above by the entire visually impaired blind population? Why or why not?**
  - a. Do you observe any age group trend among these methods?**
  - b. What kind of difficulties you think the visually impaired face while learning a new technology?**
  - c. What are the past or future solutions that address these limiting factors?**
    - i. The younger demographic are more educated on average. They are more likely to be able to access online sources of information.*
    - ii. Digital signature is getting common in Denmark so everyone is shifting toward using the internet.*
    - iii. The elderly population is experiencing difficulties: it is hard to implement in daily lives.*
- 4. Which functions/features of the methods/devices are the most important for the visually impaired?**
  - i. Something that can switch on and off.*
  - ii. A method allows easy navigation in content: skipping, playback and pausing.*
  - iii. Easy to learn and master.*
- 5. What other factors apart from the feature should be accounted for when designing a method for information distribution?**
  - a. Example: ergonomics, color contrast for the partially sighted etc.**

- i. The method must be compatible with different formats.*
  - ii. Be able to print out in braille for those who like it.*
  - iii. Cost is an issue, though more of a political issue since it is the municipalities' responsibility to buy the devices.*
  - iv. Have access to many publication which should also be accessible.*
- 6. What are your thoughts on having a calling service as the main means to distribute current information to the visually impaired?**
  - a. This system would require the use of a landline or another phone and a menu would be present to select a given area of current information**
    - i. Would not call to hear news since such a system would make it hard to save information.*
    - ii. It would also be difficult to navigate the content itself.*
    - iii. The option should be there for those who want it.*
- 7. What are your thoughts on having an Assistive Technology system to distribute information to the visually impaired in Denmark, in the near future?**
  - a. Do you think this is feasible?**
    - i. Would require many people to be taught how to use At*
    - ii. The option should be there for those who want it because AT devices have many uses.*
- 8. Do you think the budget allocated to the disability sector/visually impaired sector is adequate for the subsidization of Assistive Technology? Why?**
  - i. No response*



Hans Rasmussen

**Date:** April 6th, 2017.

**Location:** Blekinge Boulevard 2, 2630 Taastrup, Denmark.

**Interviewer:** Kazim Hyder.

**Interviewee:** Hans Rasmussen.

**Note-taker(s):** Jason Bugarin, Nelson Ndahiro.

- 1. How has the decline of the CD mailing system affected the visually impaired population?**
  - i. There's a delay in the postal system making it take more time to get up to date to current information, and current affairs in your local area.*
- 2. What are the main methods the visually impaired currently use/used to obtain current information?**
  - a. Current information can be news, shopping deals, and local events.**
    - i. Radio, television, and Braille to some extent. He is more inclined towards audio based method or online for those who can manage. We don't have talking newspaper over the radio in Denmark.*
    - ii. It's hard to implement in daily lives.*
- 3. How accessible are the methods suggested above by the entire visually impaired blind population? Why or why not?**
  - a. Do you observe any age group trend among these methods?**
    - i. The older population.*
  - b. What kind of difficulties you think the visually impaired face while learning a new technology?**
    - i. They don't know how to use specific configurations, skipping to specific chapters, navigating, fast reading, they just use it to read the whole thing. So it is not that convenient for them.*
    - ii. Once they learn how to read, increase volume, (only the essentials), they do not "want" or feel the need to use the useful characteristics of DAISY readers such as playback and skipping ahead.*
    - iii. Takes time to learn and become proficient in use.*
  - c. What are the past or future solutions that address these limiting factors?**
    - i. He is satisfied with the amount of accessibility, but other blind people may not because they have gained visual impairment with age.*
    - ii. "The fact that sighted people can just open up a newspaper while in the train for example is something we miss on".*
- 4. Which functions/features of the methods/devices are the most important for the visually impaired?**
  - i. Speed of the device, once someone gets used to AT, fast reading of info is useful for the visually impaired.*

- ii. *Easy to stop.*
  - iii. *Skipping to specific chapters, navigating.*
  - iv. *If you could have a device where you can keep it on at night and access them the next morning. Such an automated system that can enter the routine of a person.*
  - v. *A service as easy as a radio-reading service at a specific time every day at a specific time but while keeping in mind that they want the same quantity and quality of information as sighted people.*
- 5. What other factors apart from the feature should be accounted for when designing a method for information distribution?**
- a. **Example: ergonomics, color contrast for the partially sighted etc.**
    - i. *No additional comments.*
- 6. What are your thoughts on having a calling service as the main means to distribute current information to the visually impaired?**
- a. **This system would require the use of a landline or another phone and a menu would be present to select a given area of current information**
    - i. *Personally, he wouldn't call to hear news since it's hard to save information. He can't jump back to previous option, and always having to write down what you hear is tedious. Although, the option should be there for those who want it.*
- 7. What are your thoughts on having an Assistive Technology system to distribute information to the visually impaired in Denmark, in the near future?**
- a. **Do you think this is feasible?**
    - i. *Believes AT is very useful and has potential, but the issue is making current info available to the device.*
- 8. Do you think the budget allocated to the disability sector/visually impaired sector is adequate for the subsidization of Assistive Technology? Why?**
- i. *They are very underestimated. The big methods to provide info to the blind changed 3 times in Denmark: tape recorder, cassette, then AT. Every time the method was changed, the government had to be convinced to fund this new method.*
  - ii. *For AT right now, there is need for a system that distributes this information. This means they now need to convince people that this method is useful.*

## Digitaliseringsstyrelsen

**Date:** 24th March, 2017.

**Location:** Landgreven 4, 1301 KØBENHAVN K, Denmark

**Interviewer:** Jason Bugarin.

**Interviewee:** Peter Houmann, Henriette Eskelund-Hansen.

**Note-taker(s):** Kazim Hyder, Kaye Dandrea.

- 1. Why did Denmark become digitized in the first place? What are the advantages and disadvantages?**
  - a. Money, speed, democracy?**
    - i. Digitalization is the most cost effective way to communicate with the public.*
    - ii. More effective and a cheaper way to distribute forms and contact documents.*
    - iii. Postal service has financial problems.*
    - iv. Digitization has freed up to EUR 296 million per year.*
- 2. How are these systems funded and ran?**
  - i. There are 98 municipalities in Denmark. In 2014, by law it's mandatory for citizens to have digital post, and in 2013 it was mandatory for businesses.*
  - ii. You get all kinds of letters from all kinds of governments.*
  - iii. Most letters are from one government to many people and there are many different ways to do this. Some municipalities are good at this.*
- 3. What is their prognosis for snail mail? What will happen to the process? Will they recommend changing to systems (speed of handling communication between authorities and citizens)?**
  - i. No answer.*
- 4. How does the exemption category work? Do many people actually get exemption when they request it?**
  - a. How many visually impaired individuals are exempt from using the system?**
  - b. Are the elderly the main demographic in the exemption category? Do you have a percent?**
    - i. You are allowed to say no to digital post.*
    - ii. If you have a computer in your home and you are able to read on it, then it is required by law to have digital post.*
    - iii. 1% of the population is exempted from Digital Post.*
    - iv. Have to be 15+ as per the law.*
- 5. Why does an exemption category exist opposed to making everything accessible?**
  - i. Libraries in Denmark educate people how to use the digital post. They have to have people (teachers) in the libraries/municipalities for this.*
  - ii. 7000 digital ambassadors are employed that are good at helping people with the different technologies.*

6. **What is currently being done to advance the system in place?**
  - a. **To fix disadvantages or make the system better**
  - b. **Any for people with disabilities and/or visually impaired individuals specifically?**
    - i. *Helpdesks are available to help disabled people.*
7. **Does the digitization trend actually help or is it alienating people? Will groups be left behind? Electronic illiterate? Education?**
  - i. No answer.
8. **What are your thoughts on having an Assistive Technology system such as in Iceland, meet most of the current information needs of the visually impaired in Copenhagen, in the near future?**
  - a. **Information is sent to the devices instead of put on a cd**
  - b. **Do you think this is feasible?**
    - i. No answer.
9. **Do you think the budget allocated to the disability sector/visually impaired sector is adequate for the subsidization of Assistive Technology? Why?**
  - i. No answer.
10. **Are there any additional challenges or considerations for a digitized communication system?**
  - i. No answer.

## Low Visual International (LVI)

**Date:** March 27th, 2017.

**Location:** Hørkær 24 st. TV, 2730 Herlev, Denmark.

**Interviewer:** Kazim Hyder.

**Interviewee:** Bue Vester Andersen.

**Note-taker(s):** Silvio Torres, Nelson Ndahiro.

1. **What devices for distributing current information are the most popular in sales?**
  - a. **What key features do these devices include?**
    - i. *Market is very small, they don't keep track of sales/stats.*
2. **What other factors do you believe are involved with the popularity and sales of your products?**
  - a. **This can include things such as prices, and ergonomics**
    - i. *Refer to the answer in question 1*
3. **What are the most useful features in Assistive Technologies for the visually impaired?**
  - i. *Ergonomics is a super big deal for blind and visually impaired*
  - ii. *A lot of people have some residual sight, so color contrast is big*
  - iii. *Pocket calculators*
  - iv. *Buttons with raised notes*
  - v. *OCR*
  - vi. *Ability to read variety of formats*
4. **What do you think are the main considerations when developing AT devices for the visually impaired?**
  - a. **Specifically for the visually impaired**
    - i. *A lot of people have some residual sight, so color contrast is big*
    - ii. *Old people have problems, yes, but in the next decade people will know how to use computers*
5. **How is the needs of visually impaired population taken into account in the development of assistive technologies? How does the attitude of the visually impaired population towards new technology affect the sale of these products?**
  - i. *Refer to the answer in question 4b*
6. **What are the barriers when selling an AT device?**
  - a. **For example, limited market exposure to AT devices? If yes, what role does it play in the sales?**
    - i. *Very, very small market*
    - ii. *Not much room for competition*
    - iii. *Present exposure if mostly led by rumors or information from family and friends*
    - iv. *All municipalities do whatever they want*
    - v. *Visual impairment is a very small number compared to other disabilities*

## Instrulog A/S

**Date:** March 20th, 2017.

**Location:** Bjerringbrovej 116, 2610 Rødovre, Denmark

**Interviewer:** Nelson Ndahiro.

**Interviewee(s):** Michael Nilsson, Johannes Nørgaard

**Note-taker(s):** Kazim Hyder, Jason Bugarin.

### 1. What devices for distributing current information are the most popular in sales?

#### a. What key features do these devices include?

- i. *DAISY players are the most popular devices for information distribution. Victor reader Stratus is the most popular desktop device.*
- ii. *The 4m version is the simplest version and most favored by the visually impaired, while the 12m version is the more advanced version. Victor Reader*
- iii. *Stream is the most popular portable device.*
- iv. *The user can call Nota to put book or other content type on the device “bookshelf” or the storage place for media for the user to read.*
- v. *Content can also be downloaded to the device from various sources.*
- vi. *In the United States you can download directly without calling in.*
- vii. *Denmark does not have a Wi-Fi download system for their local information through Nota. PlexTalk Linio is another device but it is considered much more difficult to use.*
- viii. *This device can also access Nota materials.*
- ix. *Milestone 312 can also access Nota documents with the user's credentials.*
- x. *The device is hard to use compared to Victor Reader Stream, less buttons makes the device navigation harder.*
- xi. *Handheld devices needs a computer to download media content, so it is not as easy as desktop devices which currently use CDs as an option to insert in the device.*
- xii. *The Victor Reader Stratus does not have Wi-Fi and only runs on content accessed through and SD card or CD.*
- xiii. *Countries such as Germany, Norway, Sweden, and Japan are using Wi-Fi push notification to distribute current information.*
- xiv. *Denmark does not use a Wi-Fi push notification currently.*
- xv. *Instrulog is hopeful that a Wi-Fi push notification system will be created in the future for Denmark.*

### 2. What other factors do you believe are involved with the popularity and sales of your products?

#### a. This can include things such as prices, and ergonomics

- i. *Working with municipalities to sell device can limit the sales.*
- ii. *Certain products are known or used by the municipalities so they are more often chosen.*

- iii. *Some devices are chosen because they are known to be easily repaired.*
  - iv. *Municipalities like to “stay to their roots” or use devices that they have used in the past.*
  - v. *This can be exact models or the same manufacturer.*
  - vi. *Price is not a big factor between portable and desktop types.*
  - vii. *All devices are similar in price in each category (among portable devices and among desktop devices), so price is not much of a factor.*
- 3. What are the most useful features in Assistive Technologies for the visually impaired?**
- i. *The most important feature of a device should be simplicity, specifically in “navigation” and “user friendliness”.*
  - ii. *Another important consideration for a user is the battery life of the device.*
  - iii. *To have a longer time to access content, compared to a phone the AT devices last significantly longer compared to a phone.*
  - iv. *Device needs to have good tactile features.*
  - v. *The spacing and physical button position are important to visually impaired users.*
  - vi. *The visually impaired mainly interact with the devices through hearing and feeling*
- 4. What do you think are the main considerations when developing AT devices for the visually impaired?**
- a. **Specifically for the visually impaired**
    - i. *The elderly is not the only group that struggle with technology, there are people who struggle in all age groups.*
    - ii. *Instrulog believes there is always people in each age class who struggle with technology.*
- 5. How is the needs of visually impaired population taken into account in the development of assistive technologies? How does the attitude of the visually impaired population towards new technology affect the sale of these products?**
- i. *Overall motivation and the attitude of a person dictates how open they are to learning technology*
  - ii. *Most people learn to use different technologies because they are forced to. They will lose information is not.*
  - iii. *Some people are intimidated to use and learn new technology*
  - iv. *A lack of technology causes isolation from news, some people become isolated because they stop asking family or friends to tell them information. They feel like a burden.*
  - v. *The elderly like old technology and using the device or method they always have.*
  - vi. *A slow paced change is happening to all people using technology.*
- 6. What are the barriers when selling an AT device?**
- a. **For example, limited market exposure to AT devices? If yes, what role does it play in the sales?**

- i. *The municipalities and the money are the largest two factors.*
- ii. *The municipalities do not want to spend money on people for devices if they can use it on something else.*
- iii. *The bare minimum is given out for funding for devices. The municipality will not give a subsidization for a device they deem as having overlapping features.*
- iv. *Some municipalities give the best devices to individuals.*
- v. *Some municipalities look heavily at price and buy the cheapest device.*
- vi. *Some municipalities will not help with repairs or updates for the devices.*
- vii. *Instrulog would be in favor for a set of guidelines being created to help make the AT selling/buying process easier with municipalities.*
- viii. *There is a “massive grey area for funding” of AT devices.*
- ix. *Each municipalities have many interpretations of what visually impaired individuals need -” interpreted in a million different ways”.*
- x. *In Denmark the subsidization is formally 50% off of the price for AT devices.*
- xi. *This can happen but it is not always followed by the municipalities.*
- xii. *Visually impaired individuals can pay the difference between the device the municipality will pay for and the device the individual wants.*
- xiii. *The law basically states that the minimum assistance must be given to the visually impaired for devices to help accessibility and services for the visually impaired.*



## National Federation for the Blind

**Date:** March 27th, 2017.

**Location:** Blekinge Boulevard 2, 2630 Taastrup, Denmark. (Conference Call)

**Interviewer:** Kaye Dandrea.

**Interviewee:** Tammy Albee.

**Note-taker(s):** Silvio Torres.

- 1. According to your website, NFB offers 400 publications to choose from (like Wall Street Journal, ESPN etc.). Who is responsible for the conversion from text to audio?**
  - i. Publishers are in charge of converting their publications, but if they do not, workers from NFB manually convert it*
- 2. We read that NFB-Newsline is compatible with AT devices (example: Victor Reader Stream II), how do they work on those devices?**
  - i. Yes they are, it is either streamed using Wi-Fi. If they will not have access to internet, they may download all the files they want for the day and read them offline*
  - ii. All using their iPhone application*
- 3. What are the advantages of using a telephone dial-in system over any other method for delivering current information to the visually impaired?**
  - a. Examples: radio reading service, audio recorded CDs, assistive technologies.**
  - b. How fully-fledged is this system, are there enough publications for users to rely on Newsline?**
    - i. There are over 400 publications*
    - ii. It is a very easy to learn system*
- 4. What are the attitudes of the users toward this service?**
  - a. Any complaints by the users?**
    - i. No comments*
- 5. What are the barriers and the limiting factors of the telephone dial-in system?**
  - a. For the user**
  - b. For the company/service provider**
    - i. System is non-profit and free for users. If a state lower's their budget allocated for the system, it is difficult to operate in that area*
- 6. What is the budget for the NFB newsline?**
  - a. We read an article mentioning how expensive NFB-Newsline is to fund**
  - b. Does the cost make the service difficult to maintain?**
    - i. System is financed through governor's budget, legislative budget, public service commissions, grants*
- 7. Is there potential for this system to become outdated or outshined by other methods such as assistive technologies? Why or why not?**
  - i. This system's sole purpose is to help people. It is not a business trying to make any profits or outshine anyone else.*
- 8. How has the number of users of NFB changed over the years?**
  - a. Is this system increasing or decreasing in usage and why?**

- i. Amount of users have increased steadily from 100,000 to 115,000 users.*
- 9. Is there any age group trend among your users?**
  - a. Depending on if data is present**
    - i. Not an exact figure, but 80% of users are over 65 years of age*

**Nota**

**Date:** April 21st, 2017.

**Location:** Teglværksgade 37, 2100 København Ø

**Interviewer:** Nelson Ndahiro, Kazim Hyder.

**Interviewee:** Peter Seyfarth, Stine Duus Svendsen

**Note-taker(s):** Kazim Hyder, Nelson Ndahiro

- 1. Can you give us a brief overview of what is Nota's role in current information/news distribution to the visually impaired individual?**
  - a. What current information distribution system is currently present?**
    - i. They record and send CD newspapers to PostNord. Nota also provides many publications from national newspapers and magazines on their website. They also print Braille books for the visually impaired in Scandinavia and Switzerland.*
- 2. What are the advantages of using Nota over other services that provide the visually impaired with access to current information? (TV, radio, family members)**
  - i. News is delivered faster to users.*
- 3. What advantages has the shift towards a digitized model created for the visually impaired to obtain current information?**
  - a. What kind of problems the visually impaired have to encounter since digitization?**
    - i. For Nota, though the government pays for the purchase of CDs, it is cheaper to produce online material and they can use resources somewhere else.*
- 4. What are the attitudes of the users toward this service?**
  - a. Is there any age group trend among your users?**
    - i. Most users of the CD system are elderly because CD players and DAISY readers with CD ports are easier to use for them. They do not enjoy tardiness of the CDs.*
- 5. What are the barriers and the limiting factors of Nota?**
  - i. Small changes in an information system will be a huge change for them so they tend not to shift to new method.*
- 6. We are researching different current info methods, specifically AT, is there potential for a distribution system compatible with DAISY readers?**
  - a. Wi-Fi push-notifications?**
    - i. Nota already have a push-notification system known as DODP. They believe that AT devices with push notification has a lot of potential but not many present AT devices are compatible with DODP.*

- ii. *Local municipalities have already given their members DAISY players, some of which do not support the DODP system, so they are not in a favor of paying extra for the new DAISY players with the DODP.*

**7. What is NISO (accessible format for the visually impaired) and why is it more convenient for Nota if many devices worldwide use DAISY?**

- i. *NISO stands for the National Information Standards Organization*
- ii. *It is an accessible format for AT devices that is easier for Nota to record than DAISY.*
- iii. *They have no knowledge of this format causing reading problems for the visually impaired.*

**8. Is there a specific allocated budget by the government?**

**a. Is it enough in your opinion?**

- i. *Nota is under state budget, so there is a certain amount of money is allocated. Production is somewhat limited by budget, like any other organization.*

## Appendix E. Specific Responses to Device Evaluation Interview Questions

### Further Description of Results Section 3.2

For each participant we include the pre and post interviewers, the group member who conducted the device tutorial, and the note taker. The group member in each of the positions varied based on availability. For example, one device evaluation was done in a large group with multiple participants. This required division of the group members and each person to have multiple jobs. We do not include the location of the interviews in order to protect the privacy of the participants and their residential addresses.

We also include the questions and answers involved during our interview as well as the results of the tests in table format. The numbered bullets indicate the step of the procedure, the bolded lettered bullets indicate the questions asked, and the lower case roman numerals indicate the responses of the participants. The evaluation rubrics follow the responses to all questions. The abbreviations within the boxes are complete (C), partially complete (PC), and incomplete (IC) and they describe the level to which the individual completed each task. Further description of these abbreviations are within the methodology Section 2.2.1.2. The use of the word “Null” indicates that there was a problem with the device or the topic was not discussed.

#### Participant One

**Date:** April 6th, 2017.

**Interviewer(s):** Kaye Dandrea

**Product Tutorials and Trials:** Kaye Dandrea

**Note-taker(s):** Silvio Torres

1. Pre-Interview: Semi-Structured Interviews with Danish Association of the Blind Members
  - a. What does the term current information mean to you?
    - i. The latest updates on what is going on within the community and around the world
  - b. What type of current information do you seek?
    - i. National politics
  - c. How important is it for you to have access to current information?
    - i. “Very important to know what is going on so you are not excluded”
  - d. What is your current method of acquiring current information?
    - i. Television or phone
  - e. Have you ever used the CD mailing system?

- i. Local newspaper on a CD, only local news
    - ii. "I don't connect the same way with an audio CD as I do with a print document"
  - f. Were you affected by the digitization of information and the decline of the postal service? Why or why not?
    - i. It is difficult to use the computer and navigate with zoom text
    - ii. Mobile friendly version would be beneficial for her
  - g. Why did you choose the method that you use?
    - i. "Easier way than finding a DAISY player and putting something in"
    - ii. Faster
  - h. What are the direct costs you pay for getting information and any associated costs?
    - i. No comment
  - j. Do you have any issues with the method that you use? If so, what are they?
    - i. When the audio playback is in other languages it is hard for her to understand
    - ii. Navigation is a good idea but the view can be more narrow because the individual may not be aware of all of the options available
  - k. What are the other methods of acquiring current information that you know of?
    - i. Yes and has one, seldom uses it because she has some sight and enjoys reading
    - ii. Old Victor Reader and Victor Reader Stream II
  - l. How confident are you in your use of technology?
    - i. Not confident in technology
  - m. How comfortable are you when learning a new technology?
    - i. "It is annoying to learn"
    - ii. "I am a woman and therefore do not know much about technology"
    - iii. Sometimes the logic is hard and she is uninterested
2. Post-Interview
- a. How do these devices differ from your usual method of accessing current info? (if they do not use AT)
    - i. She normally uses TV and the assistive devices are more involved
  - b. If you could add any feature to a device what would it be?
    - i. No comment
  - c. What did you like about the devices
    - i. They are not as hard to figure out as she thought prior to interacting with them
    - ii. Blaze ET: "Looks like a TV remote, then you think you can do it because

- it's familiar to you"
- iii. She benefited from the devices that felt familiar to her
  - d. What are some things you disliked about any of the devices?
    - i. Many buttons, however "they are necessary"
    - ii. "It's okay. Not much wrong"
    - iii. "The milestone was hard because it has the fewest buttons"
  - e. Would you use an AT device on a daily basis?
    - i. Not on a daily basis but pretty frequent
  - f. Would you rather use a radio service which broadcasts at a specific time every day?
    - i. Prefer radio to AT
  - g. Would you rather have a calling service which would use a landline or portable phone to call a number and browse through information by voice?
    - i. Prefer calling service to AT

### Evaluation Rubrics

Assessing "User-Friendliness" of Devices				
Tasks	Milestone 312	Victor Reader	Blaze ET	Notes
Turn Device ON	C-Unfamiliar	C-Unfamiliar	C-Unfamiliar	
Make Recording	C-Unfamiliar	C-Unfamiliar	C-Unfamiliar	
Retrieve Recording	C-Unfamiliar	PC-Unfamiliar	IC-Unfamiliar	
Adjust Volume	C-Unfamiliar	C-Unfamiliar	C-Unfamiliar	
DAISY Book	PC-Unfamiliar	C-Unfamiliar	C-Unfamiliar	
OCR	N/A	N/A	C-Unfamiliar	

Importance of Features to Participant	
Feature	Score
Navigation within book/article: “fast forward, rewind, time jump, chapter”	4
OCR	1
Recording	2
Standalone Menu Button	3
Radio	2
DAISY Book	4
Sleep Timer	Null
Fewer Buttons	1
Many Buttons	3
Buttons with only one function	3

## Participant Two

**Date:** April 7th, 2017.

**Interviewer(s):** Kaye Dandrea

**Product Tutorials and Trials:** Kaye Dandrea

**Note-taker(s):** Silvio Torres

1. Pre-Interview: Semi-Structured Interviews with Danish Association of the Blind Members
  - a. What does the term current information mean to you?
    - i. Accesses news several times a day every day
    - ii. Being able to access this information is necessary
  - b. What type of current information do you seek?
    - i. Politics, local and national news
    - ii. Political party news
    - iii. Handicapped party news
    - iv. Theatre programs and scripts: A program (she created) exists that allows for the script to be handed out to visually impaired individuals before the show in order for them to review it before attending
    - v. Personally she cannot take books off the internet, but she has a friend who helps her to do so
  - c. How important is it for you to have access to current information?
    - i. It is very important for her to have access
    - ii. "The same as eating, talking with my friends, contact with society"
    - iii. "You have to be active and know what is going on"
  - d. What is your current method of acquiring current information?
    - i. Computer
    - ii. Newspaper
    - iii. Local news once a week from three areas in Copenhagen
    - iv. iPod-podcast, telephone calls, jump more intervals than 15 seconds
  - e. Have you ever used the CD mailing system?
    - i. Yes, through subscription
    - ii. However the CDs are very behind because of the postal system
  - f. Were you affected by the digitization of information and the decline of the postal service? Why or why not?
    - i. Decline of postal service-yes because it is much slower than it used to be and updates are received later
  - g. Why did you choose the method that you use?
    - i. What features (cost, mobility, how fast they receive updates, etc.) are important for an information source?



- ii. -More modern-Victor reader, easier to have a lot of books
    - iii. The computer and telephone are faster than waiting for a CD to be mailed over
  - h. What are the direct costs you pay for getting information and any associated costs?
    - i. She does not pay for her subscriptions
    - ii. Paid for the Straus in part and all of the Victor Stream
  - i. Do you have any issues with the method that you use? If so, what are they?
    - i. No
  - j. What are the other methods of acquiring current information that you know of?
    - i. Do you know AT? See if they know about any AT devices.
    - ii. She is aware of assistive technologies and has two DAISY Players in her home
    - iii. She enjoys them because of the many buttons and ability to store information
    - iv. If they are already using AT devices, this will just help gather info on why they chose AT.
  - k. How confident are you in your use of technology?
    - i. Overwhelming sometimes but her attitude to the computer is “amazed” and open to learning new skills
      - 1. Wants more human like voices in the devices
  - l. How comfortable are you when learning a new technology?
    - i. Not scared of new technology or doing anything wrong, just initially intimidated
    - ii. What challenges do you think you might face while using new technology?
    - iii. Time, and sometimes need help, lots of practice and write it down what to do to do something (with recorder)
2. Post-Interview
- a. How do these devices differ from your usual method of accessing current info? (if they do not use AT)
    - i. Victor Reader big one-Municipality
    - ii. Victor reader stream-bought herself
    - iii. Better than a cassette
    - iv. Can specifically talk about the individual devices, or compare all the AT devices to their usual method.
  - b. If you could add any feature to a device what would it be?
    - No response

- c. What did you like about the devices
  - i. likes that the Milestone is modern and small
- d. What are some things you disliked about any of the devices?
  - i. Does not like the large size
  - ii. Not really
- e. Would you use an AT device on a daily basis?
  - i. AT on daily basis
- f. Would you rather use a radio service which broadcasts at a specific time every day?
  - i. Not really
- g. Would you rather have a calling service which would use a landline or portable phone to call a number and browse through information by voice?
  - i. Would not want instant updates on an assistive device, likes commercials
  - ii. It was hard for her to comment because she was unable to imagine the service
  - iii. "It is hard to decide because we do not have it right now"

**Evaluation Rubric**

Assessing "User-Friendliness" of Devices				
Tasks	Milestone 312	Victor Reader	Blaze ET	Notes
Turn Device ON	C-Unfamiliar	C-Familiar	Null	
Make Recording	IC-Unfamiliar	C-Familiar	Null	
Retrieve Recording	PC-Unfamiliar	C-Familiar	Null	
Adjust Volume	IC-Unfamiliar- Very hard, such a mess	C-Familiar	Null	
DAISY Book	PC-Unfamiliar	C-Familiar	Null	
OCR	N/A	N/A	Null	

<b>Importance of Features to Participant</b>	
<b>Feature</b>	<b>Score</b>
Navigation within book/article: “fast forward, rewind, time jump, chapter”	4
OCR	Null
Recording	3
Standalone Menu Button	3
Radio	1
Daisy Book	4
Sleep Timer	4
Fewer Buttons	4
Many Buttons	1
Buttons with only one function	3

### Participant Three

**Date:** April 12th, 2017.

**Interviewer(s):** Kaye Dandrea (pre-interview), Silvio Torres (post-interview)

**Product Tutorials and Trials:** Silvio Torres (Milestone 312), Kazim Hyder (Victor Reader Stream II), Kaye Dandrea (Blaze ET)

**Note-taker(s):** Silvio Torres (pre-interview), All (device task completion), Silvio Torres (post-interview)

#### 1. Pre-Interview: Semi-Structured Interviews with Danish Association of the Blind Members

- a. What does the term current information mean to you?
  - i. Internet, and television
- b. What type of current information do you seek?
  - i. Political news, sales, shopping, weather, house rents etc.
  - ii. Whatever is on radio, and Television. -general news , politics, sales-
- c. How important is it for you to have access to current information?
  - i. Yes, information is important, more than once a day
- d. What is your current method of acquiring current information?
  - i. Radio and television, Danish radio, English podcasts
- e. Have you ever used the CD mailing system?
  - i. Yes, I received mail from the newspaper
- f. Were you affected by the digitization of information and the decline of the postal service? Why or why not?
  - i. No answer
- g. Why did you choose the method that you use?
  - i. What features (cost, mobility, how fast they receive updates, etc.) are important for an information source?
  - ii. iPhone, computer
  - iii. She has an iPhone and a victor reader stream
  - iv. iPhone for daily tasks , victor reader for books and study
- h. What are the direct costs you pay for getting information and any associated costs?
  - i. From municipality, while working for work, when Nota switched you could get it to read CD's. PlexTalk but bought victor reader stream.
  - ii. Received a device from the municipality. Got the device for reading
- i. Do you have any issues with the method that you use? If so, what are they?
  - i. Simultaneous translations
- j. What are the other methods of acquiring current information that you know of?

- i. Do you know AT? See if they know about any AT devices.
      - 1. Computer, iPhone, television, radio
  - k. If they are already using AT devices, this will just help gather info on why they chose AT.
  - l. How confident are you in your use of technology?
    - i. They are all not afraid
    - ii. Confident
    - iii. How comfortable are you when learning a new technology? What challenges do you think you might face while using new technology?
      - 1. comfortable
- 2. Post-Interview
  - a. How do these devices differ from your usual method of accessing current info? (if they do not use AT)
    - i. "I use stream and iPhone stream to listen to books, phone for radio and podcasts"
  - b. If you could add any feature to a device what would it be?
    - No comment
  - c. What are some things you disliked about any of the devices?
    - None
  - d. Would you use an AT device on a daily basis?
    - i. She does
  - e. Would you rather use a radio service which broadcasts at a specific time every day?
    - i. "I'd rather not, I like what I'm using now"
  - f. Would you rather have a calling service which would use a landline or portable phone to call a number and browse through information by voice?
    - i. "I don't think so"

## Evaluation Rubrics

Assessing "User-Friendliness" of Devices				
Tasks	Milestone 312	Victor Reader	Blaze ET	Notes
Turn Device ON	C-Unfamiliar	C-Familiar	C-Unfamiliar	
Make Recording	C-Unfamiliar	C-Familiar	C-Unfamiliar	
Retrieve Recording	C-Unfamiliar	C-Familiar	IC-Unfamiliar	
Adjust Volume	C-Unfamiliar	C-Familiar	C-Unfamiliar	
DAISY Book	C-Unfamiliar	C-Familiar	C-Unfamiliar	
OCR	N/A	N/A	C-Unfamiliar	

Importance of Features to Participant	
Feature1	Score
Navigation within book/article: "fast forward, rewind, time jump, chapter"	3
OCR	1
Recording	3
Standalone Menu Button	3
Radio	1
Daisy Book	4
Sleep Timer	4
Fewer Buttons	1
Many Buttons	4
Buttons with only one function	3

## Participant Four

**Date:** April 12th, 2017.

**Interviewer(s):** Kaye Dandrea (pre-interview), Kazim Hyder (post-interview)

**Product Tutorials and Trials:** Kaye Dandrea (Milestone 312), Kazim Hyder (Victor Reader Stream II), Kaye Dandrea (Blaze ET)

**Note-taker(s):** Kazim Hyder (pre-interview), All (device task completion), Kazim Hyder (post-interview)

1. Pre-Interview: Semi-Structured Interviews with Danish Association of the Blind Members
  - a. What does the term current information mean to you?  
Any important news nationally
  - b. What type of current information do you seek?  
National News and politics, recent market/business deals
    - i. Political news, sales, shopping, weather, house rents etc.
  - c. How important is it for you to have access to current information?  
Quite important, multiple times per day
  - d. What is your current method of acquiring current information?  
From internet, CD, telephone
  - e. Have you ever used the CD mailing system?  
Has used before and to a lesser extent now.
  - f. Were you affected by the digitization of information and the decline of the postal service? Why or why not?  
Now use Radio and still somehow use CD when available, Computer and iPhone (use Podcasts) allows satisfactory navigation.
  - g. Why did you choose the method that you use?
    - i. What features (cost, mobility, how fast they receive updates, etc.) are important for an information source?  
Computer and iPhone, Victor Reader stream, Use them because most people use them so decided to get them.
  - h. What are the direct costs you pay for getting information and any associated costs?  
Bought it himself because government takes long to deliver AT.
  - i. Do you have any issues with the method that you use? If so, what are they?  
Victor Reader stream was hard to learn but he managed
  - j. What are the other methods of acquiring current information that you know of?
    - i. Do you know AT? See if they know about any AT devices.  
Bought it himself, Got Victor Reader from Instrulog, previously used a PlexTalk Any issues you face with methods you use

- ii. If they are already using AT devices, this will just help gather info on why they chose AT.
- k. How confident are you in your use of technology?
- l. How comfortable are you when learning a new technology?
  - i. What challenges do you think you might face while using new technology?  
Computer is hard to use when websites are not DAISY formatted  
It is difficult but he learned his AT device, not afraid of new technology

## 2. Post-Interview

- a. How do these devices differ from your usual method of accessing current info? (if they do not use AT)
  - i. Can specifically talk about the individual devices, or compare all the AT devices to their usual method.
  - ii. Usually uses AT
- b. If you could add any feature to a device what would it be?
  - i. Lots of menus, television, easy to carry around, store, OCR
- c. What are some things you disliked about any of the devices?
  - i. Just getting accustomed to it
- d. Would you use an AT device on a daily basis?
  - i. Victor reader every day
- e. Would you rather use a radio service which broadcasts at a specific time every day?
  - i. Radio is a good service to have
- f. Would you rather have a calling service which would use a landline or portable phone to call a number and browse through information by voice?
  - i. It would be good for elderly people who have difficulties using the computer and smartphone



## Evaluation Rubrics

Assessing “User-Friendliness” of Devices				
Tasks	Milestone 312	Victor Reader	Blaze ET	Notes
Turn Device ON	C-Unfamiliar	C-Familiar	C-Unfamiliar	
Make Recording	IC-Unfamiliar	C-Familiar	PC-Unfamiliar	
Retrieve Recording	C-Unfamiliar	C-Familiar	IC-Unfamiliar	
Adjust Volume	PC-Unfamiliar	C-Familiar	C-Unfamiliar	
DAISY Book	PC-Unfamiliar	C-Familiar	C-Unfamiliar	
OCR	N/A	N/A	C-Unfamiliar	

Importance of Features to Participant	
Feature	Score
Navigation within book/article: “fast forward, rewind, time jump, chapter”	4
OCR	3
Recording	3
Standalone Menu Button	3
Radio	4
Daisy Book	3
Sleep Timer	3
Fewer Buttons	0
Many Buttons	4
Buttons with only one function	2

## Participant Five

**Date:** April 12th, 2017.

**Interviewer(s):** Kaye Dandrea (pre-interview), Kaye Dandrea (post-interview)

**Product Tutorials and Trials:** Silvio Torres (Milestone 312), Kazim Hyder (Victor Reader Stream II), Kaye Dandrea (Blaze ET)

**Note-taker(s):** Nelson Ndahiro (pre-interview), All (device task completion), Kaye Dandrea (post-interview)

1. Pre-Interview: Semi-Structured Interviews with Danish Association of the Blind Members
  - a. What does the term current information mean to you?  
“recorded newspaper”
  - b. What type of current information do you seek?
    - i. Politics, national news, local news, movies on TV
  - c. How important is it for you to have access to current information?
    - i. Seeks current information every day. It is important for him because visually impaired people should be up to date
  - d. What is your current method of acquiring current information?  
Radio, Victor Reader Stream
  - e. Have you ever used the CD mailing system?
    - i. Not subscribed to anything, but download things off the Internet and listen to it. Although he is subscribed to some Danish IT news about computers, Danish supermarkets.
  - f. Were you affected by the digitization of information and the decline of the postal service? Why or why not?
  - g. Why did you choose the method that you use?
    - i. What features (cost, mobility, how fast they receive updates, etc.) are important for an information source?  
Downloads podcasts to Victor Reader Stream. He can also navigate well
  - h. What are the direct costs you pay for getting information and any associated costs?  
Purchased it himself from Instrulog A/S, not the municipality.  
Why he bought it himself: Had problems with municipality as it was taking over 6 months to be delivered.
  - i. Do you have any issues with the method that you use? If so, what are they?  
If he can read via computer, he follows it, but sometimes when websites are not accessible, he just does not bother. Also listens to podcasts.
  - j. What are the other methods of acquiring current information that you know of?

- i. Do you know AT? See if they know about any AT devices.  
He uses Victor Reader Stream because if he uses music, podcasts and etc. on iPhone, it would be too much on one device. So that is why he plans to use another device, that is, Victor Reader Stream.
- k. If they are already using AT devices, this will just help gather info on why they chose AT.
- l. How confident are you in your use of technology?  
-Glad to see news from Denmark radio TV because they read the text that is on the screen when they interview people from other countries in other languages.
- m. How comfortable are you when learning a new technology?  
-He is a technical person so is open to learn new devices.
  - i. What challenges do you think you might face while using new technology?

## 2. Post-Interview

- a. How do these devices differ from your usual method of accessing current info? (If they do not use AT. Can specifically talk about the individual devices, or compare all the AT devices to their usual method.)
  - i. He has used the Milestone 312, but currently uses Victor Reader Stream II. He mentioned that using Milestone 312 was hard for him to use due to its complex menu structure, which makes the navigation difficult. He, however, liked the OCR scanning feature in Blaze ET.
- b. If you could add any feature to a device what would it be?
  - i. He wanted the OCR feature to be in Victor Reader Stream II since it did not have a camera.
- c. What are some things you disliked about any of the devices?
  - i. Milestone: Did not like the menu structure of the device.
  - ii. Blaze ET: Nothing to say about this device.
  - iii. Victor Reader Stream II: He wanted a camera to be included in this device for the OCR feature.
- d. Would you use an AT device on a daily basis?
  - i. He uses the Victor Stream II on a daily basis since he has been using it for years.
- e. Would you rather use a radio service which broadcasts at a specific time every day?
  - i. He listens to Denmark Radio through his Victor Reader Stream II which has radio integrated in it. He also uses his iPhone and Digital Audio Broadcasting (DAB) device in his living room for listening to radio broadcasts.

- f. Would you rather have a calling service which would use a landline or portable phone to call a number and browse through information by voice?
  - i. He mentioned that many people prefer smartphones for accessing current information than relying on a calling service. He added that calling a number can be difficult for a visually impaired, and news might not be updated fast in a calling system.

**Evaluation Rubrics**

<b>Assessing “User-Friendliness” of Devices</b>				
<b>Tasks</b>	<b>Milestone 312</b>	<b>Victor Reader</b>	<b>Blaze ET</b>	<b>Notes</b>
Turn Device ON	C-Unfamiliar	C-Familiar	C-Unfamiliar	
Make Recording	C-Unfamiliar	C-Familiar	C-Unfamiliar	
Retrieve Recording	PC-Unfamiliar	C-Familiar	IC-Unfamiliar	
Adjust Volume	PC-Unfamiliar	C-Familiar	C-Unfamiliar	
DAISY Book	C-Unfamiliar	C-Familiar	C-Unfamiliar	
OCR	N/A	N/A	C-Unfamiliar	

Importance of Features to Participant	
Feature	Score
Navigation within book/article: “fast forward, rewind, time jump, chapter”	3
OCR	4
Recording	4
Standalone Menu Button	3
Radio	3
Daisy Book	4
Sleep Timer	3
Fewer Buttons	0
Many Buttons	4
Buttons with only one function	3

## Participant Six

**Date:** April 12th, 2017.

**Interviewer(s):** Kazim Hyder

**Product Tutorials and Trials:** Silvio Torres

**Note-taker(s):** Silvio Torres

1. Pre-Interview: Semi-Structured Interviews with Danish Association of the Blind Members
  - a. What does the term current information mean to you?
    - i. news, mainstream, local, national, international, background info - magazines, in depth programs (TV & newspapers), public info (municipality) to know what is going on in the community
  - b. What type of current information do you seek?
    - i. Let them be aware of the types of current information: political news, sales, shopping, weather, house rents etc.
      1. All of them, what's going on in your community, municipality, administration from trash pickup to transportation changes
  - c. How important is it for you to have access to current information?
    - i. Very important
  - d. What is your current method of acquiring current information?
    - i. Television (Apple TV), Danish and international programs (Apple TV connects to them and then can navigate that way), Danish Broadcasting has an app to watch shows after they're shown, BBC mostly, Danish radio, NPR for American news, iPhone, SONOS (a media streamer that's connected to devices). Internet browsing, uses JAWS on laptop
    - ii. Victor Stream - Book share (accessible DAISY E-books, American system 250,000 international titles available compared to 30,000 Danish books available)
  - e. Have you ever used the CD mailing system?
    - i. Yes, some, for local news. Published once a week with background, local and international stuff.
  - f. Were you affected by the digitization of information and the decline of the postal service? Why or why not?
    - i. Yes, getting books and newspapers wasn't good so changed to digital and broadcasting. Stopped in 2014. Only uses online broadcasting. Hasn't been heavily affected but it's discouraging for him to even try to use the mailing system since it's so bad
  - g. Why did you choose the method that you use?

- i. What features (cost, mobility, how fast they receive updates, etc.) are important for an information source?
  - 1. Technology lover, info on CD was okay but as times changed, pressing one button with tech compared to slow mailing system seems unreasonable
  - 2. Ease of use, minimum training in using the system, online source with a dedicated media device is good, not everyone uses iPhone or Android so app based medium may not be an ideal idea
- h. What are the direct costs you pay for getting information and any associated costs?
  - i. Subscription to newspapers, cable connection for TV, newspapers pay monthly subscription, (local is in audio and free), Magazine paid service but now reads it through an app, NYT isn't visually impaired friendly (can't skip or rewind anything).
- i. Do you have any issues with the method that you use? If so, what are they?
  - i. Navigation issues while accessing newspaper that he downloads.
  - ii. Apple TV apps not entirely accessible
  - iii. Can watch live and archived shows, you can see name of show but not where to find it
  - iv. Degradation of how accessible Apple apps are but android in slowly but surely getting better (matching Apple)
- j. What are the other methods of acquiring current information that you know of?
  - i. Do you know AT? See if they know about any AT devices.
    - 1. Dutch radio service
    - 2. PlexTalk
    - 3. DAISY players by Bones
    - 4. DAISY players by HIMS
- k. If they are already using AT devices, this will just help gather info on why they chose AT.
  - i. Got it in 2008, it was the one with the most features available
  - ii. Then later got the Wi-Fi feature that was added
  - iii. Players by HIMS were expensive
    - 1. Paid for by himself from Instrulog
- l. How confident are you in your use of technology?
  - i. How comfortable are you when learning a new technology?
    - 1. What challenges do you think you might face while using new technology?
      - a. Very confident, if you need help get help or play around

and figure it out

- b. 30 years using technology so comfortable
- c. Challenge - yes, stuff needs ease of use regardless.  
PlexTalk example with writing in own code was tedious and not nice
- d. Technology should make things easy, not complicated, so should be easy to learn and use.
- e. Trying new tech that's completely new is always difficult to get accustomed to it all regardless

## 2. Post-Interview

- g. How do these devices differ from your usual method of accessing current info? (if they don't use AT)
  - i. Can specifically talk about the individual devices, or compare all the AT devices to their usual method.
    - 1. Milestone is very simple, but no online capabilities. Victor Stream has Wi-Fi which is much preferred.
    - 2. OCR is nice to have, but iPhone, and Tablet can both take pictures and read aloud
- h. If you could add any feature to a device what would it be?
  - i. Access YouTube
  - ii. To connect to braille device that could display written text
- i. What are some things you disliked about any of the devices?
  - i. Milestone - looks the same that it did 10 years ago. Its layout is too complicated and difficult for someone to press several functions and the actual timing of holding buttons
  - ii. Victor Stream - FM radio would be nice, can't read PDF files, have to follow file structure
  - iii. Blaze ET - lots of buttons on the sides was weird, too easy to press them by accident
- j. Would you use an AT device on a daily basis?
  - i. Yes, victor, braille note taker, computer, Sonos (several devices) Sonos connect, Apple TV
- k. Would you rather use a radio service which broadcasts at a specific time every day?
  - i. Podcasts is preferred over radio service
- l. Would you rather have a calling service which would use a landline or portable phone to call a number and browse through information by voice?



- i. I rather not use the calling service since I don't want to use a phone to have to call in and get the information
- ii. I don't think Nota is promoting the service much at all, the distribution means are tough as you have to use the computer, or you use the CD mailing system which is not that good. People also want a wider variety of what is available (newspapers) they are more conservative and what not but what if you want to read more liberal newspapers or vice versa. They don't provide many options.

**Evaluation Rubrics**

<b>Assessing "User-Friendliness" of Devices</b>				
<b>Tasks</b>	<b>Milestone 312</b>	<b>Victor Reader</b>	<b>Blaze ET</b>	<b>Notes</b>
Turn Device ON	C-Familiar	C-Familiar	C-Unfamiliar	
Make Recording	C-Familiar	C-Familiar	C-Unfamiliar	
Retrieve Recording	C-Familiar	C-Familiar	C-Unfamiliar	
Adjust Volume	C-Familiar	C-Familiar	C-Unfamiliar	
DAISY Book	C-Familiar	C-Familiar	C-Unfamiliar	
OCR	N/A	N/A	C-Unfamiliar	

Importance of Features to Participant	
Feature	Score
Navigation	4
OCR	2
Recording	4
Standalone Menu Button	4
Radio (Internet radio is 4, FM is 1)	
Daisy Book	4
Sleep Timer	2
Fewer Buttons	1
Many Buttons	3
Buttons with only one function	1

## Appendix F. Detailed Task Pathways

The following list can be used for replication of the evaluation and use by the interviewer in order to confirm completion of a task. Some of these tasks can be completed through multiple pathways. If the participant accomplishes the end goal, it is considered complete.

- I. Milestone 312
  - a. Turn Device On
    1. Use “select” button to wake up the device button on top side
  - b. Making a Recording
    1. Press and hold “record” button: top button on the front face
    2. Speak
  - c. Retrieving a Recording
    1. Use “select” button to select “audio”: button on top side
    2. Use “ok” button to select “audio”: middle circle button on front face
    3. Use “arrow” buttons to find recording: left and right arrow shaped buttons on front face
  - d. Adjust Volume
    1. Hold “mode” button: bottom X button on front face
    2. While holding “mode”, use the left (down volume) and right (up volume) arrows to adjust the volume: left and right arrow shaped buttons on front face
  - e. Daisy Book
    1. Use “select” button to select “audio”: button on top side
    2. Use “arrow” buttons to select the book: left and right arrow shaped buttons on front face

**OR**

  1. Use “select” button to select “books”: button on top side
    2. Use “arrow” buttons to select the book: left and right arrow shaped buttons on front face

- II. Victor Reader Stream II
  - a. Turn Device On
    1. Press and hold “power” button until there is an audible beep: top button on left side of device
  - b. Making a Recording
    1. Press and hold “record” button: button on right side
    2. Speak
  - c. Retrieving a Recording

1. Use “1” button for menu and press until “notes”: second button from top on left side of the face
  2. Use buttons “4” and “6” to navigate through notes: third buttons from the top on the left and right side of the face
  3. Use “play” to hear the recording: middle button on bottom of face
- d. Adjust Volume
1. Use the “power” button to sort through volume, reading speed and tone. Select volume and use the “arrow” keys to adjust volume: power button is top button on left side of device. Arrows keys are on the left side of the device
  2. Use “arrow” keys to adjust volume: arrow keys on left side of device
- e. DAISY Book
1. Use “1” button for menu and press until “talking books”: second button from top on left side of the face
  2. Use buttons “4” and “6” to navigate through books: third buttons from the top on the left and right side of the face
  3. Use “play” to start the book: middle button on bottom of face

### III. Blaze ET

- a. Turn Device On
1. Press and hold “Power” button: button is in the center at the very top of the device in dark red with a raised power symbol
- b. Making a Recording
1. Press and hold “record” button: top button on right side, with a raised circle
  2. Speak while holding record
  3. When done, take finger off of “record” and press the “ok” button to save the recording
- c. Retrieving a Recording
1. Use the “record” button once: top button on right side, with a raised circle
  2. Use the “arrow” buttons to select the recording: left and right arrow shaped buttons on the front face
    - a. To delete a recording, retrieve a recording and hold down the “cancel” button which is below the downward triangle, to the left. Bright red. Then press “OK”, which is the circle button in the center of the 4 directional triangles.
- d. Adjust Volume
1. Use the “volume up” button and “volume down” button : buttons on the

left side of the device with a raised triangle pointing up (volume up) and a raised triangle pointing away down (volume down)

e. DAISY Book

1. Use the “home” button: button is at the top as part of 3 buttons under the power button and on top of the cursors. It is the middle button of the three. Directly above the “up” arrow key
2. Use the “down” button until you have reached the “Book Reader” folder: button is the down arrow key of the cursors.
3. Use the “Select/OK” button to go into folder: button is the center button with (ok) written on it in the middle of the cursors.
4. There is only one book in this device so that will automatically start playing

f. OCR

1. Press the “OCR” button: button above the cursors to the right. It has OCR in dark red for people with some residual sight.
2. Device will automatically turn flash on and take picture then read out loud the information