VSP VISION™

Emerging Technology for Accessibility

A guide for navigating the world of assistive tech

The Global Innovation Center at VSP Vision™ believes accessibility-focused technology has the potential to benefit greater sets of users than ever. This *Emerging Technology for Accessibility Guide* aims to help innovators navigate the needs of users and the shifts driving emerging technology in this arena.

Vision loss and blindness impose an annual economic burden of **$35.5 billion**[5] in the United States due to indirect costs including absenteeism, reduced work force participation, and lost productivity. Vision care plays an integral role in a person's ability to be employed, healthy, and productive, and is a component of overall health. The future of assistive technology is ripe for innovation, with the potential for universal value to all.

This guide is intended to spark conversation, encourage the use of inclusive design principles, and ultimately advance understanding of accessibility, low vision, and the emerging assistive device space.

The VSP® Global Innovation Center certainly can't wait to see how emerging assistive technology will shape our industry.

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Part I:
Introduction to Accessibility

Overview

As a *health-focused* leader in vision care, **VSP Vision™ empowers human potential through sight.** Here we take a closer look at how assistive devices improve the quality of life of members with low vision and address other accessibility challenges.

Terms in this guide:

- **Accessibility** affords those with disabilities the opportunity to independently access the same information, engage in the same interactions, and/or appreciate the same services as those without disabilities in an equal and effective manner

- **Accessible technology** describes products that have been *designed with the needs of many different users* in mind

- **Assistive technology** refers to products that have been specifically designed to help a person with a disability *perform a task*

A Connection to Overall Health

Vision plays an essential role in not only productivity and livelihood but also overall health. Access to and awareness of tools that can both improve quality of life and mitigate undesirable health outcomes is a priority for low vision individuals.

Vision impairment is associated with:

- Cognitive decline and dementia[8]
- Increased fall risk[12]
- Lower levels of physical activity[9]
- A higher prevalence of depression[6]

Tactics to avoid these outcomes:

- Physical activity[15]
- Social activity[2]
- Assistive devices

"Technology is the bridge between the sighted and the unsighted. Access to assistive technology can improve the quality of life of those living with blindness and low vision."

- Sam Seavey, Assistive Technology Expert and @TheBlindLife on YouTube
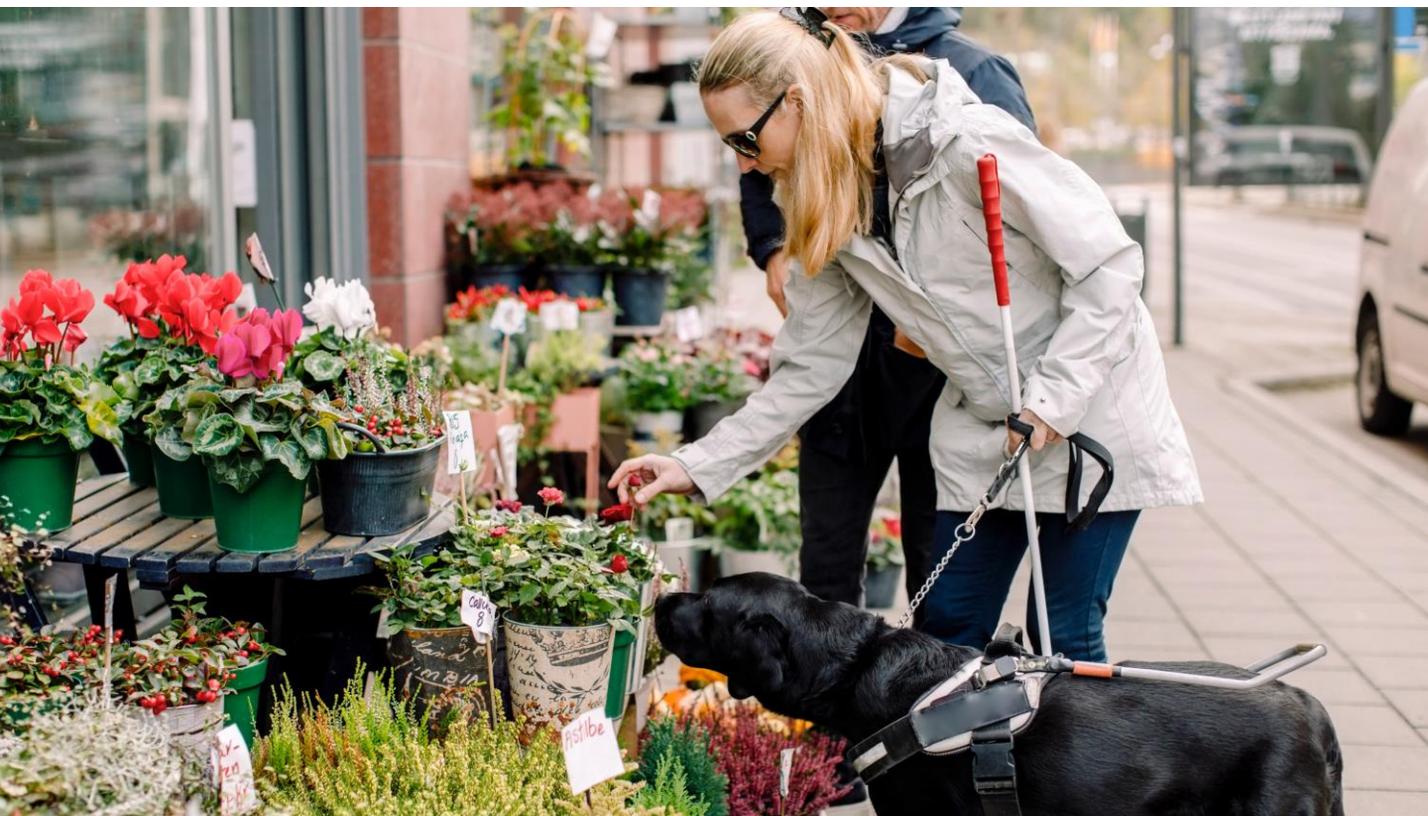
Universal Value of Accessible Design

The Curb Cut Effect is the phenomenon of disability-friendly features being used and appreciated by a larger group than the population they were originally intended for. Designing for those with disabilities has the potential to create universal value.

Smart Eyewear Case in Point:

Assistive technology like text-to-speech and closed captioning are on-ramps to wider market adoption of smart eyewear. While designed for those with vision loss and hearing loss respectively, a larger population will appreciate the convenience tools for improved productivity.

"As we define and invent the future of wearable technology, we believe everyone should have access to and be a part of that future. Universal design, inclusive design, and accessible design all play key roles in human-centered design which drives our innovation at Meta. From digital interfaces to physical form factors, each consideration works to invite more people to this future and naturally dissolve technology into the background, furthering our mission of connecting people."

-Meta Accessibility Team

Low Vision Overview

About Low Vision

More than 7 million Americans live with uncorrectable low vision.[10]

Nearly **3 million** Americans with low vision are in the workforce.[4]

Low Vision Defined:

A person is said to have low vision, or partial blindness, when they have some vision present but are unable to accomplish visual tasks due to vision loss that can't be corrected with glasses, contacts, medication, or surgery.

Low Vision Terminology:

- **Visual Impairment** occurs when a person has 20/70 vision or worse in the better eye with correction

- **Partially Sighted** individuals have a visual acuity between 20/70 and 20/200 with conventional prescription lenses

- **Legal Blindness** is defined by having central vision of 20/200 or worse in the better eye with the best possible glasses or contact lenses or having a visual field of 20 degrees or less in the better eye

Individuals who have *20/70 vision* can see things from 20 feet away that someone with normal vision can see from 70 feet away. Similarly, having *20/200 vision* means being able to see something at 20 feet that someone with normal vision can see at 200 feet.

Low Vision Manifestations

Normal Vision:

**Central Vision Impairment:**

Peripheral Vision Loss:

Uncorrectable Blurred Vision:

Hazy Vision:

Night Blindness:
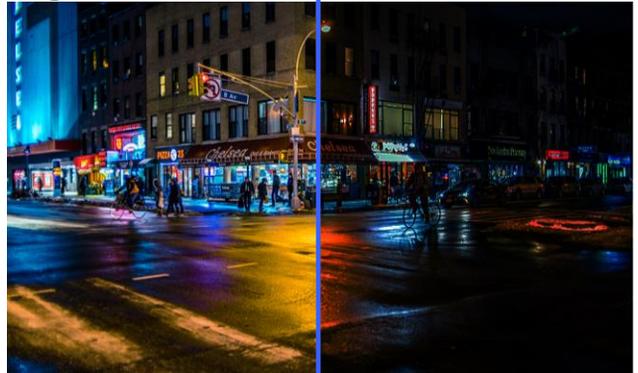
Normal   *Night Blindness*

Try the VSP Vision™ <u>See Like Me</u> App

Common Causes of Low Vision

U.S. Prevalence:

Age-Related Macular Degeneration (AMD) occurs when a part of the retina called the macula is damaged, leading to central vision loss. AMD is the leading cause of vision loss in people over 50.

[11]

20M

Diabetic Retinopathy is an eye condition that can cause vision loss in those living with diabetes. High blood sugar over time can lead to damaged blood vessels in the retina.

[3]

9.6M

Glaucoma is caused by damage to the optic nerve, the connection from the eye to the brain, leading to vision loss. High eye pressure increases risk for glaucoma.

[14]

3M

Stroke affects almost 800,000 individuals annually in the United States, while traumatic brain injury (TBI) affects 1.5 million.[13,16] *Both conditions can lead to uncorrectable low vision.*

Retina

Optic Nerve
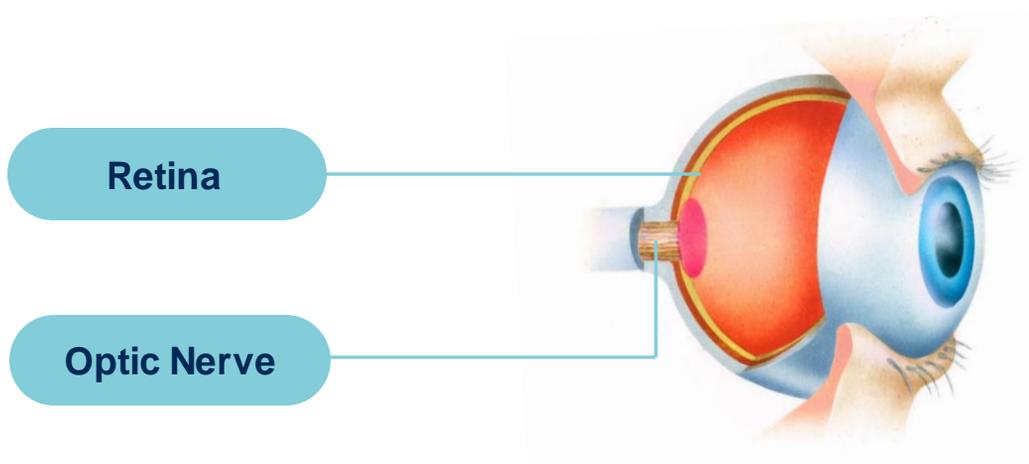
Part III:
Designing Technology for Accessibility
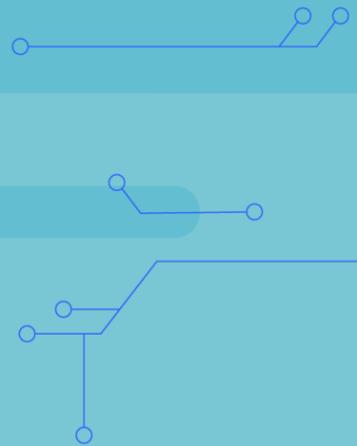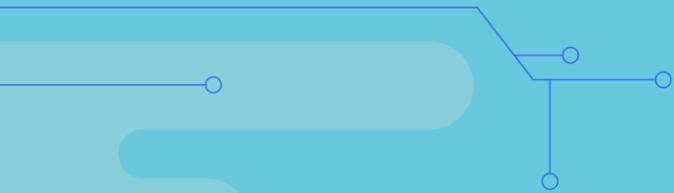
Design Considerations

The Global Innovation Center at VSP Vision™ encourages the development of assistive technology for low vision following an inclusive design methodology. Considering key design features likely increases the adoption of assistive devices for low vision.

Assistive device design considerations for an improved user experience:

A discreet appearance reduces social stigma and physical discomfort while still including needed features and sufficient battery life.

All-in-one functionality assists users in various tasks, multi-tasking, all-day-wear, and on-the-go applications.

Allowing for customization for different pathologies, preferences, and habits could meet a broader market.

"We focus on developing a product that is a 'Swiss Army Knife' solution for users. The eSight headset can aid low vision users with multiple different visual tasks throughout the day in different environments, at a desk and on the move."

- Aaron Tutwiler, eSight CEO

"We have a diverse user base, including deaf blind individuals who appreciate vibrational feedback. Our users can tailor the intensity and type of sensory feedback the application provides based on individual needs and preferences."

- Willem Van de Mierop, AYES Founder

Three Emerging Form Factors

Augmented reality (AR)-enabled smart eyewear takes a multisensory approach to connect users to the world around them

AI-powered devices guide users with object identification and navigation

Consumer device apps transform our smartphones, tablets, and headphones into accessibility tools

AR-Enabled Smart Eyewear
Takes a multisensory approach to connect users to the world around them

AR smart eyewear devices enable users to better understand their environment with supplemental sensory input. AR describes technology that overlays digital information onto the real world in a user interface experience through software on consumer electronics like smart eyewear and mobile devices. Content delivered by AR can span one or more sensory modalities such as visual, auditory, and haptic (vibrational). Assistive technology developers often prioritize smart eyewear with AR to address vision and hearing loss.

"Smart glasses are the ideal form factor to let an AI assistant see what you're seeing and hear what you're hearing"
- Mark Zuckerberg, Meta Connect, 2023[7]

eSight 4

eSight Go, expected 2024

The **eSight AR headset** provides an innovative solution for low vision conditions, enabling those with central vision loss or legal blindness to achieve up to 20/20 enhanced vision. The lightweight, **all-in-one** product moves with the user throughout multiple activities and environments.

One of 11 life-changing assistive technologies, CNN 2020

Products to Watch:

Innovega's smart contact lenses and **AR** glasses increase independence and improve quality of life of those with visual impairments by restoring vision.

Innovega Eyewear System

Biel Glasses and Panasonic smart glasses

Biel Glasses and **Panasonic** focus on a joint product that uses Panasonic's VR glasses and Biel Glasses' low vision technology to improve mobility independence for the visually impaired with **AI** and **AR.**

AI-Powered Devices
Guide users with object identification and navigation

From wearables and handheld devices to mobility aids, products are being equipped with AI-powered computer vision that assists the user in understanding surroundings, turning these devices into guides. Computer vision, a subcategory of AI that interprets meaning from digital camera images or videos, provides real-time feedback for the user like scene description, object detection, facial identification, navigation, and more. AI software algorithms have the potential to help a user understand surroundings in the same way a human assistant could, increasing user independence.

OrCam MyEye

OrCam harnesses the power of **AI computer vision** and **audio AR** to support the low vision population. Its wearable and handheld formats communicate visual information out loud to the user.

A TIME Magazine Best Invention of 2021

Product to Watch:

Glidance is a self-driving mobility aid for those with sight loss that leverages **AR** and **AI computer vision** in its product robotics, sensors, and software.

Amos Miller experienced difficulty using a cane after losing his sight in his 20s, inspiring him to create an improved mobility solution. He founded Glidance with mechanical engineering expert, researcher, and inventor, Mike Sinclair, to improve the quality of life of users through advanced autonomous driving and robotics technology.

- Glidance.io

Consumer Device Apps
Transform our smartphones, tablets, and headphones into accessibility tools

Many of today's smartphones and connected consumer electronics have assistive technologies and capabilities built-in that are otherwise typically found within standalone assistive devices. Examples of emerging technology integrated within app function include AI computer vision and AR. As a result, apps can be designed to unlock, amplify, and repurpose these features for disabled populations, transforming an owned device into a functional accessibility tool, increasing assistive technology access and adoption.

Software integrated within consumer devices is also easy for new users to adopt. Those with a less severe disability who previously opted out of expensive, specialized devices may appreciate assistive features integrated within consumer devices. Additionally, as an aging population acquires disabilities like vision loss and hearing loss, consumer devices will become an obvious first-line assistive device choice.

"For patients who use their smartphones, assistive applications can be very effective."

- Dr. Michael W. Ohlson, O.D., FAAO,
Low Vision Consultant
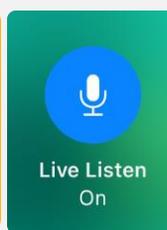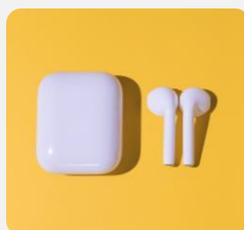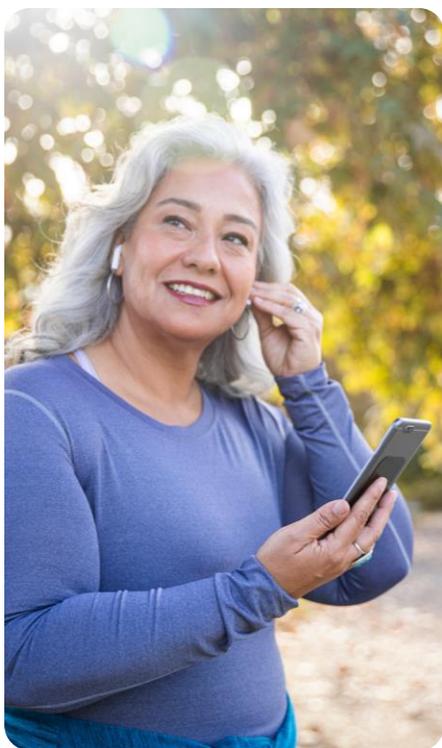
Using **Apple Live Listen** with **AirPods** or **Beats** amplifies important sounds for the user via in-ear microphones.

AYES OKO enables blind and low vision users to cross the road with ease. The user points an **iPhone camera** towards the pedestrian signal, and the **AI** app interface communicates navigational feedback with audio and haptic vibrational **AR**.

Available on iOS

Consumer Device Apps

Accessibility Apps in Action:

Available on iOS and Android

Be my eyes is an **AI-powered** visual assistance app with **computer vision** for real-time image description generation. The tool, Be My AI, provides immediate identification, interpretation, and conversational visual assistance for a range of tasks. The app also connects users with live volunteers.

Apple Design Award Winner for Social Impact 2021
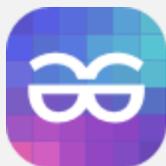
Available on iOS and Android

TapTapSee uses a consumer device camera, image recognition **AI,** and **VoiceOver AR** to identify objects out loud from a picture or video.

AFB American Foundation for the Blind
Expanding possibilities for people with vision loss

American Foundation for the Blind Award Recipient

AV AppleVis Hall of Fame

Inductee to AppleVis iOS Hall of Fame

Available on Android

Lookout by **Google** uses **AI computer vision** to improve the efficiency and ease of daily tasks for those with low vision or blindness. The app uses a smartphone camera to report important scene information to users out loud with **AR**.

Available on iOS

Seeing AI is a free app from **Microsoft** that harnesses the power of **AR** and **AI** to narrate the world around the user, operating as a talking camera for the blind and low vision community. The tool helps users with a variety of daily tasks through text-to-speech, facial, product, and currency identification, and document reading.

How do blind people use phones?
"We've got Siri. We've got Alexa. We've got Hello Google. We've got so many smart home devices. Of course technology providers have thought of us. […] There's all sorts of programs for computers and for phones. TalkBack. VoiceOver. Voice Assistant. ZoomText. JAWS."

-Molly Burke, @MollyBurkeOfficial on YouTube
"Answering the 10 Most Googled Questions about Blindness!"[1]

vsp global innovation

About the VSP® Global Innovation Center

At VSP Vision™, our purpose is to empower human potential through sight. As the first and only national not-for-profit vision benefits company, VSP has been the leader in health-focused vision care, providing affordable access to eye care and eyewear for more than 85 million members through a network of more than 41,000 providers.

The VSP® Global Innovation Center (GIC) is VSP's lens into the future. Through emerging technologies, new business exploration, and strategic connections within the innovation ecosystem, the GIC is a hub for reimagining the way eye care and eyewear are delivered to the world.

To learn more please visit www.vspglobal.com/innovation

Call to Innovators

At VSP Vision™, we are constantly reimagining the way eye care and eyewear are delivered to the world. To fulfill this promise, the VSP® Global Innovation Center (GIC) is actively seeking new startups and technologies to collaborate with on forward-looking innovations, especially around access. Interested in connecting? Let's talk.

Get in touch with us at globalinnovationcenter@vsp.com

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