

Access to information

No more exclusion - the Icelandic information accessibility revolution focuses on the needs of senior citizens with visual impairments

Kristinn Halldor Einarsson

Birkir R. Gunnarsson

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Report on two big projects BIOVI took on in order to secure access to information for visually impaired people in Iceland, with special attention to the needs of senior citizens with visual impairments.

Crisis to resolve.

Back in 2008, the main topic of discussion among people with visual impairments in Iceland was a growing concern with the lack of an adaptable high-quality and reliable text-to-speech (TTS) engine. A number of Icelandic speech synthesizers were available, but they were lacking in speech quality and fast becoming obsolete. How could this crisis be resolved?

Iceland, with its population of mere 320,000 inhabitants, a mere fraction of whom use computerized speech on a regular basis, was far from a lucrative market for a TTS engine manufacturer, especially since the Icelandic language itself is complex and challenging.

It soon became clear that the only way to address this issue was to commission a brand new text-to-speech engine built from scratch. How could that be achieved in the midst of a financial meltdown, the worst in Iceland's economic history?

Senior citizens with vision loss.

There is no denying the need for a text-to-speech engine, particularly among senior citizens with age-related vision loss. A featured article on the [Nordic Welfare Center](#) website, clearly demonstrates that older people who are not computer literate are left behind and increasingly isolated in the brave new world of technology heralded by the web, social networks and mobile devices.

Compounding this problem is the fact that the internet is no longer just about fun and games. Official government services are increasingly being moved out of brick and mortar facilities to online media such as websites and mobile applications. This means better and more flexible services for those who can use technology, but no services for those who cannot.

To prevent the escalating exclusion of senior citizens with visual impairments, something had to be done, and a high-quality and adaptable text-to-speech engine is a crucial component of any such technological solution. Older people with a visual impairment and limited computer literacy skills are among the largest subgroups of those who struggle with vision loss.

AMD and quality of life.

[Age-related Macular Degeneration](#) (AMD) is by far the most common cause of vision loss in the developed world. In Iceland, over 70% of people with visual impairments are over the age of 68, most of whom have lost, or are losing, their sight due to AMD. The most common symptoms of AMD include loss of central vision -- as it progresses, so does the individual's inability to read print. Is it possible to provide these people with an easy-to-use technology that enables them to enjoy newspapers, TV, and other things they value, without having to teach them how to use computers?

Solutions

In the Exhibition Hall at the 2008 World Blind Union (WBU) conference in Geneva, there were several assistive technology vendors showing off their products. Among them was the Dutch manufacturer Solutions Radio (SR), showing off their streaming Daisy/audio player called the Webbox. This SR player is an intuitive web-enabled device with a built-in TTS engine capable of reading online text-based media in addition to audio streaming capabilities.

If we could equip such a player with a high-quality TTS engine and connect it to a network of popular content such as newspapers, magazines and TV subtitles, this device

would offer up precisely the kind of information that older users coping with vision loss so desperately need.

However, it would not be possible for these people to take advantage of the device without a high-quality, human-sounding text-to-speech engine. Furthermore, such a TTS engine also has to meet the needs of other users with visual impairments in a world of new software and hardware platforms.

Doing the impossible takes a little bit longer - the making of the new Icelandic TTS engine.

In 2010, in response to a few years' worth of dialogue, Blindrafelagid -- the Iceland Organization of the Visually Impaired (BIOVI) -- decided that it was time to take action despite the challenging economic conditions, and to commission the development of a top-quality TTS engine. The first steps in this process were to find suitable expert collaborators, to select a manufacturer, and to provide the necessary financing. From the get-go, it was clear that this would be the most ambitious and complex project ever undertaken by the organization in its history.

Preserving Icelandic = quality of life.

In the summer of 2010, the project was publicly launched under the slogan 'Preserving Icelandic = quality of life'. The idea behind the slogan was to demonstrate that a quality Icelandic TTS engine was more than just a tool for people with disabilities; it was essential for keeping the language itself -- the symbol of the nation -- alive and relevant. The launch was successful, and a broad stakeholders' group of expert collaborators was soon established, including members of linguistic and electronic engineering societies from local universities.

TTS manufacturers.

The collective expertise and reputation of the group proved instrumental in helping BIOVI to secure the required funding of 500,000 Euros to finance the TTS development. After an initial price and quality comparison survey of the potential TTS manufacturers, keeping in mind the goals and requirements set forth in the project definition document, the Polish TTS vendor [Ivona](#) was chosen to develop the TTS engine.

The Royal National Institute of Blind People (RNIB)'s positive feedback regarding working with Ivona factored into the decision, as did the fact that Ivona was receiving a number of prizes from leading industry publications.

The contract was signed in March 2011, and by the summer of 2012, two Icelandic TTS voices, Karl and Dora, were ready for use. The collaboration with Ivona was superb throughout the process. More detailed information on TTS project are available.

Breaking down accessibility barriers with technology - BIOVI's Webbox service

Once the development of the new Icelandic TTS voices was under way, it wasn't long before Blindrafelagid (BIOVI) took steps to ensure that the new voices would live up to their potential, and to revolutionize accessibility to information for the users who needed it the most.

BIOVI partnered with [Solutions Radio](#) on a project to deliver unprecedented amounts of media content to Icelandic senior citizens suffering from vision loss. The project's kick-off meeting took place in the summer of 2012 at Solution Radio's headquarters in Delf in the Netherlands. There, all the basic deliverables of the services were defined. The service is based around interactive access offered through the SR media players to entertainment

and information that had not been accessible to Icelandic senior citizens with visual impairments.

The Webbox

The SR webbox player is a simple and intuitive web-enabled device compatible with the Digital Access to Information and Systems (Daisy) protocol. It connects either via ethernet or wifi, and -- once configured -- it is ready for immediate use. Each device has its own unique IP address and can be configured to access content based on the user's individual subscription model and/or preferences. Needless to say, it is running the new Icelandic TTS engine.

What kind of content is available via the Solutions Radio network?

The SR player is versatile and can replay all kinds of online content. Some content is easy to provide, such as MP3 files and online streaming, as well as radio and podcasts. Other types of content require configuration, technical infrastructure and collaboration with the content providers. The largest and most challenging webcast projects thus far have been making daily newspapers and other magazines accessible via the device, as well as designing the interface enabling users to borrow audio books. [The Icelandic audio library](#) allows listeners to listen to audio books through streaming, all from the comfort of their SR player.

What content is currently available through BIOVI's webcasting service?

From BIOVI:

- General information on BIOVI services and activities
- News stories and announcements
- "Handpicked Articles", the audio-magazine published by BIOVI every two weeks that contains news and announcements as well as a selection of the most popular and interesting current newspaper and magazine stories
- Kaleidoscope, BIOVI's magazine (published semi-annually)
- Recordings of board meeting documents (with some access restrictions)

From the Iceland National Institute for the Blind and Visually Impaired (INIB):

- News and Announcements
- Information about ocular diseases
- Information regarding the operation of the Center and its services.

From the Icelandic Audiobook Library:

- Over 7000 Icelandic audiobook titles
- 250-300 new titles added every year
- Recommended readings for Icelandic elementary school students
- Textbooks for high school students (grades 11 through 14)
- A large selection of foreign (mostly English or American) books for university students
- Access to a selection of audiobooks from other Nordic national libraries linked through the Nordic inter-library lending exchange.

Users can stream audiobooks directly to their Webbox once they have added them to their personal bookshelf. This can be done in 3 ways:

- Using the "add to my bookshelf" functionality on the Library's website
- By calling the library directly and ask its employees to add books to their personal bookshelf.
- By selecting books from the "most recent books" and "featured books of the month" lists from the webbox itself.

Newspapers, magazines and online media:

- All content of "Morgunbladid" (the Morning Newspaper), one of Iceland's two largest newspapers published daily.
- All content of "Frettatiminn" (the Icelandic Times), an online newspaper that is published daily online as well as in a weekly printed version.
- The Iceland Online Disability Forum magazine, a semi-annual publication.

Radio stations and online podcasts:

- Access to all Icelandic radio stations.
- Access to thousands of online radio stations around the world (users can select the ones that interest them to be installed on their devices).
- Miscellaneous podcasts.

TV subtitles:

The subtitles for the Iceland National Television are read by the TTS engine in real-time in sync with what is being shown on TV. This is particularly important for senior citizens who have difficulty understanding foreign languages. At least 50% of all content on the Icelandic national television channel comes from abroad and is subtitled. Thus, the webcasting service has truly opened up a whole new world of entertainment for these people.

Distribution:

Solutions Radio Webboxes are classified as assistive devices and are distributed free of charge to registered clients of the INIB.

People with a certified visual impairment (legally blind) get the device at no charge. People with less severe impaired vision can choose to lease units for a modest annual fee. As of early 2014, approximately 20% of all BIOVI members have a SR player. BIOVI's efforts to procure affordable internet connections for these devices have also been successful, and various internet service providers offer reduced rates for internet connectivity for these devices. The most surprising development is the large group of younger and computer literate visually impaired population who have signed up for the device.

Future Expectations

BIOVI plans to keep expanding the services offered through the Solutions Radio player network, as well as adding more content. In a not-too-distant future we expect to:

- Increase the number of available podcasts and make them more accessible.
- Expand the newspaper- and magazines selection.
- Offer battery operated/portable SR players.
- Add the capability to have the SR player read incoming emails and give the user the chance to reply by way of a recorded mp3 file attachment.
- Create new services based on Webbox's interactive capabilities and use its unique identification, for instance by enabling people to cast their votes in elections.

This project was envisioned, planned, and managed by Kristinn Halldor Einarsson, chairman of BIOVI.

Ivona - vendor presentation

Established in 2001, IVONA Software develops award-winning text-to-speech technology for use in the voice user interfaces on mobile devices, computers, communication systems and services. IVONA has a long-standing commitment to accessibility and works closely with the largest organizations supporting blind and visually impaired people all

over the world, including the Royal National Institute of Blind People and the DAISY Consortium. IVONA Software is a subsidiary of (AMZN) Amazon.com.
www.ivona.com

SolutionsRadio - vendor presentation

Solutions Radio bv is a privately held Dutch company with a customer base in Europe, Canada and the USA. Our goal is to enable closed-user-groups an easy and affordable way to LISTEN to Internet broadcasting without using a PC. This broadcast could be a radio station, church service, In-Store music, a school lesson or any other form of audio broadcasting.

Together with specialised partners we can fulfil your Internet broadcast needs. From end user devices (such as our [Webradio](#)), to broadcast PC's, to playlist servers, to streaming platforms. Your strengths and capabilities can be combined with ours. With our powerful complementary web-based management tool you can also manage the Webradios remotely..

Our service is clearly project based. From beginning to end you will be kept informed on the progress, planning and financials of the project.

The team behind Solutions Radio has many years of experience in the Audio and Telecom market. Your communication requirements can be realised with Solutions Radio. Now and in the future!
www.solutionsradio.com/



The Icelandic TTS project - Supplementary reading

In early 2010, the BIOVI board decided to take on the ambitious project of having a top quality TTS engine developed for Icelandic. Two voices, female Dora and male Karl, were developed and launched in mid-2012. A quality TTS engine plays a key role in making digital content accessible and enabling access to computers and mobile devices for people with disabilities, particularly people with vision impairments. They are, however, not the only beneficiaries. Recent research clearly shows significant benefits of adding computerized speech use for people with dyslexia.

TTS engines are not only for people with disabilities and people are increasingly realizing the benefits of being able to have news, emails and text messages read to them while driving, at the gym, or doing something else that prevents them from being able to use their eyes for that task.

BIOVI's decision to act swiftly despite a challenging economic environment was driven by the fact that existing Icelandic TTS engines were unable to cope with the change in the technology landscape, such as the move to 64-bit operating systems and emerging mobile platforms. Due to the small population of only 320,000, it was evident that a TTS engine of sufficient quality would never be commercially viable and it had to be funded by other means.

A TTS engine transforms digital text and information into speech. Most modern operating systems are able to run a TTS engine, and recent developments have seen the spread of computerized speech to a variety of devices from cash machines to mobile phones, TVs, and even household appliances.

The quality of a TTS engine is measured by how close to natural-sounding speech it manages to perform. It is vital to be able to offer a TTS engine in any language and prevent people who speak that language and cannot read printed or on-screen text from being left behind by technology.

Between 12 and 20% of the population of a typical western European country suffers from some type of print disability, a group consisting of people with visual impairments, dyslexia, cognitive disabilities and senior citizens. In the rapidly expanding world of digital information, speech input and output plays an increasingly important role for society in general.

It is obvious that languages that cannot adapt to technology and modern communication are at high risk of becoming irrelevant and non-competitive; eventually this might lead to the complete extinction of these languages.

Project planning and organization

The man in charge of the TTS development was Kristinn Halldor Einarsson, BIOVI's chairman. He developed the idea for this project while studying project management at the University of Iceland's adult education curriculum in the winter of 2009-2010. The initial planning and scoping for the project was in fact his graduation assignment.

Once the project statement was written and its requirements and goals had been clearly defined and documented, a project working group was established. The group consisted of stakeholder representatives and was chaired by Huld Magnúsdóttir, CEO of the Iceland National Institute for the Visually Impaired (INIB). Its composition changed slightly as the project moved along, though at the core it was led by a

select few key players. The organizational chart below shows the composition and role of the different stakeholders and subcommittees within the group.

Key definitions

In the beginning, a subgroup of experts was established and tasked with evaluating potential TTS vendors who were interested and had the capacity to meet the requirements and expectation set forth in the project description document. The core requirements were largely based on lessons learnt during previous attempts at creating a quality TTS engine for Icelandic.

The core requirements included:

- **Quality:** The TTS engine needed to be of quality comparable to the best TTS engines for major languages, and the speech had to sound as natural as possible.
- **System compatibility:** The TTS engine had to be compatible with the widest possible selection of operating systems and other software platforms.
- **Licensing and Ownership:** A core requirement was that the finish product had to be fully owned by BIOVI and individual user licenses should be available free-of-charge to its members as well as other users with a certified print disability.
- **Adaptability:** The TTS engine could be improved through collaboration with Icelandic research and linguistic experts thus benefit from linguistic research at the University of Iceland and University of Reykjavik.
- **Flexible and future-proof architecture:** The TTS engine and its manufacturer needed to offer opportunities to be implemented on emerging hardware and software platforms or any ICT that needs to be made accessible.

To ensure these requirements, a flexible and reliable developer had to be chosen.

The Project Experts

The project benefitted greatly from a vast amount of expertise in related fields.

Principle project consultants:

- Eiríkur Rögnvaldsson - Professor of Icelandic at the University of Iceland
- Jon Gudnason PHD - Dr. of Electrical Engineering and speech synthesis at Reykjavik University
- Birkir R. Gunnarsson and Hlynur Hreinsson - Assistive Technology Subject matter experts at INIB (Birkir is also BIOVI's Electronic Information Accessibility Officer, as well as being a longtime screen reader user)

The agony of choice: finding the perfect TTS manufacturer

After an initial round of consultation, research, and quality assessments, 4 TTS manufacturers were selected as potential partners for the project.

These were Acapella, Ivona, Lucuendo and Nuance.

After negotiations and further assessments based on the goals specified in the project description, the decision was made to hire the Polish TTS manufacturer Ivona for the job.

For more information on Ivona and its history, please visit <http://www.ivona.com/us/> Ivona benefitted from successful and longstanding collaboration with the RNIB, whose experience and advice played a key role in the decision making process.

The company has received a number of [industry awards](#) in recent years and decisively beat the competition in a 2011 study conducted by ASR magazine. In this

study, which pitched Ivona's TTS voices against voices from other major industry players such as Microsoft, AT&T and Nuance, the conclusion was clear: Ivona were the leaders in TTS quality and reliability.

Improved quality of life

Less than 18 months after their launch, the new TTS voices Karl and Dora have already improved quality of life significantly for a large group of people with print disabilities. The positive effects have been noticed by organizations such as the Iceland National Institute for the Blind and Visually Impaired and the Iceland Audiobook Library, whose primary role is to serve this group.

Every person with a certified print disability (such as a visual impairment or dyslexia) can get a TTS license free of charge. As of early 2014, over a 1000 such licenses have already been issued. It is encouraging to see that several schools have invested in organizational licenses to be able to offer TTS engines as part of their technology portfolio. A growing number of government organizations such as the Iceland Public Radio, Social Insurance Agency and the Icelandic Government Offices have purchased the Ivona iWebreader to offer users the ability to have website content read out loud by the new TTS voices.

TTS and language preservation

Icelandic is a rare language, fighting for its survival in a rapidly evolving world. If the language is unable to transform itself to meet people's everyday needs, it soon becomes irrelevant and outdated.

Therefore, the development of an Icelandic TTS engine is an important step towards language preservation. TTS engines define how Icelandic is read and interpreted by computers. We believe a high-quality TTS engine is essential for any modern language that wishes to remain relevant. These concerns are supported and further outlined in an official brief published by Iceland's Ministry of Education in 2009, as well as in the policy definition of the Icelandic language protection committee in 2012.

Dora and Karl, voices of the Vikings

The Icelandic Ivona TTS engine comes with two voices, the female Dora and the male Karl (incidentally, 'karl' is the Icelandic word for male).

The software can be used on all supported 32 and 64-bit versions of Windows, on the Android mobile operating system, and has all the technical abilities to run on Apple hardware and operating systems (iOS for iPhone/iPad/iPod/Apple TV and OSX for Apple's desktops and laptops).

Unfortunately, TTS voices from third party vendors cannot be used with Apple's core screen reader, Voiceover. A complex workaround is possible for OSX, but there is no technical or approved solution for making that happen on iOS devices.

Apple has to approve the voice and implement it with its native screen reader application. Unfortunately they have not responded in any way to years of campaigning by BIOVI to make their devices run with Icelandic TTS engines.

Apple has only implemented support for a selection of Nuance Vocalizer voices, and shows little interest towards non-lucrative markets such as Iceland. Therefore,

unfortunately, the Viking couple Dora and Karl cannot be used on any Apple devices, much to BIOVI's frustration.

The following apps and Ivona utilities are currently available for the Icelandic TTS voices:

[iReader](#) (see video demonstration on the homepage)

[iWebREader](#), a server side webpage reader

[Android app voices](#)

[Ivona Text-To-Speech Enterprise solution tools](#)

Hear the difference for yourself

If you want to hear a head-to-head comparison of the first and second generation Icelandic TTS voices and the new Ivona TTS voices, take a listen to this [audio sample](#) (mp3 file)

Key contributors

The project would not have been possible without the unrivaled generosity of many individuals and organizations who provided vital financial support, as well as donating their time, data and work to the project. The response and interest BIOVI received clearly showed broad support for its message regarding the link between language preservation, and the need for a quality TTS engine had been heard. Icelandic itself -- a language that has remained more or less unchanged for over a 1000 years -- is often considered the nation's greatest treasure and the essence of its identity.

The financing of the project went smoothly and ended up taking a lot less time than originally anticipated.

BIOVI received substantial financial contributions from the following organizations (consider an exchange rate of 160 Icelandic krona or ISK to the Euro in 2010/2011)

- Friends of the Blind organization: 5.0 million ISK (approx. 32000 Euros)
- Disability special project fund: 15 million ISK (approx. 95000 Eur)
- Ministry of Health, Welfare and Education: 11,3 million ISK (approx. 70000 Eur)
- Lion ´s Red Feather Fundraiser: 19.3 million ISK (approx. 121000 Eur)
- Iceland Disability Forum: 10 million ISK (approx. 60000 Eur)
- Richard P Thedór and Dóra Th. Sigurjónsdóttir memorial fund: 25 million ISK (160000 Eur)

- Total: 85.6 million ISK (approx. 535000 Eur)

Key supporters and contributors of knowledge, data and expertise:

[The Icelandic National Institute for the Blind and Visually Impaired](#) (INIB)

[The Icelandic National Audiobook Library](#)

[Corpus Islenskur Ordasjodur at the University of Leipzig](#)

[CADIA - the Artificial Intelligence Center at Reykjavik University](#)

[The Icelandic Dyslexia Association](#)

[The Icelandic Center for Language Technology \(ICLT\) at the University of Iceland](#)

[Royal National Institute of Blind People](#)

[Arni Magnusson Institute](#)

The project's unique protector and sponsor is Vigdis Finnbogadóttir, ex-president of Iceland and the first female president in the world.

Project manager was Kristinn Halldór Einarsson, chairman for BIOVI.
Report authors: Birkir R. Gunnarsson and Kristinn Halldór Einarsson.