



Leveraging the Potential of Mobile for Persons with Disabilities

Scoping Study

November 2018



The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences

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Acronyms

AAC	Augmentative and Alternative Communication
AI	Artificial Intelligence
AT	Assistive Technology
DPOs	Disabled People's Organisations
ICF	International Classification of Functioning, Disability and Health
ICT	Information and Communication Technology
KII	Key Informant Interviews
MNO	Mobile Network Operator
PWD	Persons with Disabilities



Introduction

“Everybody will have a disability at some point in their life.”

– **Holger Dieterich, founder, Wheelmap.org**

“Smartphones have opened up a world for me.”

– **Trevor Palmer, director - www.g1100services.com; trustee - Disability Wales and See Around Britain**

Executive Summary

An estimated one billion people globally suffer from some form of disability, 80 per cent of whom live in emerging markets.¹

Currently, persons with disabilities (PWD) in these countries face a range of barriers, including isolation and discrimination, lack of community and institutional support, and a general lack of awareness of both the disability itself and mitigation strategies. Insufficient access to ICT exacerbates these challenges and efforts of stakeholders are often inadequate and misaligned.

The ubiquity, affordability and innovation of mobile technology have the potential to improve the lives of PWD. By providing access to communication and information, mobile phones and related services could facilitate more inclusive participation in society and tackle the barriers PWD face.

The GSMA Mobile for Development (M4D) department could help to ensure that the benefits of mobile technology are fully leveraged and shared by PWD in emerging markets, and that mobile providers are working to make their services accessible for all.

1. World Health Organization and World Bank, 2011

Context

An estimated one billion people globally² live with a disability.

With the explicit inclusion of disability³ in the 17 Sustainable Development Goals (SDGs) in the 2030 Agenda for Sustainable Development, the topic is gaining momentum in both the public and private sector.

According to WHO estimates, 80 per cent of persons with disabilities (PWD) live in developing countries, and World Bank estimates show that 20 per cent of the world's poorest have a disability. The consequences of disabilities include fewer educational opportunities, lower employment rates, widespread discrimination and higher poverty levels, making PWD vulnerable and marginalised. It has been estimated that 90 per cent of children with disabilities in developing countries do not attend school,⁴ that unemployment levels for PWD can reach up to 80 per cent in some countries,⁵ and that children with disabilities are 3.7 times more likely to be victims of violence.⁶



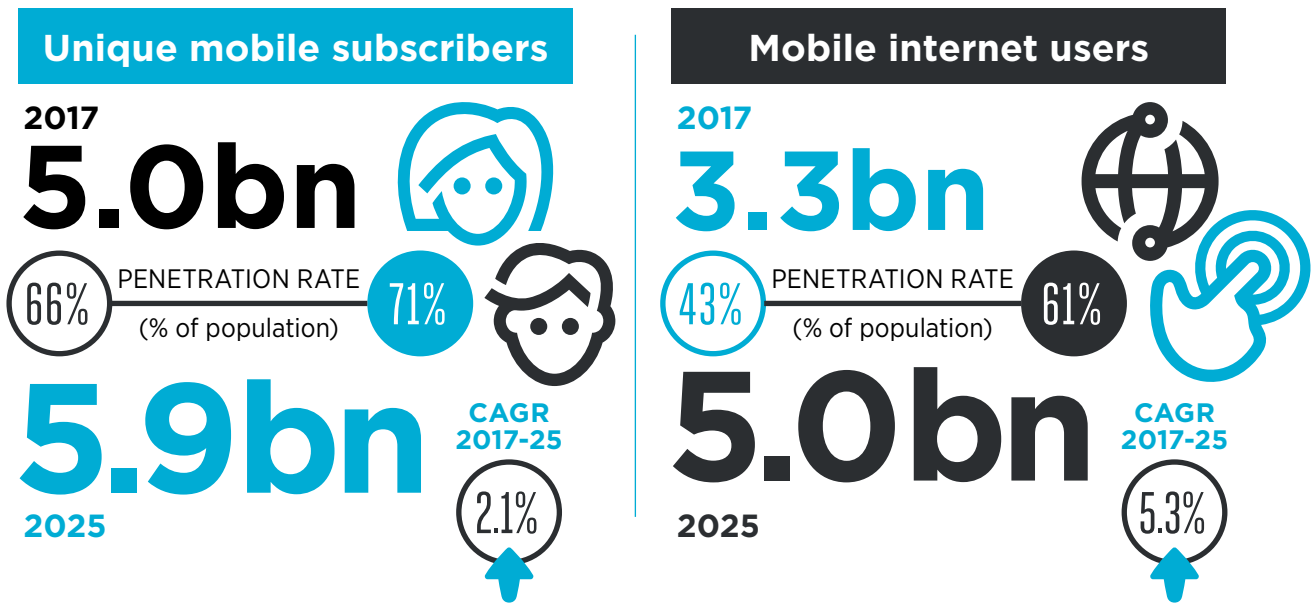
2. World Health Organization and World Bank, 2011
 3. Specifically, in SDG 4, 8, 10, 11 and 17
 4. UNICEF, 2014
 5. International Labour Organization, 2002
 6. World Health Organization, 2012

What is a disability?

The definition of disability greatly influences who is identified as a person with a disability. The UN Convention on the Rights of Persons with Disabilities (CRPD) states in Article 1: “Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which — in interaction with various barriers — may hinder their full and effective participation in society on an equal basis with others.”⁷

This definition aligns well with the International Classification of Functioning, Disability and Health (ICF) of the World Health Organization’s “bio-psycho-social model”, which considers a disability a dynamic interaction between health conditions and contextual factors that can hinder full and effective participation in society.⁸ This classification connects a medical diagnosis with the context in which a person lives.

The mobile industry has reached five billion unique mobile subscribers⁹



In many low-income countries, mobile is becoming a delivery channel for public services, including social and health services. Across different regions and socio-economic status, it is becoming a ubiquitous and pervasive technology that could improve the lives of PWD by alleviating some of the barriers they face and promoting greater inclusion.

7. United Nations, 2001
 8. World Health Organization and World Bank, 2011
 9. GSMA, 2018



By bringing together mobile providers, tech innovators, the development community and governments, the GSMA Mobile for Development (M4D) department could help to ensure the benefits of mobile technology are fully shared by PWD in emerging markets.

Objectives

The objectives of this report are three-fold:

- To gather insights on the current ecosystem, including the issues PWD face today and how mobile technology could improve their lives;
- To map promising initiatives and start-ups in the field of mobile technology and disability, both in emerging and developed markets; and
- To identify key areas of focus for the GSMA Mobile for Development team, both in terms of research and insights and providing technical advice.

Methodology

A three-step methodological approach was followed:

- 1** Review of existing research;
- 2** Key informant interviews (KIIs) with ecosystem actors; and
- 3** KIIs with persons with disabilities (PWD) in five emerging markets.

The review included existing research and reports on disability and mobile by the World Health Organization (WHO), The World Bank, The Global Initiative for Inclusive ICTs-G3ICT, Handicap International, International Telecommunication Union (ITU) and others.

The analysis was complemented with KIIs with ecosystem actors expert in the field of mobile technology and/or disability. A list of interviewees and detailed bibliography are available in Appendix I and III. Stakeholders were selected based on their relevance in their respective field and category (MNO, NGO, start-up, international agency, etc.) to provide a broad view of the ecosystem.

Twenty-six interviews were conducted: eight with start-ups, six with disability associations, four with MNOs, three with international organisations, two with experts, one with a foundation, one with an accelerator and one with a tech giant. The aim was to map the existing ecosystem in terms of actors, initiatives and main areas of intervention.



Face-to-face KILs with PWD were conducted in five selected countries: Kenya, Mali, Ghana, Tunisia and Afghanistan. In total, 60 people with different types of disabilities (mobility impairment, visual impairment, etc.) were interviewed, with at least seven interviews per country.

To create as representative a sample as possible, interviewees were selected as much as possible to capture people with a variety of disabilities and a balance of gender and geography (rural and urban).

The main objective of the in-country interviews was to identify context-specific barriers related to disability and/or mobile that PWD face in their daily lives.



Existing Barriers in Emerging Markets

Persons with disabilities in emerging markets are particularly vulnerable and face many barriers to full inclusion in social and economic life. Research has long shown that households with a disabled member are more likely to experience hardships, from scarce food and housing to limited access to water, poor sanitation and inadequate health care. These household-level challenges translate into community barriers, such as lower levels of education, employment and inclusion in society.

Five main barriers have been identified that exacerbate the challenges faced by PWD in low- and middle-income countries. Isolation, ICT accessibility, misalignment of efforts of actors in the ecosystem and lack of engagement of the private sector, are witnessed in most countries, but vary by geography, culture and socio-economic status. In emerging markets, these barriers are compounded by a general and widespread lack of awareness of disability issues, including the causes, the spectrum of different types of disabilities and the daily challenges faced by PWDs within society.



Lack of awareness

Isolation

Accessibility

Misalignment of efforts

Lack of engagement



Lack of Awareness

This is a multifaceted barrier that includes lack of awareness about the disability itself, existing initiatives to aid with impairments and inclusion issues for PWD. This lack of awareness affects not only the individual, but also their community and broader society.

INDIVIDUAL LEVEL

PWD in emerging markets are often not fully aware of the extent of their disability and the initiatives available to support them.

PWD often never visit a practitioner. In case of accidents, the practitioner is typically consulted directly after the event, but no adequate follow-up is scheduled.

“...I was a soldier and I got badly injured: I got injuries on head and my left side body got paralyzed. [...] I was not able to walk and sometimes I was suddenly attacked internally and would go unconscious and fall down. (...) doctors only helped me when I was injured 30 years ago [since then no medical support was provided]”

- Interviewee #2, Afghanistan

This experience is more common among those with mental and cognitive impairments, which are harder to identify and are often heavily stigmatised in some communities.

“The intersection between mental illness and culture is an issue. If you have a mental illness for example it might be perceived maybe it is because you didn't pay a dowry. Mental illness is seen as a punishment for having done something bad or omitted to do something you are supposed to within your cultural context. So, people with mental illness might not seek any form of support or help and may choose to address the issue by paying the dowry”

- Michael Njenga, Users and Survivors of Psychiatry in Kenya

When a doctor is consulted, the diagnosis tends to be inconsistent across patients and countries. The WHO¹⁰ has reported a lack of a standardised approach to diagnosis and patient care. In 2001, the WHO adopted the International Classification of Functioning, Disability and Health (ICF), which provides a standard for health and disability statistics and harmonises approaches across sources of disability data.

“From the professional’s side, so far there is no good way to capture the person’s disability because health practitioners perceive it as cumbersome and because everybody is not used to the ICF.”

– Stefanus Snyman, Functioning and Disability Reference Group of WHO & ICF Mobile

Lack of awareness at the individual level also extends to a lack of disability initiatives and associations. Many PWD who were interviewed, especially in Afghanistan, reported extremely limited knowledge of disability associations, disabled people’s organisations (DPOs), government initiatives, or devices and applications that could provide support.

“I do not know if there are any associations that help disabled people: I have never looked for and do not know about it.”

– Interviewee #2, Afghanistan

COMMUNITY LEVEL

Including PWD in education, work and social settings was reported as a challenge across countries. One reason for this, other than lack of effort and cultural reasons, was lack of awareness in the community about practical ways to meet the needs of PWD. For instance, “less than 2% of deaf persons go to university in Ecuador and most of them quit because universities cannot cope with PWD.”¹¹

SOCIETY LEVEL

A complete lack of recent data on disability, such as statistics, categories or geography, has been reported. Practitioners and policymaking associations are not aware of how many PWD there are, where they are located and the nature of the disability. “So far data is collected from scratch, every time there is the need. There is no real-time data available and what is available doesn’t facilitate holistic management.”¹²

10. World Health Organization and World Bank, 2011

11. Interview: Hugo Jacome, SpeakLiz

12. Interview: Stefanus Snyman, Functioning and Disability Reference Group of WHO & ICF Mobile



Isolation

Persons with disabilities are often isolated from their community, but to varying degrees, from lacking communities of peers to stigmatisation and discrimination that can lead to mistreatment and violence.

A general lack of communities of peers with similar disabilities with whom one can share experiences and stories is a main barrier for PWD. In some cases, there is lack of awareness of existing communities, but more often there are no support groups and no peers who understand the situation and could share advice and best practices.

“PWD can’t share their stories with one another. They feel alone. Especially if it’s children with disabilities.”

– **Stefanus Snyman, Reference Group WHO & ICF Mobile**

Discrimination in the form of prejudice, disrespect, but also violence and abuse against PWD, has long been documented by statistics and research. WHO estimates show that children with disabilities are 3.7 times more likely to be victims of violence and 2.9 times more likely to be victims of sexual violence. Children with mental or intellectual impairments are 4.6 times more exposed to the risk of sexual violence than their non-disabled peers.¹³

These statistics are particularly relevant in emerging markets, where stigma and exclusion can be common.

“The biggest issue people with disability face is more related to stigmatisation than anything else. We feel less than second-class citizens in our own country.”

– **Interviewee #1, Ghana**

Discrimination in some cases can reach extreme levels. Although legislation, norms and public campaigns have been trying to eradicate discriminatory behaviour, episodes of violence still occur in many countries.

In Ghana, for instance, psycho-social disabilities are associated with curses and demons. As a result, those with mental impairments are at times segregated in religious prayer camps where they have been reported to be mistreated, beaten and starved.

Albino persons also face a harsh environment. In several African countries, superstitious beliefs feed the idea that albino persons are not truly humans and that their body parts possess magical healing power. As a result, the market for their body parts is flourishing.

“For people with albinism, there is a lot of insecurity. We live in fear because we don’t know when someone will target us to harm us.”

– **Interviewee #6, Kenya**

13. World Health Organization, 2012



Accessibility

In emerging markets, ICT accessibility to both hardware and software has not been fully addressed and remains very limited.

In terms of software, most websites are not accessible for PWD, cutting off access to mainstream information and communication platforms.

Existing solutions such as apps are far from efficient and functional. Some still malfunction and could be improved. For instance, ICT accessibility tools, such as Android's Talkback,¹⁴ often do not function properly. Available languages are limited and may limit usage of accessibility features.

In terms of hardware, accessible devices and services are still perceived as expensive. Price remains a main barrier in developing countries as “affordability is the key to accessibility”.¹⁵ However, in an effort to provide equal access to information, some countries have adopted policies and regulations requiring accessible devices and services. Because of this, some device manufacturers have begun embedding accessible hardware and software in their products, which is lowering costs. There are also many examples of innovative apps that are now freely available, such as colour detectors or money readers for persons with visual impairments, or the screen reader that is now a default setting in most computers and phones.

Most accessibility features still rely on smartphones (as opposed to feature phones) given the processing power they require. However, in low- and middle-income countries, smartphones are still considered expensive and have a lower penetration rate. Smartphones represent only 34 per cent of total mobile connections in Sub-Saharan Africa and 52 per cent in Middle East and Northern African countries.¹⁶

“I use a feature phone to call family and friends. Keypads are small and not friendly so making and receiving phone calls sometimes is difficult. When I miss a call, I ask someone to assist me in calling the number back. I use memory to track my recently dialled numbers.”

- Interviewee #1, Ghana

“Mobile literacy” is another barrier to ICT accessibility. In general, elderly people and those with less education have a harder time using smartphones and electronic devices, such as PCs and tablets. This issue is more problematic for people with visual and cognitive impairments.

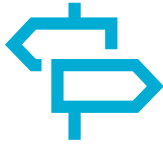
“I do not know a lot about mobile phones: I have given it to my child and he made the font large for me. This is the only service I use.”

- Interviewee #6, Kenya

14. Now renamed Android Accessibility Suite

15. Interview: Roxana Widmer-Iliescu, International Telecommunication Union (ITU)

16. GSMA, 2018



Misalignment of Efforts

Across all actors in the ecosystem, both in the disability and mobile technology sectors, efforts and initiatives are not aligned.

Stakeholders, from governments and disability associations to start-ups and tech companies, are working in silos and not communicating with each other, either within the same category or across types. In the health sector, practitioners often do not share information, forcing the patient to navigate different areas of services themselves. Government and policymaking bodies do not tend to involve disabled associations or DPOs in new policies and regulations, leading to solutions that are not truly inclusive or effective. “Software developers and start-ups often do not consult the end beneficiaries”,¹⁷ and therefore do not always respond to real needs.

In many cases, stakeholders are not aware of what is going on in the ecosystem. As a result, solutions are being developed separately without leveraging mutual findings.

“Even when organisations want to make their website accessible, they do not fully and effectively consult associations of PWD and this constitutes a huge gap in fully ensuring participation.”

– **Michael Njenga, Users and Survivors of Psychiatry in Kenya**



Lack of Engagement

Within the private sector, including mobile providers, lack of technical and commercial engagement often limits the potential market opportunity of products and services for PWD. Many companies, particularly MNOs, have not actively targeted PWD, and the initiatives they do have are often perceived as an economic burden, legal imposition or part of a CSR strategy.

The commercial potential of including PWD in a value proposition is often overlooked; therefore, private investments are often residual and private effort disappointing. This is even more regrettable as there are opportunities for positive reverse technology spillover: solutions developed for PWD could be relevant for a wider group of users and vice versa.

17. Interview: Alejandro Moledo, European Disability Forum

“It works both ways: new services for PWD can be created and scaled and then can be used for everybody and then vice versa.”

– **Jordi Arrufí, d-LAB**

For MNOs, “there is a lack of interest to support these services. Accessibility is not yet incorporated as a core aspect of the design process, just like security is.”¹⁸ However, a few MNOs are becoming increasingly active and vocal on the topic (see Safaricom case study).

CASE STUDY

Safaricom in Kenya



Safaricom exists to transform lives and this is the driving force behind everything they do. They recognized that the visually impaired/blind are at risk of being defrauded while using M-PESA. M-PESA is Safaricom’s Mobile Money Transfer Service that has become a way of life in Kenya.

With this in mind, Safaricom embarked on a journey to ensure their products and services are accessible to all. We all know that confidentiality is key when handling personal finance, a privilege that the visually impaired/blind do not fully enjoy. Hence the reason Safaricom innovated a solution to make M-PESA secure and accessible to all. The current solution has enabled the visually impaired/blind to check their M-PESA balance for free via IVR System with embedded voice biometrics. In addition, the mobile numbers for all Persons with Disability are whitelisted on Safaricom’s system, allowing priority routing for their calls to a dedicated customer care team. Safaricom intends to deliver M-PESA on Voice to make it fully accessible to the visually impaired/blind.

For most people, technology makes things easier but for persons with disability, technology makes things possible – a quote by Mary Pat Radabaugh (Director of IBM National Support Center for Persons with Disabilities, 1988)

18. Interview: Alejandro Moledo, European Disability Forum

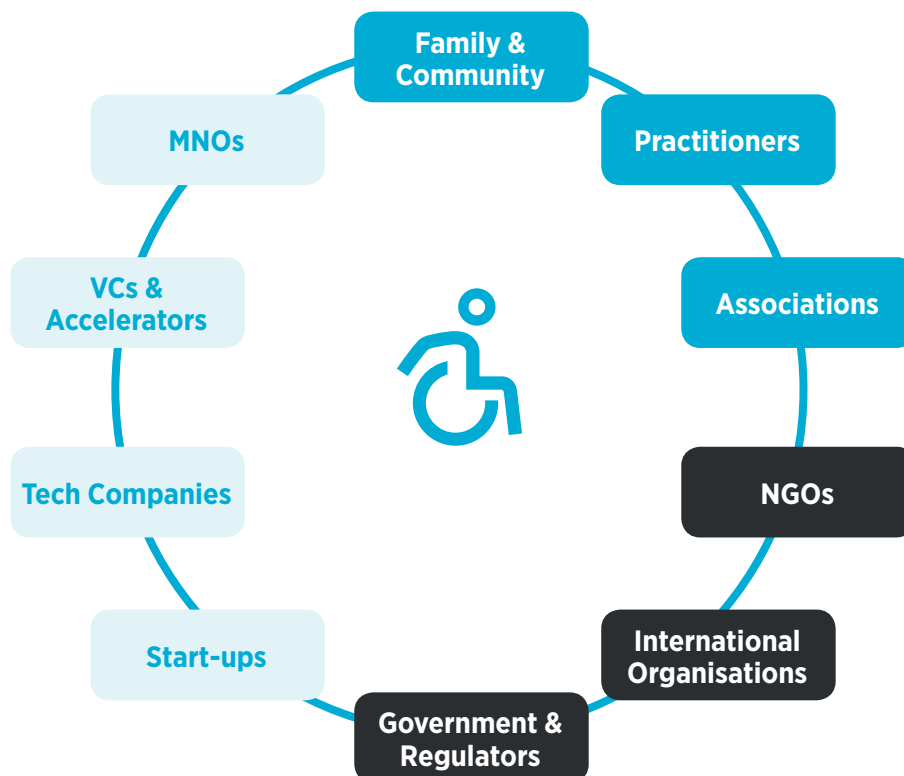


Global Ecosystem Mapping

Main Actors

Several categories of actors occupy the mobile technology and disability ecosystem. PWD, families, communities, practitioners, DPOs and disability associations, provide direct support, health services and advocacy. NGOs, international organisations and policymaking bodies concentrate on creating a supportive and positive ecosystem. Private sector actors, such as MNOs, tech companies and start-ups focus mainly on providing commercial services.

Mobile technology could improve the interactions between these actors and, in turn, improve the lives of PWD.



Current efforts can be categorised by intended area of impact and the focus of each actor:

1. Initiatives focused on ICT accessibility aim to ensure inclusiveness in communication and access to information.
2. Initiatives focused on mitigation refer to all initiatives aimed at improving the effects of a particular disability (i.e. inability to talk/see), including assistive technology (AT).
3. Initiatives focused on the social model of disability¹⁹ include activities aimed at improving the consequences of a disability, not the disability itself.



19. "The social model of disability says that disability is caused by the way society is organised, rather than by a person's impairment or difference. It looks at ways of removing barriers that restrict life choices for disabled people. When barriers are removed, disabled people can be independent and equal in society, with choice and control over their own lives." (<https://www.scope.org.uk/about-us/our-brand/social-model-of-disability>)



Accessibility (of ICT)

ICT accessibility is increasingly becoming a priority. The UN Convention on the Rights of Persons with Disabilities (CRPD) defines ICT accessibility as integral to general accessibility rights and just as relevant as physical accessibility.

“Access to ICT is a gate to access many services and to overcome barriers for PWD.”

– **Alejandro Moledo, European Disability Forum**

Accessibility refers to both communication (allowing PWD to communicate on a daily basis and in case of emergency) and information (access to mainstream information as well as services for PWD). According to the CRPD, any individual with disabilities must be able to access all devices, from mobile phones to computers.

Three broad categories of actors occupy this field. At a high level, regulators and international organisations define the norms and guidelines (e.g. CRPD, ITU guidelines) to include web accessibility as a standard feature in all ICT areas. “The approach promoted is of universality of design: not separate solutions for PWD and everybody else but inclusive applications”²⁰ that allow “everybody to have accessibility to every device.”²¹

Recently, there has been a particular focus on the mobile component of ICT accessibility. This is due to the ubiquity of mobile technology, but also the fact that mobile solutions such as apps usually have core functionalities that are easier to understand and use than web-based solutions.

There is also stronger operational involvement by software developers. Some design apps (e.g. EVA Facial Mouse,²² an app that allows a phone to be controlled by moving the head; Irisbond, see case study²³) or build features into the phone to ease access (e.g. Talkback,²⁴ the accessibility standard for Android).

Hardware developers focus mainly on manufacturing accessible mobile devices. A promising new field is home assistants, such as Google Home or Alexa, which are “easing the barriers to access the internet,”²⁵ allowing people to access and navigate the internet with their voice.

20. Interview: Benjamin Dard, CBM International

21. Interview: Alejandro Moledo, European Disability Forum

22. For more information: https://play.google.com/store/apps/details?id=com.crea_si.eviacam.service&hl=it

23. For more information, see www.irisbond.com and the case study in this report.

24. Now renamed Android Accessibility Suite

25. Interview: Tiernan Kenny, Wayfindr

CASE STUDY

Irisbond

IRISBOND

Irisbond is a Spanish start-up that has developed eye-tracking technology to allow visually impaired customers to access computers and mobile phones by moving their eyes.

Its main product uses **infrared eye-tracking technology** embedded in a hardware component combined with assistive technology (AT) software to intercept eye movement for computers and iPads.



A successful trial has been conducted with d-LAB and Twitter to allow **eye tracking with the phone's camera using an AI algorithm solution** without any specialised hardware required.

Irisbond has raised **USD 1.6 million**, mainly through grants and two funding rounds from regional Spanish venture capital firms, but more funding is required.

There are two potential impacts:

- **Lowering marginal costs:** Switching from hardware to software will make the technology more accessible.
- **Commercial opportunity:** The market includes not only PWD, but all mobile users for marketing purposes (i.e. tracking users' eye movement) and for operational purposes (i.e. jobs that require hands-free devices to be used, such as surgeons and factory workers).



Mitigation

Mitigation refers to activities and services directed at alleviating the impairments of a disability. Examples include navigation systems for the visually impaired and apps that translate sign languages for the hearing impaired.

Mitigation initiatives depend on the ubiquity of mobile phones and low service delivery costs. As global mobile penetration reaches 66 per cent,²⁶ “phones will be in the hands of even low-income people and the cost of being online is getting lower and lower.”²⁷ At the same time, service delivery via mobile is comparably more affordable as embedding solutions into phones through apps will lower the cost for end users. Switching “from hardware to software brings the marginal cost to zero.”²⁸

This field is heavily fragmented with many small start-ups and a few bigger tech companies. Start-ups provide different categories of services mainly through mobile apps: mapping, tracking, audio guides, communication tools, etc. Many of these apps may be considered a form of Assistive Technology²⁹ (AT) and can be categorised as Augmentative and Alternative Communication (AAC), such as Avaz³⁰ in India (see case study).

Start-ups are slowly gaining visibility thanks to some ad hoc events and grants. For instance, in 2015, Google.org launched a technology-based competition, the Google Impact Challenge, which focused on how technology could improve the lives and independence of PWD, and donated USD 20 million to promising initiatives. d-LAB’s challenge in 2017 was “Empowering people with disabilities through mobile technologies”. Funds received during these events are still considered a major source of income.

Bigger tech companies are becoming increasingly involved. For instance, Microsoft developed SeeingAI,³¹ an app that uses the phone camera and AI to describe surroundings to people with visual impairments. It can recognise people, situations and read texts. In many cases, the technology has been developed as a spillover from a more comprehensive market.

26. GSMA, 2018

27. Interview: Hans Jørgen Wiberg, Be My Eyes

28. Interview: Jordi Arrufi, d-LAB

29. There are various definitions of AT. We recommend using the definition of the Assistive Technology Industry Association (ATIA), which states that: “Assistive technology (AT) is any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities.”

30. For more information: <http://www.avazapp.com/>

31. For more information: <https://www.microsoft.com/en-us/seeing-ai>

CASE STUDY

Be My Eyes

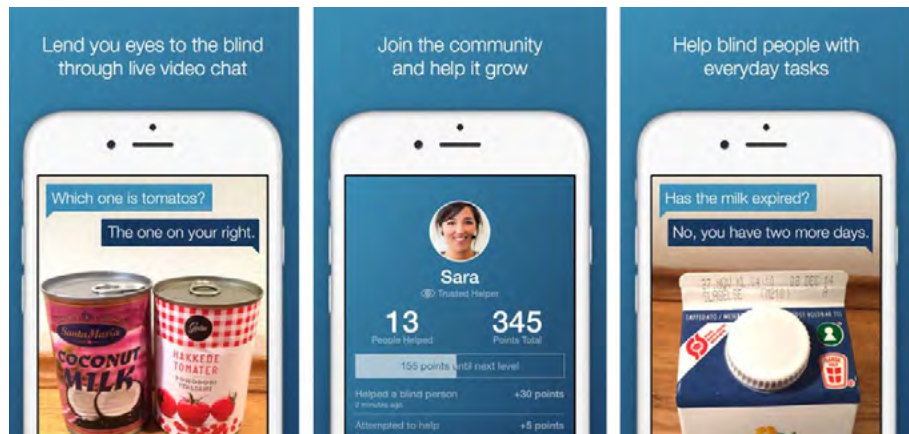


Be My Eyes

Be My Eyes is a Danish app that connects people with visual impairments to volunteers through the phone's camera to provide help with daily tasks (e.g. cooking, choosing appropriate medicine, visiting a website). The call is forwarded to a volunteer who has access to the camera visual and can provide information (e.g. the right medicine tablet to use).

850,000 visually impaired persons and 1.4 million volunteers have signed up. It is now partnering with Microsoft, Android and other tech companies to offer customised customer support for their visually impaired clients.

Although AI-based technology is evolving and web accessibility is becoming more mainstream, Be My Eyes will still be extremely relevant as it offers more accurate, context-based information and mitigates the limitations of web accessibility. Moreover, since the app only requires a smartphone and internet connection, **the potential market is very broad**, including low-income individuals.





Social Model of Disability

A broader category includes initiatives based on the social model of disability. These can be directly focused on PWD with tailored services to increase access to education, employment, health or to facilitate caregiving and peer-to-peer support.

For instance, Riziki³² is an online platform based in Kenya that helps job seekers with disabilities connect to the labour market. Care.com is an app that helps users find a caregiver for the elderly and PWD in 17 developed markets. There are many health apps available as well. A well-known one is iPharmacy, which helps people with cognitive impairments or their caregivers manage prescriptions. ICF Mobile³³ is an m-Health platform that, among other functionalities, creates online communities of peers to share experiences and stories.



32. For more information: <http://www.rizikikenya.or.ke/>

33. For more information: <http://icfmobile.org/>

CASE STUDY

ICF mobile



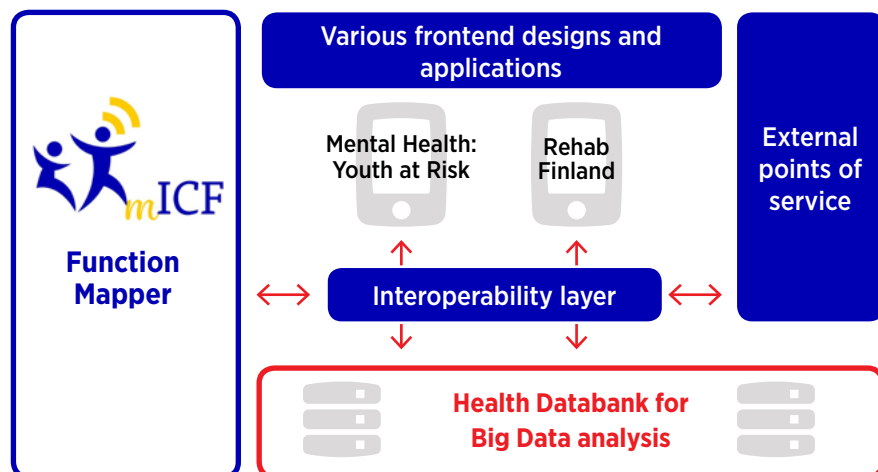
ICF Mobile is an m-Health platform aimed at PWD, practitioners and the overall ecosystem.

The mICF app allows:

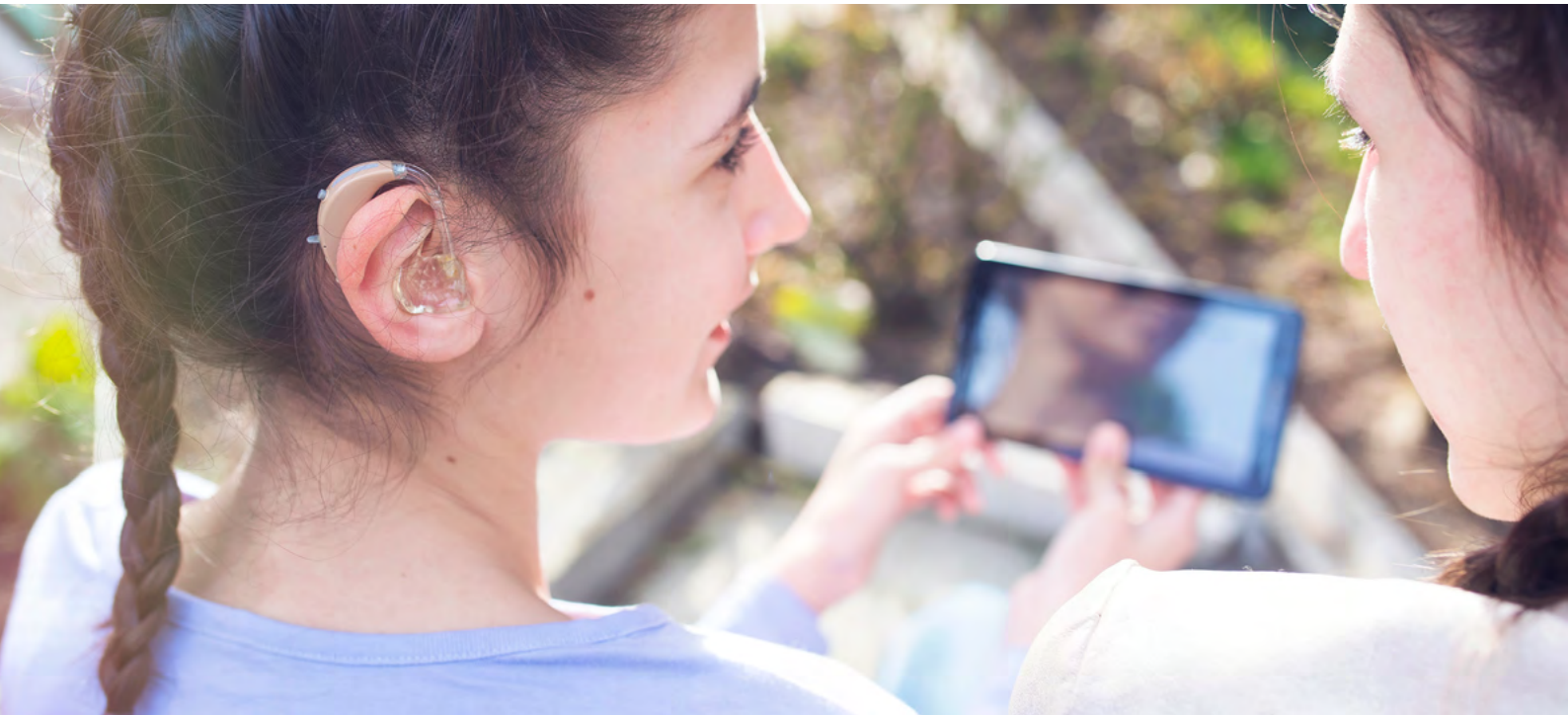
- **Practitioners** to universally classify disabilities in a standardised way;
- **Organisations** to map disabilities and collect data; and
- **PWD** to share their stories in a community and access useful, tailored information.

The app addresses two main barriers in emerging markets: **lack of information** on disability and the **isolation of PWD**. ICF Mobile collects information provided by users through their smartphones and processes it using sophisticated data analytics.

The app has the potential to be relevant for all kinds of disabilities and diseases, from cancer to autism. Through data analytics, the app could provide customised information to users (e.g. where to get healthy food in Nairobi), government and organisations (e.g. real-time data on disability) and practitioners (e.g. to analyse trends by geography and best practices).



In many cases, solutions that target the overall population could provide exponential benefits to PWD, such as food delivery services (e.g. Foodora), transport services (e.g. Uber), navigation apps (e.g. Google Maps), dating websites and home assistance devices.



Focus on Regulation

Regulators in the ecosystem have focused on accessibility at global and local levels for decades, promoting universal ICT access through web accessibility and device standards.

Globally, the main regulatory framework and reference point for legislation on PWD in all sectors is the 2006 United Nations Convention on the Rights of Persons with Disabilities (CRPD), which has been ratified by 190 countries. Article 9 requires State Parties “to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems”.³⁴

“CRPD should be the guide when working on technology. It is the reference that I use in whatever work I do. One principle presented is accessibility.”

– **Benjamin Dard, Global Advisor for Accessibility and Universal Design, CBM International**

International organisations are deeply engaged in ICT accessibility, promoting standards, policy and regulations, programmes and initiatives. Notably, the International Organization for Standardization (ISO), the International Telecommunication Union (ITU) and the World Wide Web Consortium (W3C) play an influential role in the ecosystem.

34. United Nation Convention on the Rights of Persons with Disabilities (CRPD), Article 9

“ITU looks at tackling Persons with Disabilities from an inclusive perspective, in terms of ICT accessibility.”³⁵ Therefore, ITU supports its members in developing and implementing laws, policies and practices that ensure affordable and accessible ICTs for all people, including PWD. One of their main goals is to promote accessible ICT that incorporates universal design as a key element in the process.

Universal design can be defined as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.”³⁶ This philosophy advocates not just developing solutions for PWD, but to make every product or service usable by all. For ICT accessibility, the Design for All approach promotes the application of the universal design principle in any computer and internet-based technology as a core part of the design phase, avoiding ad hoc adaptations after the fact.

ITU develops accessibility standards by creating training programmes and resources for governments to educate and support the implementation of ICT accessibility, including through presenting ICT accessibility as a potential business opportunity. ITU also raises awareness through its regional and international events or study group meetings that share best practices in ICT accessibility with its members.³⁷

Accessibility is also a key topic for national regulators who translate international directives, norms and guidelines into national norms. In Europe, the Accessibility Act is the first European standard on accessibility requirements for ICT, which includes accessibility requirements for different technologies (web, hardware, documents).

Disability associations also play a key role in accessibility issues, both in developed markets (e.g. European Disability Forum) and emerging markets (e.g. United Disabled Persons of Kenya and the African Disability Forum in Kenya).

It must be noted that despite some high-level efforts, regulation is still not comprehensive enough to ensure universal ICT accessibility. Enforcement is also extremely challenging as web developers lack the incentive and knowledge to apply accessibility standards in their work. Therefore, although some government websites have accessibility features, most local and “homemade” websites are not accessible for PWD.

35. Interview: Roxana Widmer-Iliescu, ITU

36. Ron Mace, Institute for Human Centered Design

37. ITU capacity building session on ICT accessibility: <https://www.itu.int/en/ITU-D/Study-Groups/2018-2021/Pages/meetings/session-Q7-1-sept18.aspx>



Focus on Tech Companies

Tech giants are increasing their efforts to include persons with disabilities. Accessibility features are now offered by Android and Apple.



All **Android phones include an Accessibility Suite** (previously known as Talkback), a screen reader that can be used by the visually impaired.



Apple's iPhone was the first smartphone to include accessibility features in its core design thanks to VoiceOver, Zoom, HomeKit and others.

AI-based technologies have also been developed by Google and Microsoft. These solutions can provide positive technological spillovers in different sectors.

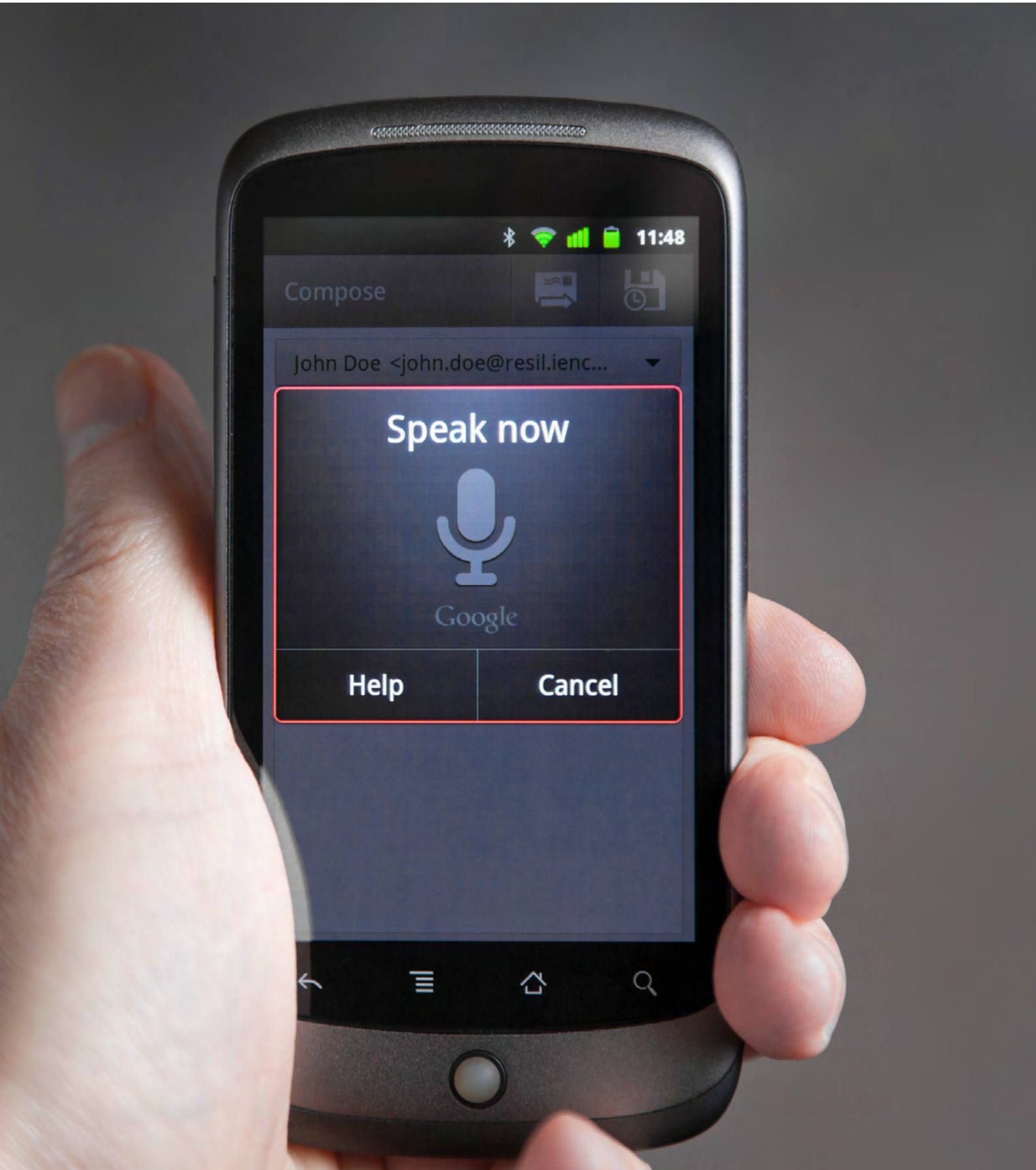


Microsoft has launched a free app for visually impaired persons (SeeingAI) that describes surroundings thanks to AI technology. The launch has been very promising: six months after release it has been downloaded over 100,000 times. Microsoft has also partnered with Be My Eyes to offer customer support to its blind customers.



Google is also looking into developing an AI camera for image recognition (Google Lens) and home assistance devices (Google Home). It has launched the Disability Impact Challenge,³⁸ awarding USD 20 million to the winners.

38. Google Impact Challenge: Disabilities, <https://www.google.org/impactchallenge/disabilities/index.html>





Focus on Start-ups³⁹

The start-up scene is characterised by a constellation of small start-ups that are difficult to identify. This fragmentation is exacerbated by the lack of a common repository or list of companies. The main characteristic these start-ups share is that many have taken part in ad hoc challenges (e.g. d-LAB, Google Impact Challenge, Chivas Venture, Zero Project).

The main challenges they address are related to “visible disabilities”, such as visual impairments (33 per cent), mobility impairments (25 per cent) and hearing impairments (18 per cent) as opposed to cognitive and intellectual impairments. Proposed initiatives mainly centre around mitigation, and many start-ups are working on the same solution, such as accessible maps, navigation for the visually impaired, closed captioning and screen readers for the hearing impaired. Communication is lacking and start-ups are often not aware of others in the market.

Most start-ups come from developed markets, which tend to have better financing and more private investors. Spain has had several initiatives, perhaps because of the d-LAB challenge, which is based in Barcelona. In emerging markets, start-ups tend to be smaller and more isolated. The most represented emerging markets are India, Egypt and Israel, which are home to flourishing start-up ecosystems.

39. In this section, a review of secondary research on 60 existing start-ups is presented, including only the initiatives that focus explicitly on disability and mobile. Initiatives for the elderly and those that do not target PWD explicitly have been left out.

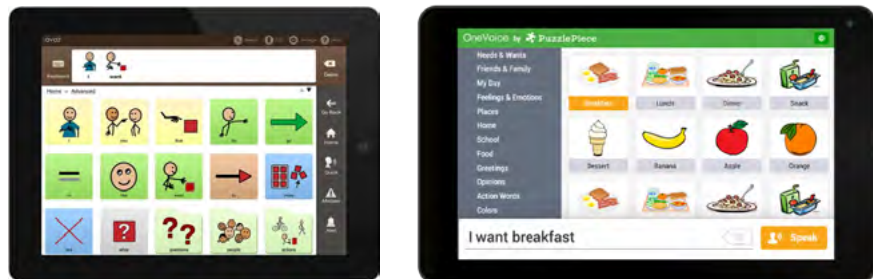
CASE STUDY
Avaz


Avaz is an India-based AAC pay-only app that offers speech therapy for autism. It enables children with autism to communicate, develop their language skills and learn new concepts by offering an easy, visual and sequential way to form sentences.

It is a **picture-based communication tool**, but AI could help users form sentences faster by offering suggestions.

The app is aimed at autistic children, but has the potential to expand to many other learning impairments and cognitive disabilities. Also, since it only requires a smartphone or tablet and an internet connection, the **potential market is very broad.**

Despite being a pay-only app, the success of Avaz led the government of Tamil Nadu to begin distributing Avaz-equipped devices in 2017 to schools for children with special educational needs and early intervention centres.



Funding still relies heavily on grants, public money and start-up challenges. Less than 10 per cent of start-ups identified raised more than a million dollars. Private investors tend to be small, scarce and scattered; no consistent investment strategy has yet targeted disability-oriented start-ups and venture capital represents less than 10 per cent of start-up funding.



Focus on Technology: Leveraging the Promise of Big Data

Technologies that can be used to assist PWD focus on four main areas: natural language/artificial intelligence/big data analysis, GPS enhancement, camera optimisation and hardware-based technology for specific cases. Rather than collecting new data or building new data collection tools, most technologies leverage what already exists, for example, data that has already been collected by devices or data collection tools embedded by default. Typically, these technologies use GPS signals, camera feeds, etc.

The current technological trend is to leverage existing information to cater to the needs of PWD. Such solutions mainly exploit software components and tools. It is possible that this trend will also take hold in emerging markets that would benefit from hardware-free technology with minimal costs.

Three main tools have the potential to greatly influence the mobile for PWD space:

- 1. Natural language processing**, which involves computer analysis of natural human language data. Applications include speech-to-text, speech-to-sign languages and vice versa, speech recognition and simultaneous translations. SpeakLiz,⁴⁰ for instance, is trying to translate sign languages to text.
- 2. Big data** offers a way to analyse large amounts of information to identify patterns, trends and predictive models, helping to “make sense of the information collected”.⁴¹ The applications are endless, from navigation systems to support platforms. ICF Mobile, for instance, leverages the data collected to create a health databank with the potential to provide custom, real-time information to PWD (based on their situation and surroundings), government and organisations.
- 3. Artificial intelligence** feeds the development of AI cameras, machine learning algorithms, self-driving cars and other innovations. Trends show that AI will be essential to democratising and mainstreaming AT. “People will use ATs without being aware of it. People will watch YouTube with subtitles just because they can’t find a quiet place [to watch videos simply with the volume on]. AT will emerge but might not have been meant for people without a disability.”⁴²

A note of caution on the limitations: for many of these solutions to work, some core foundations are needed, including strong connectivity and widespread access to internet and smartphones to access apps and services. Moreover, an AI solution “needs to be 100% reliable”⁴³ before PWD can use it. An example is SeeingAI, which allows a phone to “read” the surrounding environment with a certain degree of precision. However, 100 per cent accuracy is required when reading medication levels or encouraging someone to cross the street.

40. For more information: <https://www.talovstudio.com/speakliz>

41. Interview: Stefanus Snyman, Functioning and Disability Reference Group of WHO and ICF Mobile

42. Interview: Holger Dieterich, Wheelmap.org

43. Interview: Tiernan Kenny, Wayfindr

“For navigation, routing apps, a difference of three meters can mean life or death for a blind person, so GPS is not accurate enough.”

– **Michael Fembek, Zero Project**

The potential applications of big data and AI are important and current trends show that technology will increasingly rely on these powerful tools. However, for the moment, the human component remains essential.

CASE STUDY

Aira



Aira is a US-based start-up that uses augmented reality, video-equipped smart glasses and an app to connect visually impaired users to agents for assistance. GPS localisation and the camera embedded in the glasses stream live video to a remote human agent who directs and assists the user.

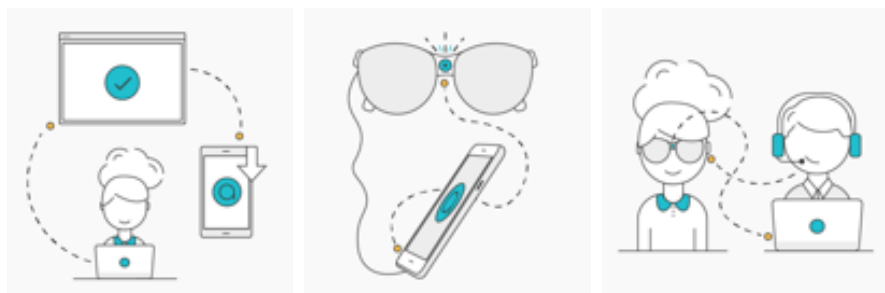
Since this technology requires fast connectivity and a 4G network, Aira collaborated with AT&T to develop an **AI-based prescription medication reader.**

Aira has raised **USD 15.3 million** through venture capital financing.

From a technological perspective, **augmented reality is transferrable** to other sectors, expanding the potential market and making the start-up more appealing financially. However, **current limitations include possible latency** (due to internet connectivity that makes the technology potentially dangerous until a faster 5G network is developed) and the price (USD 89 per month for the basic plan), which for now is a key barrier to access.

Watch the Case for Change video to learn more:

www.caseforchange.com/case-studies/mobile-tech-power-sight





The Way Forward

The GSMA M4D department could have a positive role in fostering the use of mobile technology to improve the lives of PWD by addressing barriers in the three areas of impact: accessibility, mitigation and the social model of disability.

Areas of impact	Accessibility	Mitigation	Social model of disability
Barriers addressed	Lack of technical and commercial engagement	Misalignment of efforts	Lack of awareness
	Affordability of solutions		Misalignment of efforts
			Isolation

Accessibility

To tackle the lack of technical and commercial engagement of mobile operators, and the affordability barrier, the GSMA could encourage accessible services across networks. By leveraging its influence, the GSMA could advocate for including accessibility features in all areas, from hardware to software, as part of a universal design approach.

The GSMA could also showcase the commercial opportunities of including PWD in value propositions for tech companies, start-ups and MNOs. This commercial opportunity is three-fold:

1. Enlarging the customer base and data revenues

Inclusive solutions allow PWD to become customers (or improve the experience for existing customers), thus expanding the market for MNOs. For instance, promoting “ICT accessibility as a business opportunity” as PWD are customers who use voice, data and other services.”⁴⁴

Data-heavy features, such as video calling and GPS tracking, are key AT for persons with disabilities⁴⁵ and can offer promising commercial opportunities for MNOs.

2. Ageing population

The world’s population is ageing: almost every country in the world is experiencing growth in the share of older persons in their population. By 2050, the number of people aged 60 and over is expected to double,⁴⁶ and the number of people with vision impairment could triple due to population growth and ageing by 2050.⁴⁷

The needs of the elderly are often similar to PWD, creating a vast market for solutions aimed at persons with disabilities.

3. Technological spillovers

Technology migrates from market to market. Often an innovative new solution in one area can create positive technological spillovers, as technologies developed for PWD can also apply to the general population and vice versa. For example, Irisbond was born to allow ICT accessibility for PWD, but it is now also targeting professions that require hands-free access to a mobile device or computer, such as surgeons and factory workers. At the same time, being able to track eye movements through a phone camera will open a substantial market for data. Websites will technically be able to know exactly what users are looking at while browsing.

Many features and solutions developed for persons with disabilities will be used by everyone based on their convenience, such as real-time video captioning and indoor navigation guides. This expands both the potential market and applications.

44. Interview: Roxana Widmer-Iliescu, ITU

45. Stephanidis, 2000

46. United Nations Department of Economic and Social Affairs, 2015

47. Interview: Tiernan Kenny, Wayfindr; from WHO statistics



Mitigation

The GSMA could address the current misalignment of efforts between all actors in the ecosystem. By leveraging its network, expertise and resources, the GSMA could act as a connector of different stakeholders to ensure a more efficient and structured global approach.

This could include promoting and supporting existing initiatives and connecting them with mobile providers, regulators, DPOs and disability associations. The current start-up ecosystem is extremely fragmented, populated by a small number of companies with overlapping ideas and limited access to private funding. The GSMA could play a role in fostering and nurturing innovation by providing funding and technical expertise that would allow them to become relevant and reach scale.

Social Model of Disability

The GSMA could address the lack of awareness, isolation of PWD and misalignment of efforts by leveraging its network to advocate for the importance of inclusion of PWD and push the issue onto the agendas of government and regulators in emerging markets. Although implementation and enforcement of disability-related norms is challenging and bottom-up innovations could prove more useful in promoting accessibility and awareness, regulators have the authority and reach to encourage private actors to comply. The inclusion of PWD should therefore be put forward as a priority.





Appendix I

List of Interviewees

The following 26 organisations were interviewed by phone for this report:

Organisation	Category	Interviewee
Safaricom	MNO	Boniface Gitonga Mungania
Vodafone Foundation	MNO	Estibaliz Ochoa, Mari Satur Torre
Orange Foundation	MNO	Pascale Paturle, Ludovic Issartelle
AT&T	MNO	Roman Smith, Tim Fleming, Brady Ratchford
Talov	Start-up	Hugo Jacomé
Riziki	Start-up	Fredrik Ouko
WheelMap	Start-up	Holger Dieterich
Avaz	Start-up	Narayanan Ramakrishnan
Irisbond	Start-up	Eduardo Jauregui, Marie Macharackova
Wayfindr	Start-up	Tiernan Kenny
Be My Eyes	Start-up	Hans Jørgen Wiberg
Wheelmap.org	Start-up	Holger Dieterich
d-LAB	Accelerator	Jordi Arruffi
ITU	Aid agency	Roxana Widmer-Iliescu
ICF Mobile (WHO)	Aid agency/Initiative	Stefanus Snyman
WHO	Aid agency	Matilde Leonardi
Can Child: Centre for Childhood Disability research	Expert	Olaf Kraus de Camargo
See Around Britain	Expert	Trevor Palmer
CBM International	Association	Benjamin Dard
Zero Project	Foundation	Michael Fembek
European Disability Forum (EDF)	Association	Alejandro Moledo
United Disabled Persons of Kenya (UDPK)	Association	Rebecca Opetsi
Leonard Cheshire	Association	Maria Kett, Ola Abu Alghaib
Organisation Tunisienne de Défense des Droits des Personnes Handicapées –OTDDPH	Association	Arbi Chouikh
Users and Survivors of Psychiatry Kenya (USPK)	Association	Michael Njenga
Google	Tech company	Brigitte Hoyer Gosselink

Appendix II

Country Focus

COUNTRY FOCUS

Barriers in Kenya



PWD in Kenya reported a **structured and comprehensive support system**. Support is more widespread in urban settings. Compared to other emerging markets, PWD in Kenya tend to be educated and have access to services offered by NGOs and universities, as well as financial aid. The National Council of Persons with Disabilities Kenya plays a major role in advocacy, lobbying, awareness and financial aid.

Country-specific barriers include:

- **Community awareness:** Disabilities are still not well understood and employment opportunities are often not offered to PWD.
- **Discrimination:** Disabilities are often not tolerated and socio-economic inclusion is lagging behind.

Mobile and smartphone usage is widespread. Some mobile-enabled solutions for PWD are used in the country (i.e. Android Accessibility Suite) with some barriers due to malfunctioning.

COUNTRY FOCUS

Barriers in Afghanistan



PWD in Afghanistan reported a **complete lack of a support system** in terms of medical and financial aid and from disability organisations. An annual government allowance of Afs 60,000 (about USD 815) is considered one of the only sources of income for PWD.

Socioeconomic conditions, literacy, education and employment opportunities for PWD are scarce and constitute the main barriers to inclusion.

Mobile literacy is not very advanced and feature phones are primarily used. Many PWD are not able to use smartphones.

“I am illiterate. I do not know anything — about mobile or internet or any other services. I only know how to dial a number.” – **Interviewee #1, mobility impaired**



COUNTRY FOCUS

Barriers in Ghana



Isolation is a major barrier for PWD in Ghana. The support system is primarily family networks. Local disability associations exist, but only offer residual support and there is generally no public support available.

PWD face significant barriers in their communities, including discrimination, stigmatisation and violence, lack of awareness and ICT accessibility.

Violence against PWD is frequent. In April 2017, Human Rights Watch found more than 15 people in shackles during a visit to Nyakumasi Prayer Camp. Children born with disabilities, known as “Spirit Children”, are believed to be possessed by spirits and subsequently killed.

COUNTRY FOCUS

Barriers in Tunisia



Public support for PWD in Tunisia is limited. The presence of local associations partially compensates for the lack of high-level support, although only a few associations are active.

Reported barriers for PWD include lack of awareness, stigmatisation and lack of accessible infrastructure.

Phone usage is advanced although smartphones and more advanced technologies are perceived as expensive.

COUNTRY FOCUS

Barriers in Mali



PWD in Mali face many barriers: illiteracy, discrimination, unemployment, inadequate transportation and lack of consideration from the country’s authorities.

However, **barriers are not perceived to be linked to phone usage.** Awareness of mobile services and/or apps explicitly targeted for PWD is quite limited. There is also an almost complete lack of awareness of the potential link between mobile and disability.

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