Zero Project Sector Report

Assistive Technologies

Introduction, Trends, and Developments

15 Innovative Solutions form all over the world

A joint paper by GAATO and Zero Project

In cooperation and with contributions from GAATO, the Global Alliance of Assistive Technology Organizations

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The composition of geographical regions and selected economic and other groupings used in this report is based on UN Statistics (unstats.un.org), including the borders of Europe, and on the Human Development Index (hdr.undp.org).

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Abbreviations used in this Report

AAATE	Association for the Advancement of Assistive Technology in Europe
AI	Artificial Intelligence
AT	Assistive Technology (or Technologies)
CEO	Chief Executive Officer
GAATO	Global Alliance of Assistive Technology Organisations
ICT	Information and Communications Technology (or Technologies)
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

Content

Promoting innovations through networks and partnerships

FOREWORD BY MICHAEL FEMBEK AND WILFRIED KAINZ OF THE ZERO PROJECT

Michael Fembek,
CEO

Wilfried Kainz,
Head of Research

The Zero Project is dedicated to finding, researching, and disseminating innovative solutions that support accessibility, inclusion, and people with disabilities generally, in line with the UN Convention on the Rights of Persons with Disabilities. The initiative was launched more than 10 years ago by the Essl Foundation, a non-profit private foundation based in Austria, and has evolved into a global network of persons from many sectors, with and without disabilities, who contribute their time and expertise to the mission of the Zero Project: A world with zero barriers.

Networking is the key to achieving this goal. Therefore, the Zero Project and GAATO – both large networks of accessibility and technology experts – have joined forces and jointly produced this Zero Project–GAATO Report on Assistive Technology. Through this cooperation, hopefully the first of many, the Zero Project network gets access to the expertise of GAATO, and the GAATO networks gets access to the Zero Project's research database of existing and outstanding solutions in Assistive Technology.

Further, both parties will present and promote this collaboration in joint activities, as well as individually on their websites, in online presentations, and through social media. To kick off this collaboration, the two organizations will host a Joint International Conference on Digital Inclusion, Assistive Technology & Accessibility in Leeco, Italy, 11–15 July 2022 (icchp-aaate.org).

The Zero Project and GAATO collaboration will also be the focus at the 2023 Zero Project Conference on Independent Living, Political Participation, and ICT, which will include jointly organized sessions and meetings dedicated to the topic of Assistive Technologies and their contribution to a more inclusive world (zeroproject.org).

Both Zero Project and GAATO are committed to continuing this highly productive cooperation with further publications and activities. We also want to encourage all parties and organizations working in the field of Assistive Technologies to join us in making the AT network and expertise even broader and more readily available for the benefit of a more accessible and inclusive world.

Michael Fembek
CEO, Zero Project

Wilfried Kainz
Head of Research, Zero Project

Improving access to Assistive Technology

FOREWORD BY LUC DE WITTE AND EVERT-JAN HOOGERWERF OF GAATO

Luc de Witte,
President

Evert-Jan Hoogerwerf,
Secretary-General

GAATO, the Global Alliance of Assistive Technology Organizations, is a Geneva-based global umbrella of professional Assistive Technology (AT) organizations, all dedicated to providing access to AT to everyone in need. This mission perfectly aligns with the mission of the World Health Organization's GATE Initiative, designed to assist UN Member States to improve AT access as a part of Universal Health Coverage. GAATO's mission also perfectly aligns with the mission of the Zero Project.

We at GAATO and the Zero Project believe that technology has the potential to change lives and help fulfil the dream of an inclusive society. We also know that there are many great assistive devices and solutions being developed by a huge number of researchers, inventors, companies, care professionals, and NGOs all over the world, as demonstrated in the WIPO report "Technology Trends 2021: Assistive Technology." Throughout the world the technology to enable innovation is available and rapidly developing, and thus the future for AT looks bright and promising.

Nonetheless, the current reality of people with disabilities or functional difficulties is not that bright, given that the majority of those in need do not currently have access to such technology. In the recently published "WHO-UNICEF Global Report on Assistive Technology," it is estimated that worldwide only a small percentage of those who might benefit from AT have access to it.

This contrast between available and new solutions, on the one hand, and the large number of people with unmet needs, on the other, must be bridged. This is why the Zero Project and GAATO have decided to join forces. The Zero Project annually looks for promising innovations; and GAATO, through its global network of experts, will help to disseminate, scale up, and expand the most promising of these innovations.

This report is the first in which we present a selection of innovations that have the potential to contribute to a more inclusive world.

Luc de Witte
President, GAATO

Evert-Jan Hoogerwerf
Secretary-General, GAATO

Introducing the field of Assistive Technology

DEFINITIONS, CHALLENGES AND DRIVING FORCES

Assistive technology helps people with functional difficulties to access opportunities just like anyone else. As such, assistive products are among the most useful innovations of humankind. Learn more about the definitions of Assistive Technology, the stakeholders, the main challenges, and the key drivers related to this topic.

By Evert-Jan Hoogerwerf and Luc de Witte

Assistive Technology (AT) is any technology that supports people with functional difficulties to perform their daily activities with less difficulty and/or obstruction, thus contributing to a more fulfilling life. This refers to people of all ages and to all kinds of functional limitations, either permanent or temporary. Assistive products can be traditional physical products, such as wheelchairs, eyeglasses, hearing aids, or prostheses, but they can also be special input devices, care robots, computers with accessible software, apps for smartphones, home automation solutions, virtual realities, etc. It is essential to understand that AT involves more than just familiar products, and that it also includes knowledge about the personalized selection of appropriate solutions, provisions, and services, as well as the training of all parties involved, the measurement of outcomes and impacts, awareness of ethical issues, etc.

Unlike most other fields, advancements in AT are very much driven by community forces and their 'group intelligence'.

Definitions of Assistive Technology

There are many definitions of Assistive Technology, and the differences mainly depend on the perspective of the user of the definition or on its intended application. For example, a definition can refer to a classification of products, such as the ISO classification 9999, to be used in industry, trade, or public procurement. Alternatively, a definition can refer to the impact of AT on human activity (e.g., the enabling function of AT) or to the participation of persons in different domains of life (e.g., AT for inclusion).

The concept of AT acquires even more depth if a definition focuses on the individual and his or her right to live as anyone else. For example, what for someone might be a normal consumer product, such as a smartphone, for others might be an essential Assistive Technology solution without which communication, mobility, environmental control, the purchase of goods and services, etc. would not be possible. From this perspective, AT is not seen as a medical need but as a fundamental human right.

Stakeholders in Assistive Technology

There are many stakeholders in AT, the most important ones being persons with permanent or temporary disabilities and the organizations that represent their interests, but also –

- informal caregivers
- professionals in health and social care services
- professionals in education
- researchers
- developers
- producers and sellers of AT

Finally, governments and the agencies implementing public policies are important stakeholders, since access to AT is considered a tool to foster equality and to build more inclusive societies. This latter principle is recognized by the World Health Organization (WHO) and its General Assembly, which have started a process towards universal coverage of AT needs, supported by civil society organizations such as the Global Alliance of Assistive Technology Organizations (GAATO) and others.

Assistive Technology is not seen as a medical need but as a fundamental human right.

Challenges to Assistive Technology

Among the challenges to AT the following are the most significant:

- How can society make sure that all people that might benefit from AT have access to it?
- What systems need to be in place to guarantee access to and the effective use of AT?
- What is the role of each stakeholder in advancing access to AT and how can efforts be coordinated?
- What kind of mechanisms should be in place to ensure that innovation in AT in terms of products, services, and policies are easily scaled up and transferred to other regions, settings, and application areas?
- Following a conference in Bologna organized by the Association for the Advancement of Assistive Technology in Europe (AAATE) on 27 August 2019, representatives of a wide range of Assistive Technology stakeholders published an agenda for action to address the challenges in the field of AT. This Bologna Declaration, endorsed by 693 individuals and 155 organizations, consists of 10 key actions (see box on page 9) and is a call to action to "increase access to quality Assistive Technologies to realize basic human rights and fully achieve the Sustainable Development Goals."

CORE CONCEPTS RELATED TO ASSISTIVE TECHNOLOGY

Some of the most important thing to know about Assistive Technologies include the following:

- AT allows people with functional limitations to live as much as possible like anyone else. Access to AT and the possibility to use it in any circumstance is therefore a human right.
- AT is not only relevant for persons with lifelong disabilities but also for persons who experience temporary or long-term limitations due to accident or illness, as well as for persons who, due to the normal ageing process, start to experience difficulties in their daily activities. In sum, AT is relevant for everyone at some point in life.
- The field of AT is rapidly developing, with changing paradigms and new products and applications being developed, tested, and produced – increasingly with the involvement of users of AT.
- AT is very personal and depends on the setting where it is used. A wheelchair needs to fit its user and may be perfect in a city, but can be totally useless in a rural area.

Driving forces in Assistive Technology

The need for advancement and dissemination of Assistive Technology is strongly anchored in international policies and legislation. These include the following:

The UN Convention on the Rights of Persons with Disabilities

Various articles of this Convention refer to AT. Together with Accessibility and Universal Design, AT is considered a human rights enabler, and people with disabilities should have access to it. The Convention has been ratified by 184 countries, all of which have committed to its adoption and to international collaboration as a tool to support its implementation (Art. 32).

The 2030 Agenda for Sustainable Development

Although the Agenda does not define a specific goal for the reduction of disability worldwide, disability is mainstreamed within the various Sustainable Development Goals, and the needs of persons with disabilities and older people is generally acknowledged (e.g., leaving no one behind). According to the WHO, "addressing the unmet need of assistive products is crucial to achieve the Sustainable Development Goals." To this end, including AT provisions under Universal Health Coverage schemes seems the most logical strategy.

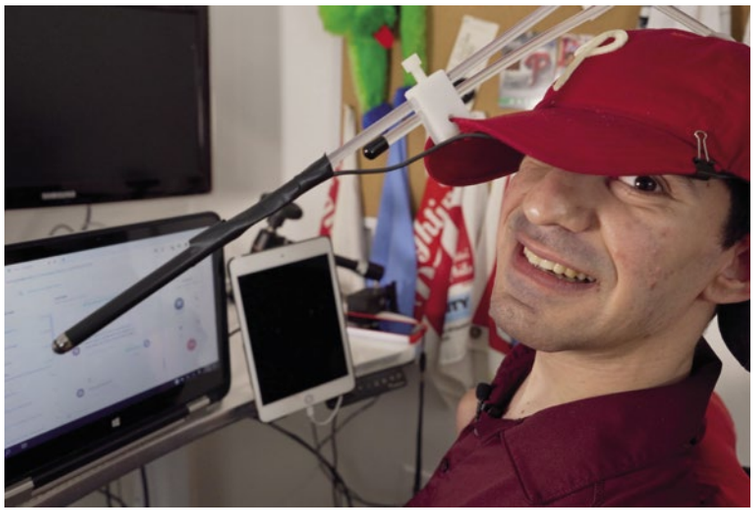
National programmes for the provision of AT

Many countries have programmes for supporting the provision of AT to persons who might benefit from it, but exactly to what extend AT is provided differs from country to country and among sectors. Being often associated with rehabilitation, the bulk of AT in high-income countries is provided under public health programmes or by medical insurances. In some countries people who need AT will get financial support to buy it for themselves (the consumer model). Other funds might come under education, employment, or social support services. A major problem for public funding agencies is to keep pace with the developments in AT and the large variation in AT-based solutions, while respecting public procurement rules, legal restrictions, and budgets.

AT communities and organizations

Unlike most other fields, advancements in AT are very much driven by community forces and their 'group intelligence'. To respond to the need not only to invent and produce solutions for individuals and groups but also to make them available and to foster their effective use, many barriers need to be overcome: technological, political, organizational, cultural, etc. This has led to significant bottom-up initiatives driven by communities of stakeholders, or even representatives of the entire value chain. At all levels, formal and informal communities work for constant improvement, some driven by persons with disabilities, others by academics, service providers, or industry. Some of these driving forces are highlighted in the Resources section (page 37).

The Bologna Declaration: Following a conference in Bologna organized by AAATE in 2019, representatives of a wide range of Assistive Technology stakeholders published an agenda for action to address the challenges in the field of Assistive Technologies.



An important part of AT: Speech recognitio technologies.

An important part of AT: Alternatives in steering devices.

THE BOLOGNA DECLARATION

In 2019 representatives of a wide variety of AT stakeholders identified the following agenda for action:

- To raise awareness about Assistive Technology, Universal Design, and accessibility as a matter of human rights, with technology being a significant and often determinative enabler for people to claim and to realize their rights.
- To further legislation with strong enforcement mechanisms on accessibility and usability of goods and services, and to promote good practices at all levels and in all domains of public and private life.
- To promote in all relevant disciplines socially responsive and responsible research, investigating barriers to full inclusion of all in society, and developing strategies and solutions to enable participation, many of which may be technology-related.
- To ensure that technological innovation takes into account the greatest possible number of potential beneficiaries following a Universal Design approach and that it does not contribute to further exclusion by widening the gap between the haves and have-nots.
- To foster Assistive Technology provision systems that are person-centred, are independent from commercial interests, and are able to provide, in a timely and affordable manner, personalized forward-looking solutions suitable for the environment of use and based on the abilities, preferences, and expectations of the end user.
- To create appropriate and robust lifelong educational opportunities for AT end-users, the health and social care workforce, and professional users of AT involved in needs assessments, in the implementation processes of Assistive Technology solutions, and in supporting the effectiveness of these solutions in time.
- To seek and require meaningful collaboration among actors at the international, national, regional, and local level; to better define the obligations and levels of responsibility of each stakeholder; and to involve persons with disabilities and a wide range of AT users.
- To pursue and ensure the quality of Assistive Technology solutions for the equitable provision of AT systems globally.
- To promote positive images, designs, and initiatives that counter the stigma that is sometimes associated with impairment and the use of Assistive Technology.
- To remove all other barriers of whatever nature (e.g., financial, political, administrative, market, knowledge, cultural, gender, etc.) for Assistive Technology and accessibility adoption at all levels.
- For more information and to endorse the declaration, please visit: https://aaate.net/the-bologna-declaration

About the Zero Project

FOR A WORLD WITH ZERO BARRIERS

The mission of the Zero Project is to work for a world without barriers. Worldwide, it finds, shares, and disseminates solutions that improve the daily lives and legal rights of people with disabilities.

By Friedrich Ruhm Perdomo

The original impetus for what would later become the Zero Project occurred in 2008, when the Essl Foundation MGE gemeinnützige Privatstiftung – an Austrian charitable foundation that focuses on scientific research and charitable giving – carried out a preliminary study on existing data related to persons with disabilities and other disadvantaged groups. On this basis, the Essl Social Index was introduced as a means of measuring the implementation of the United Nations Convention on the Rights of Persons with Disabilities.

Since then, this index has evolved into what is now known as the "Zero Project." A dedicated team has developed the original idea into a renowned research-driven initiative that – over the past 10 years – has engaged with more than 9,000 experts from around the world. More than 700 Zero Project Awardees have been identified to date, all of which share the key criteria of innovation, scalability, and impact to improve the lives and legal rights of persons with disabilities.

An international team

The Zero Project is managed out of its headquarters at the Haus der Philanthropie (House of Philanthropy) in Vienna. An international team connects with representatives of all sectors of society, conducts research based on an annual theme, and organizes local as well as global events – all centred around its flagship event, the annual Zero Project Conference at UN headquarters in Vienna. Special support is given to initiatives directly impacting the lives of persons with disabilities.

Since 2019, Chile's Fundación Descúbreme has formalized its long-standing partnership with the Essl Foundation to function as the Zero Project's Latin American arm. Throughout the year, Zero Project Latin America amplifies and promotes the Project's research and impact throughout the Spanish-speaking world. The annual highlight of this partnership is the Latin American edition of the Zero Project Conference.

Working in a global network

The Zero Project is proud of its global network of partners, experts, decision-makers, opinion leaders, and other change-makers. By fostering close collaboration among all parts of this vast network, the impact of proven solutions can be amplified and replicated elsewhere. The Zero Project believes that the diversity of relationships is a strongpoint, and continues to deepen trusted partnerships, such as our official cooperation with Fundación Descúbreme, the European Association of Service Providers for Persons with Disabilities, Unicredit/Bank Austria, and more recently through a memorandum of understanding with the European Network for Accessible Tourism.

Finding and sharing solutions

All network activities are based on the Zero Project's unique research method, with its three pillars of: (1) selecting solutions based on innovation, impact, and potential to scale; (2) engaging with thousands of Zero Project Network members and their 'crowd intelligence' as part of the selection process; and (3) supporting the selected solutions in order to increase their impact.

Based on a revolving four-year cycle, the research concentrates on one of the following four themes each year: Accessibility, Employment, Education, and Independent Living/Political Participation. Due to the increasing importance of Information and Communication Technologies, this topic is covered every year in addition to the main research theme.

THE NEW ZERO PROJECT DATABASE

Digitalization plays an important role in making proven solutions known, and in facilitating knowledge transfer internationally. In 2022, Zero Project launched the new Zero Project Database – an accessible, user-friendly tool to allow anyone to conduct keyword-based searches in the Zero Project's vast database of more than 700 curated solutions. The Database also encourages direct exchange among more than 600 organizations and 9,000 experts in over 100 countries. It is available free of charge at zeroproject.org.

How the Innovative Solutions were selected

EXPLAINING SELECTION PROCESS OF THE ZERO PROJECT AND THIS SECTOR REPORT

The 15 innovative AT solutions showcased in this publication were selected from past and present awardees of the Zero Project. Awardees are identified each year in a multi-stage selection process by a worldwide network of more than 9,000 experts.

By Friedrich Ruhm Perdomo

In a coordinated selection process, representatives from Zero Project and GAATO selected 15 innovative solutions from the Zero Project Awardees that document the state of the art in AT and demonstrate the contribution that modern technology can make to support people with disabilities to achieve a self-determined and independent life.

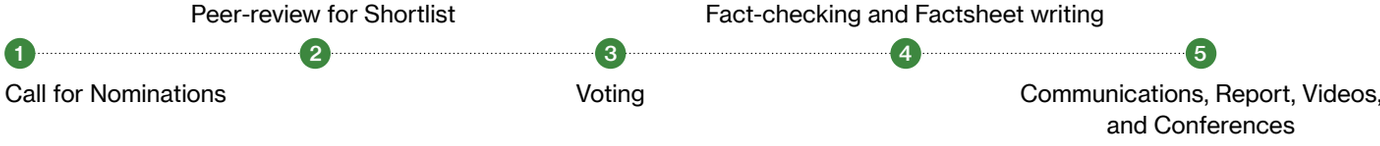
In particular, the joint objective was to identify solutions that help to bridge the gap between the possibilities and the availability of AT. Therefore, the solutions chosen are innovations that have the potential to be accessible and available to the widest possible group of people who could benefit from them.

Decisive criteria for this selection process are their technical specification and features; the efforts associated with their acquisition or implementation as well as the associated costs; and, finally, the willingness and readiness of the innovators to have their solution spread worldwide and to share it with others.

Moreover, GAATO and Zero Project have sought to include most of the vast spectrum of AT devices, from physical solutions such as prosthetics to applications using Artificial Intelligence. In addition, the organizations took into account solutions that work in low-income environments, where budget and distribution constraints might apply.

THE ZERO PROJECT – PROCESS

Five steps from the Call for Nomination to Report and Conference



THE FOUR SECTORS

1. Civil Society
2. Public Sector
3. Business Sector
4. ICT (across all sectors)

THE THREE CRITERIA

1. Innovation
2. Impact
3. Scalability

THE FIVE FOCUS AREAS

1. Employment (last in 2020–2021)
2. Accessibility (this year)
3. Independent Living and Political Participation (next in 2022–2023)
4. Education (next in 2023–2024)
5. ICT (every year)

15 Examples of Innovative AT-Solutions

The collection and exchange of innovative practices is fundamental to fostering greater awareness and knowledge about Assistive Technology. To this end, GAATO and Zero Project have joined forces to showcase innovative solutions in the field of AT from among the Zero Project Awardees of recent years.

The selected solutions demonstrate some of the wide ranging and state-of-the-art developments in the dynamic field of advanced Assistive Technologies. And they illustrate the potential of using AT to support the implementation of the UN Convention on the Rights of Persons with Disabilities and to contribute to a more inclusive world without barriers.

The selected Assistive Technologies are as follows:

- **EyeHarp Association – EyeHarp:**
  Eye and head-controlled digital musical instrument, Spain
- **Fable – Fable Crowd testing:**
  An accessibility testing platform, powered by people with disabilities, Canada
- **Global Symbols CIC:**
  An online toolbox of symbols enabling communication for all, without the use of language, United Kingdom
- **Gudgudee – Inclusive play areas for children:**
  Design studio that produces playgrounds for all children and all senses, India
- **Hayaku – Cash Reader:**
  Mobile app that identifies banknotes from more than 100 currencies, Czech Republic
- **Irisbond:**
  Controlling the computer with eye movements, Spain
- **Jaipur Foot Organization – BMVSS:**
  Providing free adaptations and prosthetics for amputees and persons with mobility issues, India
- **Livox International LLC:**
  Alternative communication platform for people with learning difficulties, Brazil
- **MUNEVO – munevo DRIVE:**
  Wheelchair control via smart glasses, Germany
- **Microsoft – Seeing AI:**
  Talking camera app for people who are blind using AI and augmented reality, United States
- **Signes De Sens – La Bulle Elix:**
  Web-browser extension for looking up explanations in sign language, France
- **Sonokids:**
  Early-learning technology for children who are blind or visually impaired, Australia
- **SubReader app:**
  Smartphone app that offers audio subtitles to foreign language movies and series, Denmark
- **Voiceitt speech recognition:**
  App-based machine learning enabling persons with speech disabilities to be understood, Israel
- **Waymap orientation app:**
  Accurate navigation system for the blind and visually impaired to improve public services, United Kingdom

The following Factsheets have been originally researched and written for the Zero Project Reports 2021 and 2022.

Early-learning technology for children who are blind or visually impaired

AUSTRALIA/SONOKIDS – BALLYLAND

Sonokids is an Australian social enterprise that produces Ballyland, a range of gamified educational software programmes and apps for children who are blind or visually impaired. The apps support children to acquire foundational (assistive) technology skills and to practice their orientation, spatial awareness, memory, and listening. Since its launch in 2013, an estimated 70,000 children have used the Ballyland suite of educational apps.

Problems targeted
Young students who are blind or visually impaired are often disadvantaged in education. In addition, using Assistive Technology, often requires special skills.

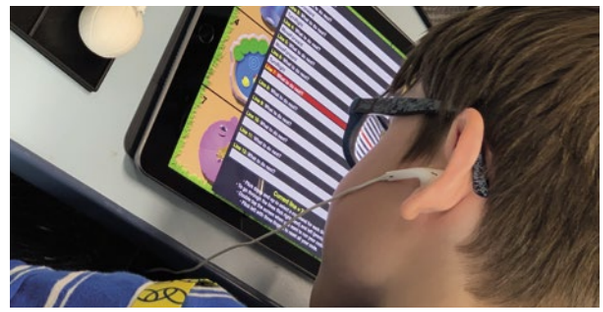
Solution, innovation, and impact
The Ballyland range of software programmes and apps allows children who are blind or visually impaired to acquire foundational (assistive) technology skills that enable them to use computers and mobile devices from the age of four. The use of images, voice-overs, audio effects, stories, and songs creates a barrier-free and inclusive learning environment. Blind or visually impaired teachers and students are involved throughout the app development process as design consultants and for beta testing, feedback, and voice-overs.

In 2013, Sonokids launched its first Ballyland early keyboarding software, followed by a series of apps for different usages. The latest app, released in March 2022, supports early learning of 'sonification'. This emerging technology uses non-speech sound to represent data or information and has huge potential for access to information by people who are blind or have low vision. Sonokids also developed Ballyland tactile learning tools.

"I love that the Cosmobally on Sonoplanet app is both accessible and fun. It can help children who are vision impaired to learn how to use sonification while playing online games and having fun just like everyone else."

Ten-year old girl who is blind

Phia Damsma
phia@sonokids.com – www.sonokids.org/ballyland-early-learning



A range of software programmes and iPad apps supports children from the age of 4 onwards.

All Ballyland apps are available in English (some are translated into other languages) and have reached thousands of students at home and through schools across Australia, New Zealand, Canada, Europe, and the United States.

Outlook, transferability, and funding
Sonokids Australia is a social enterprise financed by sales, but more importantly by grants and other types of funding. Going forward, the company will continue to expand the range of apps. Sonokids also plans to produce apps in additional languages, introduce the functionality of connecting the apps to mainstream educational programmes, and keep creating innovative opportunities for early learning of emerging technologies that can benefit children's access and inclusion.

FACTS & FIGURES Start: 2014

- On iOS: Ten English-language apps, one Spanish, one German, and one Dutch.
- On Android: Two English-language apps.
- The Ballyland range of products has been used by an estimated 70,000 children at home and in school.

Alternative communication platform for people with learning difficulties

BRAZIL/LIVOX INTERNATIONAL LLC

The Livox app enables users with speaking or learning difficulties to communicate using virtual cards with pictures or illustrated short phrases. The app, which can be operated both by blinking and by speech, is self-learning and also features a content creator to allow the user to add communication cards with videos, pictures, and music.

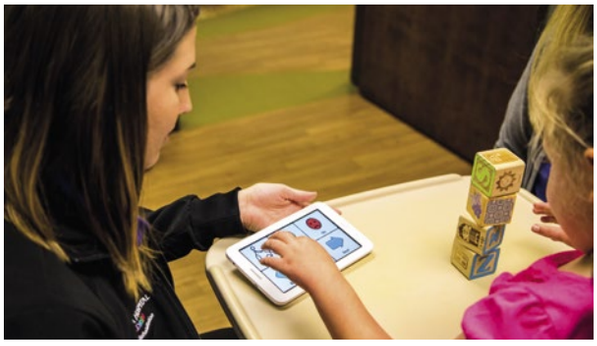
Problems targeted
People who cannot communicate verbally, or those with learning difficulties, are at risk of being excluded from the education system.

Solution, innovation, and impact

Livox displays virtual cards showing, for example, pictures of objects, places, or emotions, or illustrated short phrases such as "I want to..." or "I am...," which a person can then select to communicate. Livox uses intelligent algorithms and machine learning to ensure the platform is responsive to the user's needs. For example, it learns to correct touch if someone has difficulty touching the screen or responds to blinking if that is someone's preferred communication method. It adapts to the context and displays cards that are relevant to the time or location. Livox can be voice-activated to allow others to talk to the user, using AI technology to help them answer. Students use Livox in schools to communicate with their teachers and peers, leading to greater inclusion as this allows them to interact and take part in discussions and activities in a meaningful way. This makes students more willing to communicate at school and in other settings, leading to improvements in speech and social skills. Livox's online tool allows caregivers or support professionals to monitor progress. Education content can be created by users using the inbuilt content creator, or existing content can be shared and downloaded from Livox's online store.

"When Emanuel realized that he could communicate with Livox, we found out who he was, what he felt, and what he thought, and he has continued surprising us in many ways since!"

Marina Gaya, mother of a Livox user



Livox learns to correct touch if a user has difficulty touching the screen.

Outlook, transferability, and funding
Livox's revenue comes from selling licenses for the software to users, ranging from individuals and families to schools and governments. The cost of a license varies from $35 to $63 a month, depending on the functionality. In 2016, Livox also received a $550,000 grant from Google to develop its technology.

The company has developed a partnership with an organization in the Middle East to make Livox available in Saudi Arabia, Egypt, Djibouti, and Sudan. The local partner is responsible for translation, localizing, and marketing. It has also run pilots in other countries, and it will continue to improve its algorithms to allow more meaningful conversations between people who can and cannot speak.

FACTS & FIGURES Start: 2011

- By the end of 2019, Livox was being used by over 25,000 people in 11 countries.
- The software is compatible with 25 languages.

Carlos Pereira
carlos@livox.com.br – https://livox.com.br

An accessibility testing platform, powered by people with disabilities

CANADA/FABLE – FABLE CROWDTESTING

The Fable's Engage platform makes it easy for product teams to engage with people with disabilities at every stage of product development, online and on demand. The platform is fully accessible, allowing people to work flexibly and remotely. In this way Fable provides employment opportunities for people with disabilities to participate in digital accessibility research and testing. In 2022, Fable had hundreds of people with disabilities working as accessibility testers.

Problem targeted
Digital products are often inaccessible to people with disabilities, and there are few flexible, accessible job opportunities in the digital sector.

Solution, innovation, and impact
Fable's Engage platform makes it easy for companies to connect to people with disabilities for user research and accessibility testing. Companies submit requests to the platform, and Fable's community of testers – ranging from novice users to technology experts – respond to the requests. Testers take part in user research interviews, provide feedback on prototypes, and test compatibility with Assistive Technology, among other services. Clients include Walmart, Slack, and Shopify. One client, Gatsby JS – an open-source website builder – used Fable to make changes that made 26,700 websites more compatible with screen readers. Since 2018, Fable has facilitated flexible and remote working for many people with disabilities who earn a technology sector wage.

Five Fable team members enjoy a happy moment together.

Outlook, transferability, and funding
Fable is a subscription-based platform and does not share revenue figures publicly. Companies pay a monthly fee, which allows them a maximum number of requests per month. The cost varies depending on the organization and its needs. Between 2020 and 2022, Fable's revenue increased 14-fold. In May 2022, Fable announced it had raised $10.5 million in addition to a $1.5 million round of funding in 2020. With this funding Fable aims to scale up its impact, bringing inclusive product development to more organizations.

"What makes Fable unique is that it is a diverse community of people living with disabilities."

Samuel Proulx, Community Manager, Fable Tech Labs

FACTS & FIGURES Start: 2018

- Fable experiences a 500 per cent increase in revenue between December 2019 and June 2020.
- The company can offer compatibility testing with ten different assistive technologies.
- *A project related to ICT.*

Mr. George Mason
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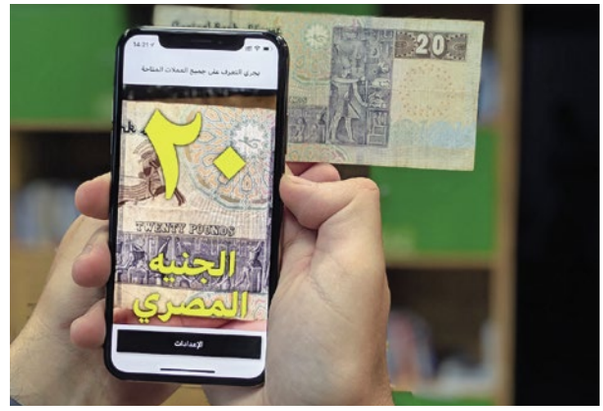
Mobile app that identifies banknotes from more than 100 currencies

CZECH REPUBLIC/HAYAKU – CASH READER

In 2019, Hayaku – a start-up company based in Brno, Czech Republic – launched Cash Reader, a smartphone app that enables persons with visual impairments to identify banknotes from many countries. The user points their smartphone's camera at a banknote and the app announces the currency and denomination, either through speech or vibration patterns. The basic version is free, and the full version is a subscription or payment model. In 2021, Cash Reader was able to identify more than 100 currencies.

Problem targeted
People with visual impairments can find it difficult to identify banknotes when running a business or when paying with cash.

Solution, innovation, and impact
Cash Reader is an app available on iOS or Android phones that identifies banknote values for almost every currency globally. Users point their smartphone's camera at the banknote and the app informs them of the value, either using speech or vibration patterns, which provides more security in public places.



No risk of confusion: accurate identification of a banknote.

"Cash Reader makes banknotes accessible to strengthen the independence of the visually impaired worldwide."

Tomas Jelinek, Founder, Cash Reader

The app can read even a small portion of a bank note at almost any distance and at various angles or light conditions thanks to Artificial Intelligence and deep learning. To make this happen, over 10,000 photos are taken of each type of banknote in circulation to account for different conditions and surroundings. By 2021, Cash Reader has been used by more than 150,000 people around the world. The technology has also been implemented into third-party devices aimed at visually impaired or elderly people, such as smart glasses and specialized phones.

Outlook, transferability, and funding
Hayaku offers the basic version of Cash Reader for free, and a subscription model that is targeted towards companies. The full version is available as a monthly or yearly subscription ($4 to $12) or one-time purchase ($14 to $28). The pricing is different depending on the standard of living in each region. The money-reading technology is also being licenced as an easy-to-integrate Software Development Kit for companies, such as when integrating into smart glasses. The company employs six blind "ambassadors" in places such as Argentina, China, and India to promote the Cash Reader in their region, as well as to perform necessary translations and organize business opportunities. In the coming years Hayaku aims to collect banknotes from African and Asian countries, with a long-term goal of making every banknote in the world accessible.

Mr. Tomas Jelinek
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FACTS & FIGURES Start: 2019

- The app was downloaded more than 150,000 between 2019 and 2021.
- In 2021, Cash Reader can distinguish among more than 100 currencies.
- *A practice related to ICT.*

Smartphone app that offers audio subtitles to foreign language movies and series

DENMARK/SUBREADER APP

SubReader is a start-up company based in Copenhagen, Denmark, founded in 2016. The SubReader smartphone app reads subtitles of movies and TV-series aloud, thus supporting all persons with reading difficulties such as dyslexia or visual impairments. The app, which can be used independently, employs technological (non-human) voices, making it compatible with an unlimited number of films and television programmes. In 2021, SubReader users collectively watched more than 500 hours of movies every day.

Problem targeted
Enjoying movies in different languages when using subtitles can be difficult for people with dyslexia, visual impairments, or language disabilities, as well as for younger children and the elderly.

Solution, innovation, and impact
Users can download the SubReader app to their smartphone, then search for thousands of movies and TV series across streaming services. The app can then be automatically synchronized with the audio track and the user can choose a preferred voice. Most importantly, the app enables users with reading difficulties to be independent of others. Also, since the app is used with headphones, each individual can enjoy the movie without interfering with the experience of others. SubReader is also used by younger children who have not yet learned to read quickly enough, and by older people who find subtitles too fast to keep up.

"Today I saw an English film for the first time in my life – SubReader has opened a new world for me."

Camilla Møller, user

The app is available in more than 40 languages and is used in homes, cinemas, and at schools. In 2021, SubReader was available in more than 100 cinemas in Denmark, Sweden, and the Netherlands.

Outlook, transferability, and funding
Parts of the app are available for free use at home, with extras – such as streaming services – available by subscription. Cinemas pay for a SubReader server, which allows the service to be free for their patrons. For schools, either the municipality or the individual schools can purchase a licence, which allows the students free use.

The main objective in the coming years is to continue expanding into new markets and to develop the product to include more streaming services and TV channels. Other aims are to build in the possibility for using the app with live TV and videos, along with making it available for more people by providing descriptive text in addition to the subtitles.

A family enjoying foreign language movies together, with the mother receiving the audio-translation via earphone.

FACTS & FIGURES Start: 2016

- Between 2016 and 2021, the app had 100,000+ downloads.
- During the same period, people have streamed more than 120,000+ hours of film.
- *A practice related to ICT.*

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Web-browser extension for looking up explanations in sign language

FRANCE/SIGNES DE SENS – LA BULLE ELIX

Signes De Sens is an NGO located in Lille, France, that specialises in Universal Design and accessibility features for persons with disabilities. In 2018 it introduced Elix Bubble, a free extension for web browsers like Edge, Chrome, or Safari. Users can look up words or expressions and access sign language videos via the bilingual French/French Sign Language Elix Dictionary without leaving the web page. In 2021 the Elix Dictionary contained more than 40,000 signs and expressions, and Elix Bubble had more than 1,500 users.

Problem targeted
Using the Internet can be difficult for people who are deaf or hard of hearing due to the need to constantly switch between tabs to find the definition of a word.

Solution, innovation, and impact
Signes de Sens has for several years been providing Internet users with a bilingual French/French sign language (FSL) video dictionary. As of 2018, FSL users can now access Elix Dictionary at the click of a button when browsing the Internet using the Elix Bubble. This browser extension provides translation of text on web pages via a tooltip (a box opens when right clicking a word), meaning users do not have to leave the page. The dictionary also offers multiple meanings of words.

> "Elix Bubble improves the lives of deaf people by facilitating access to reading and written French on the web."
>
> Simon Houriez, CEO, Signes De Sens

Users can also request sign language videos that have not already been requested and share the videos on social networks. The project collaborates with people who are deaf as critics, contributors, and promotors, and several deaf employees are involved in the project itself. The services are aimed at deaf people practicing sign language along with professionals, caregivers, educators, and family members. As of 2021 there were 71,000 active users of the Elix Dictionary, with 1,500 using Elix Bubble.

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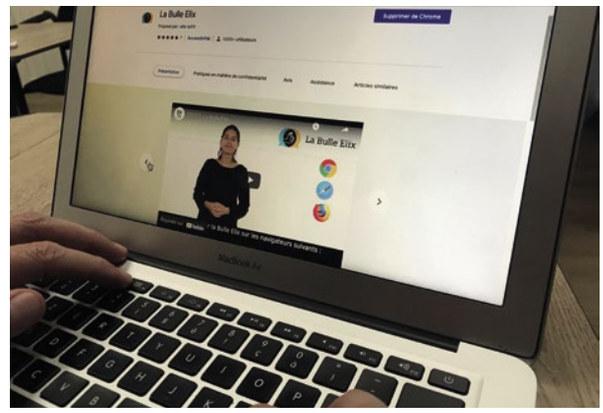

What a sign language to text dictionary looks like.

Outlook, transferability, and funding
Elix and Elix Bubble are financed by a range of grants, including public funding from the French Ministry of Culture, and individuals and foundations. Other models are being explored to ensure financial sustainability, including income through advertisements, new paid features, or the sale of features such as of books and games.

Signes de Sens is aiming to have 150,000 regular users of Elix Bubble, along with expanding it to other countries, by 2025. Another goal is to explore the possibilities of a gateway between various sign languages, such as American Sign Language and others.

FACTS & FIGURES Start: 2018

- The Elix Dictionary had 71,000 users in 2021.
- Around 6,000 people use the Elix Dictionary every day.
- *A practice related to ICT.*

Wheelchair control via smart glasses

GERMANY/MUNEVO – MUNEVO DRIVE

In 2019 the technology company Munevo, based in Munich, Germany, introduced munevo DRIVE – a technology based on smart glasses that allows the steering of a wheelchair through head movements. The glasses are easily connected to any conventional wheelchair via a small adapter, thus supporting those users who are unable to steer their electronic wheelchair through the conventional joystick. Munevo works with specialist dealers and manufacturers regarding the product's distribution, and in 2021 it had over 100 users in more than five countries.

Problem targeted
Many wheelchair users are unable to steer standard electric wheelchairs using their own hands or conventional steering devices.

Solution, innovation, and impact
munevo DRIVE is a hands-free wheelchair control system that allows the user to steer their wheelchair with head movements using smart glasses that pick-up sensors and translate them into control signals. These signals are transmitted to the wheelchair control unit via a small adapter, which can connect to any conventional electric wheelchair. The adapter is quick to install and to calibrate according to the user's usual posture and current sitting position.

Steering the wheelchair with the movements of her eyes.

"munevo DRIVE makes life worth living again."

Dirk, a test user of munevo DRIVE

munevo DRIVE also allows users to share their location in case of an emergency, adjust their seating position, and take and share pictures using a camera integrated into the glasses. Munevo collaborated with the Pfennigparade Foundation, an assisted living community for wheelchair users in Munich, to develop and test the system in 2018. The number of people using munevo DRIVE has steadily grown from ten in 2019 to over 100 in 2021.

Outlook, transferability, and funding
munevo DRIVE is distributed through specialist distributors and manufacturers, which act as coordinator among the clients, social security offices, and health insurance providers The price of the basic version is €7,700, and in many cases the cost is covered by health insurance providers.

Going forward, Munevo plans to make munevo DRIVE available in more countries, and it will also add more features so that the system can support users with everyday tasks, such as navigation. These planned add-ons will allow the user to control not only a wheelchair but also smartphones, computers, smart home systems, and robotic arms.

FACTS & FIGURES Start: 2019

- munevo DRIVE takes approximately five minutes to install and 20 seconds to calibrate.
- The system is currently sold through 27 distributors and five manufacturers.
- *A practice related to ICT.*

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App-based machine learning enabling persons with speech disabilities to be understood

ISRAEL/VOICEITT SPEECH RECOGNITION

In 2018 the startup company Voiceitt, based in Tel Aviv, Israel, introduced a speech recognition app for persons with speech disabilities. With machine learning, the smartphone app identifies the unique speech patterns of its users and enables them to communicate with family and friends without an intermediary. Moreover, Voiceitt developed an interface enabling other companies with voice-enabled products and services to make their products accessible. In 2021, Voiceitt was available in app stores and had hundreds of users worldwide.

Problem targeted
Most speech control IT-solutions on the market today do not cater to people with speech disabilities.

Solution, innovation, and impact
Voiceitt' s speech recognition app is designed for individuals with non-standard speech. It has two main functions: Voiceitt Talk and Voiceitt Home. The app's AI-component enables it to continuously develop its Automated Speech Recognition (ASR) capabilities by learning to identify speech patterns from specific voice samples around the world and by analysing individual users' speech patterns, including utterances, breathing pauses, and more. The more people who use the app, the larger the corpus of voice samples and, subsequently, the smarter and more effective the AI technology becomes. The app allows users to communicate directly with other people, such as family and caregivers, in their own voice and speed. The Home function relates to Alexa smart home devices, enabling users to perform daily tasks such as switching lights on and off or watching TV by using their voice commands. From 2018 to 2021 the Voiceitt user base grew from 12 individuals in a small pilot to 200 beta testers to several hundreds of users worldwide.

> "Voiceitt improves independence and quality of life for people with disabilities, and those who care for and about them."
>
> Sara A Smolley, Co-Founder

Ms. Sara Smolley
sara@voiceitt.com – www.voiceitt.com

Giving back control to those with speech impairments.

Outlook, transferability, and funding
A funding round in 2020 drew such investors as M12 (Microsoft's Venture Capital Fund), Amazon Alexa Fund, Connecticut Innovations, AARP, and others. By 2021, Voiceitt raised more than $17 million. The company's business model is based on license sales and its API business – when other companies integrate Voiceitt technology with their existing products.

Voiceitt will expand its user base, particularly among health care professionals who use the app to communicate with their clients and patients., making them accessible to people with speech and motor disabilities. The company will also combine the app with more products and services offered to persons with speech impairments.

FACTS & FIGURES Start: 2018

- Voiceitt gives users with speech disabilities the possibility to express themselves in their own voice.
- $17 million had been raised by 2021 for the further development of the app.
- *A practice related to ICT.*

Design studio that produces playgrounds for all children and all senses

INDIA – MUMBAI, PANCHKULA ETC./GUDGUDEE – INCLUSIVE PLAY AREAS FOR CHILDREN

Gudgudee is a product and space design studio, based in Thane, India, that designs and builds inclusive playgrounds for children with disabilities while also providing a range of indoor and outdoor products for playgrounds. Starting in 2014 the company has worked with occupational therapists, child experts, psychologists, parents, and children. Gudgudee caters to all disabilities, looking beyond only wheelchair-accessible spaces by introducing elements that encourage play through all senses.

Problem targeted
Playgrounds in India are often not accessible to children with disabilities, and thus they cannot play with their non-disabled peers.

Solution, innovation, and impact
Gudgudee is building customized playgrounds for children with and without disabilities and creating innovative play areas with interactive elements of sound, smell, touch, and visuals. The concept includes unique play elements, such as life-sized lollipops that rotate and allow a child to see the playground in different colours, large drums, macaron-shaped swings, and xylophones and bells for sensory stimulation.

A child playing with the coloured lollipops.

"Our students love spending time in the garden; it is being used for free play and sensory therapy."

Dr. Salil Jandyal, CEO, Victoria Memorial School for the Blind, Mumbai

In addition to design consultation and execution, the company offers maintenance of executed playgrounds and a ready-to-install product catalogue. During the COVID-19 pandemic, Gudgudee also launched a range of indoor play products that children could enjoy at home.

Between 2014 and June 2021 the design studio has implemented 45 projects for inclusive play areas in 14 cities in India. Its clients include schools and NGOs in Mumbai and Bengaluru, among other places, as well as government bodies. Gudgudee is also working with leading Indian real estate developers to provide inclusive playgrounds for large residential buildings.

Outlook, transferability, and funding
Prior to COVID-19, Gudgudee had an annual revenue of about $2.5 million. The company generates sustainable revenues on the sale of its catalogue products and through its design and consulting services. Over the next three to five years, it aims to increase its annual revenue to $20 million and build at least 30 inclusive playgrounds per year. Gudgudee has already partnered with the National Institute of Urban Affairs to create a guide for creating accessible playgrounds in Indian cities and for various smart city projects and decision-makers across the country.

FACTS & FIGURES Start: 2014

- Between 2014 and 2021, Gudgudee has implemented 45 projects in 14 cities.
- The company's revenue in 2019–2020 was $2.5 million compared to $0.8 million in 2018–2019.
- *A practice from the Business Sector.*

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Providing free adaptations and prosthetics for amputees and persons with mobility issues

INDIA / JAIPUR FOOT ORGANIZATION

Jaipur Foot Organization is an NGO that provides free orthoses, prostheses, and assistive aids to patients with locomotor disability. Established in 1975 and serving 59 patients in its first year, that number rose exponentially to 90,790 beneficiaries in 2019. The organization has 26 centres in India and has held outreach programmes in 35 countries across Asia and Africa.

Problem targeted
According to WHO, only 5–15 per cent of people needing orthotic/prosthetic services in low and middle-income countries have access to them. The Jaipur Foot Organization strives to meet the needs of the unserved.

Solution, innovation, and impact
The Jaipur Foot Organization identifies persons having mobility challenges, with particular focus on poor amputees from rural areas. The organization provides a variety of assistance, such as artificial limbs, callipers, wheelchairs, and tricycles – all free of charge and delivered directly to the user. In addition, it holds more than 50 field camps per year in India and around the world, whereby doctors and technicians travel with equipment and materials to provide on-the-spot fabrication and the fitting of prosthetic limbs and other aids to persons who may otherwise be unable to access help.

FACTS & FIGURES Start: 1975

- Prosthetics are provided free of charge.
- The organization specifically targets the poor living in rural areas.
- Some 60,000 persons with mobility issues are served each year.

> "When I lost my leg, I felt that my life was over. The Jaipur Foot has not just replaced my lost leg, it has given me my life back."
>
> Mr. Sanjay Gupta, a Jaipur Foot beneficiary

The organization has also designed its own prosthetic components, including the Jaipur Foot and the Jaipur Knee, the latter hailed by *Time* magazine as one of the world's 50 best inventions in 2009. The Jaipur Knee, a polycentric artificial knee joint developed in partnership with Stanford University, mimics the normal pattern of human locomotion.

All components are affordable, high-performance, and robust alternatives to expensive assistive aids previously in use. The Jaipur technology is durable, inexpensive, water-resistant, quick to fit, and easy to transfer. Nonetheless, there is an ongoing effort to enhance design and durability of the devices. The organization carries out in-house research and also partners with such elite US institutions as the Massachusetts Institute of Technology, Stanford University, and Santa Clara University.

Outlook, transferability, and funding
Funding comes from corporate social responsibility support and individual donors. The mission is to restore the mobility and dignity of people with locomotor challenges in India and across the world.

The Jaipur Foot is an inexpensive, water-resistant, and quick to fit below-knee prosthetic.

Pooja Mukul
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Controlling the computer with eye movements

SPAIN / IRISBOND

Since 2013, IRISBOND has developed its own devices, such as Hire, as well as software development kits for other developers; and it has partnered with such major companies and institutions as Apple, Microsoft, Samsung, and the Massachusetts Institute of Technology. IRISBOND has received numerous awards, including a Zero Project Award (2016), the International Telecoms Union's Award Accessible Europe: ICTs 4 All (2019), and the European Commission's EU Excellence Seal for COVID-19 (2020).

Problems targeted
There are millions of people in the world who have difficulty communicating due to severe disabilities. As eye-tracking technology is increasingly integrated into various consumer verticals, overcoming operating system barriers is a major challenge.

"We believe that touchless technology like Hire offers new opportunities for a safer, more inclusive world, especially as we enter a post-pandemic environment."

Eduardo Jauregui, CEO, Irisbond

FACTS & FIGURES

- Product sales grew eight-fold from 2013 (€ 12,000) to 2014 (€ 99,000).
- The number of users grew nearly ten-fold from 6 (2013) to 57 (2014).
- The number of potential users worldwide is very high, including people with ALS, multiple sclerosis, paralysis, brain damage, spinal cord injury, etc.

Solution, innovation, and impact
Introduced in 2020, IRISBOND's eye-tracking device Hire is a multi-platform hands-free device that enables companies to design and develop eye-tracking capabilities for computers, tablets, ATMs, and access systems, among others.

Hire allows receipt of information through eye movements and interaction with devices, and works indistinguishably with Windows and iOS thanks to its connection with these devices in a native manner.

Hiru's advanced AI-based software algorithms, combined with state-of-the-art hardware, capture eye movements and translate them into precise actions on iPadOS, a mobile operating system developed by Apple for its iPad line of tablet computers. This allows users with physical and motor disabilities the option to use eye-tracking for communication, learning, work, and multimedia apps such as YouTube and Spotify. Moreover, Hiru has received the "Made for iPad" certification from Apple and now is the first multi-platform eye-tracking device that works seamlessly with iPad devices running iPadOS 15 or later, in addition to Windows.

Outlook, transferability, and funding
IRISBOND distributes its products through traders to 36 countries in Europe, South America, and North America. The funding process through the National Health System for Augmentative and Alternative Communication systems is different in each country. IRISBOND partners are in charge of managing the funding process in their own countries.

In Spain, eye-tracking devices such as Hiru are 100 per cent funded by the National Health System starting in 2020. IRISBOND, together with other associations and institutions, played a leading role in the process to achieve this milestone.

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Eye and head-controlled digital musical instrument

SPAIN – TURKEY/EYEHARP ASSOCIATION – EYEHARP

Founded in 2019 and based in Barcelona, Spain, the non-profit organization EyeHarp Association has developed the Eyeharp, an eye or head-controlled digital musical instrument. Using the EyeHarp software and a tracking device, it captures eye and head movements so musicians can play melodies simply by looking at the notes on the screen. The basic version of EyeHarp is free, and there are advanced options that can be purchased. In 2021, EyeHarp had more than 900 users worldwide, some of whom have played in concert halls and online concerts.

Problem targeted
Most musical instruments need players with excellent motor skills, making the experience of learning and playing music inaccessible to people with physical disabilities.

Solution, innovation, and impact
EyeHarp is a digital musical instrument controlled by the player's eye or head movements, and that consists of an eye-tracking device that communicates with an intuitive musical interface. This allows users to play a melody simply by looking at the notes displayed on the screen. EyeHarp's interface is adaptable to the musical level and physical capabilities of each individual, and includes learning tools and exercises, performance evaluations, musical memory games, and various instrumental sounds.

"Our main mission is to improve the life of people with disabilities through music."

Zacharias Vamvakousis, CEO, EyeHarp Association

EyeHarp offers all the musical capabilities of any other traditional instrument and can be played alone or together with other musicians and in concerts.

In 2020 the Association began teaching online EyeHarp classes, thus reaching more students from various countries. EyeHarp musicians and students have performed in concert halls, such as the Gran Teatre del Liceu in Barcelona, Spain.

Mr. Zacharias Vamvakousis
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Playing the EyeHarp.

Outlook, transferability, and funding
The instrument development started at Pompeu Fabra University, as a PhD research project. EyeHarp has a "freemium" business model, with a basic version available at no cost. The premium version is available at a subscription of €15 a month, €150 a year, or a one-time lifetime subscription of €589. The focus of EyeHarp' s business model is selling software licenses to music therapists and to music students and musicians with disabilities. It also started a crowdfunding campaign to expand development in 2022 and is seeking full or partial funding investors. Looking further ahead, EyeHarp aims to develop versions for platforms other than Windows and to create a certified course for music therapists.

FACTS & FIGURES Start: 2019

- EyeHarp' s premium version costs €150 per year.
- In 2021, EyeHarp had 945 users worldwide.
- *A practice related to ICT.*

An online toolbox of symbols enabling communication for all, without the use of language

UNITED KINGDOM – CROATIA, SERBIA ETC./GLOBAL SYMBOLS CIC

An NGO founded in 2017 and based in Milton Keynes, United Kingdom, Global Symbols provides sets of graphic symbols (such as a clock, food, body, house, etc.) and online tools to connect them for communication. It supports anyone with a communication disability, in any language, all for free and open source. A key feature enables users to create their own symbols. In 2021 more than 5,000 people used Global Symbols each month, with an increasingly global outreach.

Problem targeted
Symbols used to support augmentative and alternative forms of communication are often misrepresented and do not fit in multicultural contexts.

Solution, innovation, and impact
Global Symbols includes four key features: (1) Symbol Sets, (2) Board Builder, (3) Symbol Creator, and (4) training. The open-source store consists of multilingual graphic symbols to support individuals with complex communication needs. Symbol Sets are available on the website for free, reflect various languages and cultures, and mainly cover daily objects, commonly used adjectives, and words. The Board Builder allows users to add their own symbols to create customizable charts or boards. There are readily available templates, or a user can create their own from scratch. With the Symbol Creator, users can create new symbols by importing images and adding or resizing various shapes. Together with UNICEF, Global Symbols has developed a detailed free and open-licensed training programme on using and creating new symbols. The two organizations are currently working together in Croatia, Montenegro, and Serbia, and have started work in Bulgaria and Turkey. In 2021, Global Symbols also began a project in the slums outside Nairobi, Kenya. Since the website's launch in 2017, site visitors increased from 66 in the first month to some 5,000 users per month in 2021.

> "Global Symbols helps ensure that the right to communicate is not denied to those without a voice."
>
> David Banes and E. A. Draffan,
> Directors, Global Symbols CIC

Mr. David Banes
davidbanes@hotmail.com – www.globalsymbols.com

How to describe your symptoms to your doctors without speaking their language.

Outlook, transferability, and funding
Global Systems has a low-cost funding model. The cost to sustain the project is about €3,000 and the development budget is €20,000 per year, both covered through sponsorships. In the next three years Global Systems aims to add a minimum of three symbol sets from different languages each year; to develop technology integration to facilitate the use of the symbols in a more diverse range of products; and to establish a sponsorship programme to build sustainable income.

FACTS & FIGURES Start: 2017

- Between 2017 and 2021 over 2,000 people used the Board Builder app to create communication boards.
- In 2021 the training programme had 280 learners from 30 countries.
- *A practice related to ICT.*

Accurate navigation system for the blind and visually impaired to improve public services

UNITED KINGDOM/WAYMAP ORIENTATION APP

Waymap, an IT start-up company based in the Greater London area of the United Kingdom, enables both indoor and outdoor orientation for the blind and visually impaired with a location accuracy of one meter. Users choose their destination on a smartphone app and the route is automatically created, considering their preferences for mobility, routing, and instructions. In 2021, Waymap worked with public transport companies in the United Kingdom and the United States, who pay for these services. The app is free for the end user.

Problem targeted
Navigating indoor and outdoor spaces is a challenge for people who are blind or have a visual impairment. Moreover, other approaches such as GPS and beacons often lack accuracy and reliability.

Solution, innovation, and impact
Waymap is targeted towards public transport companies that offer it as a personal navigation application to their customers with disabilities for free. The app guides and supports people both indoors and outdoors while delivering real-time orientation. It has an accuracy of up to one metre. Waymap supports anyone whether they have a disability or are simply unfamiliar with the location or lack confidence in travelling. It uses the existing sensors on smartphones that measure movement, direction, and elevation to navigate via dead-reckoning, a process of calculating current position. This technology has the advantage of requiring no technical infrastructure on location, such as beacons. Now available at five locations in the United Kingdom and in North America, 50 people are currently using the app; and a grand scale rollout was planned in the Washington, DC, area in 2021. Waymap is following the CTA Standard 2076, which specifies requirements for the design of inclusive audio-based network navigation systems.

> "Waymap will change lives by making our breakthrough technology available to as many people as we can."
>
> Ethan Brooks, Director of External Affairs Waymap

Mr. Ethan Brooks
ethan.brooks@waymap.org – www.waymap.org

Using the highly accurate personal navigation map.

Outlook, transferability, and funding
Waymap's business model charges transit authorities an initial fee to map the venue and then a monthly subscription fee for continuing access to the technology. The application is free for users and is available on both the Apple App Store and Google Play. By 2024, Waymap aims to achieve annual revenues of over €35 million, focusing on contracts with city transport networks across North America and Europe. Waymap also plans to partner with health care providers, museums, offices, and universities.

FACTS & FIGURES Start: 2019

- 50 people were using the app in mid-2021 during the pilot phase.
- In 2021, Waymap was working with five public transport providers in the UK and the US.
- *A project related to ICT.*

Talking camera app for people who are blind using AI and augmented reality

UNITED STATES/MICROSOFT – SEEING AI

Microsoft Inc., the ICT-multinational company, developed Seeing AI, a free mobile talking camera app using Artificial Intelligence and augmented reality. The app helps people who are blind or have low vision to know more about who and what is around them. It assists users to perform daily tasks, such as reading a document, recognizing people, or identifying products. Seeing AI is available in 70 countries and nine languages and has assisted with over 20 million tasks.

Problem targeted
There are few free tools available to convert visual information into audio in multiple languages.

Solution, innovation, and impact
The Seeing AI app is available on iPhones and iPads. Users download the free app and can select a variety of functions to support them to complete tasks, such as reading text and handwriting, recognizing known people, distinguishing between currencies, and detecting colours and light. Users just hold up their phone or take a photo to hear a description of what is captured by the camera.

The app was developed with academic researchers and the blind community, being continually tested with a diverse user-base around the world with the help of NGOs.

Seeing AI is fully compatible with screen readers, and it supports higher contrast colours and larger font sizes for increased legibility. It is currently available on iPhones and iPads in nine languages: English, Dutch, French, German, Italian, Japanese, Turkish, Spanish, and (Brazilian) Portuguese.

> "At Seeing AI we are always talking to people with visual impairments to understand their challenges."
>
> Saqib Shaikh, Founder and Lead for Seeing AI

Seeing AI was originally created for people who are blind or have low vision, but it is also benefitting people with learning difficulties and English language learners. An estimated 20 million tasks have been completed with Seeing AI in 70 countries from 2017 to 2020.

Mr. Saqib Shaikh
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Microsoft Seeing AI Engineer Saqib Shaikh photographed at Studio C on the Microsoft campus.

Outlook, transferability, and funding
The app was developed by the Tech-for-Good team, which is part of Microsoft's AI Ethics & Society group. The group combines emerging technologies with human-centred experience to design and build ICT solutions. The team considers disability to be a driver of innovation, believing that solutions using inclusive design for persons with disabilities will eventually become mainstream for all customers.

The Tech-for-Good team will continue to work with the blind community to develop and refine solutions that leverage the latest technologies to support independent living.

FACTS & FIGURES Start: 2017

- Seeing AI is available in 70 countries.
- The app added seven new languages in 2020, which brings the total to 16.
- *A project related to ICT.*

From Innovative Solutions to Availabe and Affordable Technology

How innovative solutions can be transfered and upscaled

OVERCOMING BARRIERS, ADAPTING TO CONTEXT, SYSTEM THINKING

How innovations are (can be) disseminated and made accessible to other uses and different countries. An overview of different pathways and concepts, their pros and cons, and GAATO's approach and role.

By Evert-Jan Hoogerwerf and Luc de Witte

The rapid development of technology offers huge new opportunities for the empowerment, participation, and inclusion of persons with disabilities and older people. The case reports presented in this publication show a wide variety of experiences from very different parts of the world using different technologies. They highlight how organizations and companies are being creative in finding new ways of deploying technology in innovative products and services for the benefit of the users and of wider society. These technologies and innovations can improve lives, promote economic activities, and contribute to the development of more inclusive and sustainable societies.

"The development and adoption of an innovation is determined by many factors – e.g., technological, financial, infrastructural, human, linguistic, and cultural – as well as by capacity-related challenges."

Many solutions remain small and local

Despite such bright promise, however, the reality of making innovations available to those who can benefit from them is far from easy. Many of the solutions presented will only become available locally and on a small scale. How can these and other initiatives be scaled up and transferred to other settings, other countries, and other continents? These are urgent questions when looking at the many great ideas presented here.

It has to be recognized that a lot of creativity, energy, and economic resources have gone into the development of these innovations. It is therefore obvious that scaling up and transferring them to other contexts would be extremely worthwhile. For scaling up 'in place' this is definitely true; and, if well managed, such local scaling up would result in many more people benefitting from a particular innovation as well as greater economy of scale.

But transferring innovations to other geographical contexts is much more difficult. Research by AAATE, EASPD, and AIAS in the European Project ProACT on technology supporting integrated care showed that, notwithstanding the fact that the European Commission has been funding research in this field for many years, "there are very few documented experiences related to transferability of digital solutions for integrated care from one European region/country to another, with most of the digital solutions being created ad-hoc to support the implementation of integrated care in the specific settings."[1] The same is true for many non-digital innovations; even for simple 'traditional' technologies it is hard to cross borders.

Barriers to the transfer of innovations

The main reason for this difficulty is that the development and adoption of an innovation, in particular when it is not just about products but especially about services, is determined by many factors – e.g., technological, financial, infrastructural, human, linguistic, and cultural – as well as by capacity-related challenges. Ideas and concepts are easier to transfer, to appreciate, to remodel, to adapt, and to develop and implement locally than ready-made and immutable products and services.

An exception to this are the big disruptive innovations perceived as particularly useful by the large majority of the general population and that have had global impact (e.g., the Internet, mobile communication, Global Positioning Systems, Internet of Things, Artificial Intelligence, etc.). These technologies are of

1 Maite Ferrando, Asel Kadyrbaeva, and Evert-Jan Hoogerwerf, "Transferability of digital solutions enhancing integrated care across Europe: Identifying and prioritising barriers and enablers," ProACT Project, 2019.

a different nature, but have allowed for the development of the innovative products and services that are presented in this report.[2]

Another important reason why it is so difficult to scale up and out is the fact that most of the inventors of new solutions are individuals, small companies, or NGOs. These simply do not have the capacity in terms of expertise and financial resources to deal with the many complexities of bringing their innovations to the next level. And the Assistive Technology market is not characterised by big companies and investors.

Adopting context plays a crucial role

Many of the factors that impact the transfer of innovations from one part of the world to another are known. Some impact more on the transfer process itself, such as financial factors, legislation, trade barriers, industrial standards, product certification, and market protection, but the majority of factors have to do with the compatibility of the innovation with factors in the adopting context.

For example, the way services are organized in countries can vary greatly, as well as what the direct beneficiaries expect from an innovation, or the acceptance of the innovation by the general population. Also, the roles and responsibilities in society and what is expected from professionals in the private and public sector, as well as from politicians and policy makers, can be very different. Finally, there might be a lack of competences to actually implement the innovation.

These various factors cannot possibly be tackled by any of the people or organizations behind the 15 examples presented in this report. Thus, the question is how we can change that. Probably an international support programme is needed to identify the most promising innovations being developed in different parts of the world (such as the Zero Project is

THE TRANSFER AND UPSCALING OF INNOVATIONS ARE A HUMAN RIGHT

An important driver for spreading and transferring innovation comes from the Convention on the Rights of Persons with Disabilities. Article 32 on International Cooperation notes that all States will:

"recognize the importance of international cooperation and its promotion, in support of national efforts for the realization of the purpose and objectives of the present Convention and will undertake appropriate and effective measures in this regard, between and among States and, as appropriate, in partnership with relevant international and regional organizations and civil society, in particular organizations of persons with disabilities. Such measures could include, inter alia:

a) Ensuring that international cooperation, including international development programmes, is inclusive of and accessible to persons with disabilities;

b) Facilitating and supporting capacity-building, including through the exchange and sharing of information, experiences, training programmes and best practices;

c) Facilitating cooperation in research and access to scientific and technical knowledge;

d) Providing, as appropriate, technical and economic assistance, including by facilitating access to and sharing of accessible and assistive technologies, and through the transfer of technologies."

2 For further reading, see World Intellectual Property Organization, "Assistive technology: WIPO Technology Trends 2021."

doing), and then actively support these innovations with expertise, guidance, financial means if needed, evaluation research, etc.

The phases for a successful transfer

The existence of such complex factors does not mean that the transfer of innovation in Assistive Technology is impossible, but simply that success or failure will be determined by the awareness of the role of these factors and the ability to address them. This requires careful management, but also the breaking down of the process into specific phases.

A first phase involves the conceptualization of a possible innovation, during which the innovation is matched with the local needs and target groups. The early involvement of an innovation's potential beneficiaries is definitely a core factor for success, as they are the ones who will have to believe in the innovation and to adopt it once it becomes available. Also, the compatibility with existing legal and cultural frameworks has to be considered.

The importance of contextualization

During the next phase the keyword is 'contextualization'. During this phase the innovation's compatibility with existing practices and procedures will have to be assessed. It is important that clarity is created about who does what and how the innovation will affect how systems are currently organized. The expected primary and secondary benefits will have to be defined, but also the potential risks. As an outcome of this analysis, it will be clear which parts of the innovation can be transferred as is, but also which parts will have to be adapted.

During the actual implementation phase, the human factors tend to be the most important. Does the innovation lead to more and better jobs, especially for persons with disabilities? Is the design such that all accessibility issues are addressed? Training in the use of new products or the delivery of new services will have to be addressed, as well as changing existing organizational patterns.

Finally, thinking has to go into how the outcomes and impacts of the innovation will be assessed and measured. Important questions are whether the transferred innovation obtains the same or even better results than what it seeks to replace, and to what extent these factors can be analysed and 'predicted' in an early stage of development of the innovation. That would help a developer to remove in the design stage all potential barriers for access, upscaling, and transfer. This concept is well represented in the Universal Design approach to the development of products and services, and AT developers should take these principles as a useful guide. However, as mentioned earlier, this requires a lot of expertise and resources.

"AT developers should take Universal Design principles as a useful guide."

System thinking can be an answer

The transfer of innovation is a fascinating process that should be incentivised. An answer to the challenges described can be found in 'system thinking'. Among many other meanings, more related to the logical ordering of concepts, system thinking is a way of thinking that recognizes the fact that no one can solve the challenges alone, but rather that people and organizations (stakeholders) need each other to achieve outcomes that are greater than the value of any single contribution.

This means that there is a need to create appropriate networks and infrastructural elements to facilitate the transfer of innovation, and that communication, collaboration, and consensus (not 'standardization') are important elements to consider.

Fortunately, we do not need to start from scratch. GAATO itself is an example of how organizations can collaborate to increase the potential impact that each of its single members could make.

A clear example was the implementation of a global consensus-building process on grand challenges in Assistive Technology related to outcomes and impacts, as reflected in a recent report by Natasha Layton and Emma Smith (see "Further reading"). None of the members of GAATO would have been able to implement this process alone, but as a global network it suddenly became possible. The collaboration with the Zero Project provides another opportunity to start to address the challenges of upscaling and transferring innovative experiences in Assistive Technology more systematically, and ways should be sought on how to do that.

Key concepts of Assistive Technology

FROM INDEPENDENCE AND INCLUSION TO OUTCOME AND IMPACT

What is important to understand? What should be absolutely avoided? What social and technological trends will drive further development? The following are the main concepts currently driving engagement with Assistive Technology.

By Evert-Jan Hoogerwerf

AT increases independence and inclusion

Assistive Technology (AT) does not just compensate for an impairment, it is the gateway to major independence and inclusion. It supports the fulfilment of the right to access the opportunities that are available in society, including in the areas of education, employment, housing, public transport, leisure, the Internet and other digital environments, and independent living.

AT promotes well-being and self-determination

Effective AT use fosters mental well-being as it fosters self-determination, control over one's life, and independence in making choices. Some users and organizations associate AT with freedom, and speak about 'freedom tech'. It is well understood that increased self-efficacy and self-worth lead to a higher quality of life.

AT must be appropriate for its users

AT that is not appropriate for a particular user carries the risk of doing more harm than good. Personalised AT that is not well selected might be unusable, or even unsafe, and insisting on its use will increase frustration and early abandonment. For that reason, users of AT should be in the position to rely on professional support and services, as well as independent advice and assessments in experienced AT centres. Well trained professionals will not choose AT for users, but will provide the necessary support to allow users to choose the AT solutions that are compatible with their own goals, desires, capabilities, and environmental constraints, as well as advise them on the AT's availability.

AT generates outcome and impact

Users of AT will be perfectly able to explain how AT has changed their lives, but for society and for policy makers it is also important that outcomes at both the individual and societal level are well documented.

There is evidence that appropriate AT provision and related services lead to important savings over the longer term. AT users will need less support than those in similar conditions not using AT. Unfortunately, decisions regarding the purchase of AT are often made looking just at the initial cost of the service or device. Looking at the wider quantifiable and non-quantifiable benefits of appropriate AT most often demonstrates the worth of such an investment.

AT is perceived differently today

In the past, AT devices were often unattractive, stigmatizing, and poorly designed from an aesthetic point of view. Fortunately, this is changing rapidly due to the advancement in digital technologies that make AT solutions smaller, lighter, more similar to mainstream technologies, and sometimes even trendy. With the advancement of high-tech consumer goods such as tablet PCs and smartphones with built-in accessibility features, the distinction between AT and mainstream devices is increasingly blurred. With the wider societal acceptance of disability, the emancipation of people with disabilities, and the breakthrough of concepts such as "differently able" in sports and culture, AT users of high-tech solutions are perceived in a much more positive way than before.

AT is an emerging technology

Developments in technology are very rapid, which will enable new solutions for people who experience difficulties in their daily lives. Artificial Intelligence, new materials, robotics, smart sensors, and many other technologies will be implemented in new assistive devices and related services, offering great potential to reach the ideal that no one is left behind. An important challenge, however, is to ensure that such new developments and innovations will not lead to more inequality and that they will be available and accessible to all.

Further reading and a selection of resources

The following sources have been cited or referenced in this publication and are an excellent resource to gain further information and insight on the topics of implementation of the UN Disability Rights Convention and Assistive Technology in particular.

By Friedrich Ruhm Perdomo

Policy and systems

Assistive products for persons with disability — Classification and terminology (ISO 9999). Geneva: International Organization for Standardization (2022), iso.org/standard/72464.html.

AAATE/EASTIN (2013), "Service delivery systems for assistive technology in Europe: An AAATE/EASTIN position paper," Technology and Disability 25(3), 127–46, aaate.net/wp-content/uploads/sites/12/2016/02/ATServiceDelivery_PositionPaper.pdf.

Convention on the Rights of Persons with Disabilities (CRPD) (New York: United Nations Department of Economic and Social Affairs, 2006), un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html.

Desmond, D. et al. (2018), "Assistive technology and people: A position paper from the first global research, innovation and education on assistive technology (GREAT) summit," Disability and Rehabilitation: Assistive Technology 13:5, 437–44, DOI: 10.1080/17483107.2018.1471169.

EASPD network (2021), "Technology in Social Care and Support Services" (A policy paper from the Person-centred Technology Membership Forum of EASPD), easpd.eu/fileadmin/user_upload/Publications/EASPD_PCT_paper.pdf.

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Layton, N. et al. (2020), "Opening the GATE: Systems thinking from the global assistive technology alliance," Disability and Rehabilitation: Assistive Technology.

UNICEF (2015), "Assistive technology for children with disabilities: Creating opportunities for education, inclusion and participation" (a discussion paper).

WHO, UNICEF (2022), "Global Report on Assistive Technology (GReAT)," who.int/teams/health-product-policy-and-standards/assistive-and-medical-technology/assistive-technology/global-report-on-assistive-technology unicef.org/reports/global-report-assistive-technology.

Handbooks

Albert M. Cook, Janice Miller Polgar, Pedro Encarnação (2019), "Assistive Technologies: Principles and Practice," 5th edition (Elsevier, also available as E-Book).

Stefano Federici and Marcia Scherer, eds. (2018), "Assistive Technology Assessment Handbook (CRC Press).

Innovations

Abdi, S. et al. (2021), "Emerging technologies and their potential for generating new assistive technologies," *Assistive Technology* 33:sup1, 17–26, DOI: 10.1080/10400435.2021.1945704.

World Intellectual Property Organization (2021), "Assistive Technology" in "WIPO Technology Trends 2021," wipo.int/publications/en/details.jsp?id=4541.

Product repositories and databases

The EASTIN database, eastin.eu

GPII Unified listing, ul.gpii.net

Zero Project Database, zeroproject.org

Organizations and communities

Over the last decade the World Health Organization (WHO) and its GATE initiative and community have systematically engaged in the development of policies, strategies, and tools for wider AT use worldwide. Coordinated by the head office in Geneva, the approach is valuing the contribution of all stakeholders, including end users, professional organizations, academia, NGOs, and government representatives. See who.int/news-room/fact-sheets/detail/assistive-technology.

The Global Alliance of Assistive Technology Organizations (GAATO) is uniting the major AT professional organizations in the world. The Alliance is a non-profit association of AT-focussed membership organizations, including: AAATE, AATA, ARATA, ATIA, EASTIN, IAAT, ISPO, RESJA, RESKO, RESNA, and TREATS. GAATO is also collaborating with a variety of other global players to foster the advancement of AT worldwide. gaato.org.

The Association for the Advancement of Assistive Technology in Europe (AAATE) is the European umbrella organization of AT institutes, organizations, and individual experts. aaate.net

The European Association of Service Providers of Persons with Disabilities (EASPD) is a major European NGO working for better person-centred services inspired by the CRPD. Its Person-Centred Technology Membership Forum is a resource for all 17,000 services referring to EASPD for innovative approaches. easpd.eu

The Zero Project is working for a world with zero barriers and dedicated to the implementation of the UN CRPD. Since its start in 2003 more than 700 innovative practices and policies that can improve the daily lives and legal rights of all persons with disabilities have been identified and shared worldwide. Today, the Project's global network comprises more than 9,000 experts worldwide. zeroproject.org

#ZeroProject – join the Net-work!

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