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Mobile as Assistive Technology

India Case Study Report

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Submitted by the Global Disability Innovation Hub

Contents

Executive Summary

This summary presents findings from a 12-month research study conducted by the Centre for Accessibility in the Global South (CAGS) at IIIT Bangalore, in partnership with the Global Disability Innovation Hub (GDI Hub) at University College London. The study examined the potential of Android smartphones to function as assistive technology (AT) for people with visual and hearing impairments in India.

Three hundred participants with visual or hearing impairments were recruited through Organisations of Persons with Disabilities (OPD) across Karnataka, a southwest state of India. Each received a Samsung Galaxy A14 5G smartphone and attended structured digital skills training designed to build confident, independent use.

Across both qualitative interviews and usage monitoring, the study found meaningful impacts on participants' daily lives, particularly for those with visual impairments, who described gains in independence, communication, financial management, navigation, and access to education and employment. The training model, which combined in-person delivery with sustained peer and trainer support through WhatsApp, proved effective at building skills across varied baseline abilities and generated rich insights into what accessible digital skills training requires in this context.

For participants with hearing impairments, outcomes were more varied. Apps such as Live Transcribe were valued and well-received, but broader adoption was shaped by language barriers and the relative scarcity of applications designed with Deaf users in mind. Survey data collected at baseline offer descriptive context for these findings and point to areas, including longitudinal usage patterns and how future studies might better capture participants' confidence with technology, that inform the design of subsequent research.

The study's findings speak not only to the potential of smartphones as AT, but also to the conditions under which that potential can be realised: adaptive, sustained training; peer-learning structures that persist beyond formal sessions; and a digital ecosystem that includes rather than excludes disabled users.

Study Partners

Samarthanam Trust for the Disabled

Bangalore-based organisation working across education, livelihood, and rehabilitation for people with disabilities. It served as an OPD partner for participant recruitment and training delivery

Enable India

Non-profit organisation focused on creating sustainable livelihoods for people with disabilities. It contributed to participant recruitment and supported training delivery.

Winvinaya Foundation

Working at the intersection of disability, technology, and inclusion. It contributed to participant recruitment and training support.

Introduction

India is home to one of the world's largest populations of people with disabilities. The 2011 Census estimated approximately 2.2% of the total population, or around 30 million people, live with some form of disability, a figure widely considered a significant undercount by international organisations including the World Health Organisation and the World Bank [1]. Among people with disabilities, hearing impairments (18.9%) and visual impairments (18.8%) are among the most prevalent types [2].

Access to AT in India remains deeply unequal. The 2022 Global Report on Assistive Technologies identified a substantial gap between need and provision, with many people lacking access to adequate, affordable AT services, a gap further shaped by geography, gender, and economic background [3]. Karnataka, the state in which this study was conducted, has rural disability rates estimated at up to 6.3%, making it a particularly important context for understanding how technology interventions can extend AT access [4].

The growing availability of affordable Android smartphones presents a real opportunity. Unlike specialist AT devices, which are often expensive, difficult to obtain, and require dedicated technical support, smartphones are widely accessible, increasingly affordable, and capable of running a broad range of accessibility features natively. This study explores what that opportunity looks like in practice.

Methodology

Sample and Recruitment

The study employed a purposive sampling approach, working through three OPD partners: Samarthanam Trust, Enable India, and Winvinaya Foundation. To participate in the study, individuals must:

- Be permanent residents of India,
- Be aged 18 or above, with a visual or hearing impairment, and
- Not have another co-existing disability or health condition that limited their ability to give informed consent and participate in the study.
- Recruitment was managed by IIIT Bangalore in collaboration with OPD partners rather than through open calls, to ensure the quality and suitability of the sample. Participants were drawn from those engaged in some form of education or casual work, which supported sustained engagement. The study was completed with 300 participants and no dropouts.

Participant Demographics

Of the 300 participants:

- 53.7% were male and 46.3% female
- 46.7% resided in Bengaluru
- By disability type:
    - 36.3% were completely blind, 19.7% had low vision
    - 35% were Deaf, 5% hard of hearing
    - 4% unspecified.
- The sample was predominantly young: 85% were aged 16 to 30, 12.4% were aged 31 to 46, and 2% were aged 46 or older

- The majority (78%) were students. Around 54% had attained higher education, 31% had completed secondary education, and 4.3% had received vocational training.

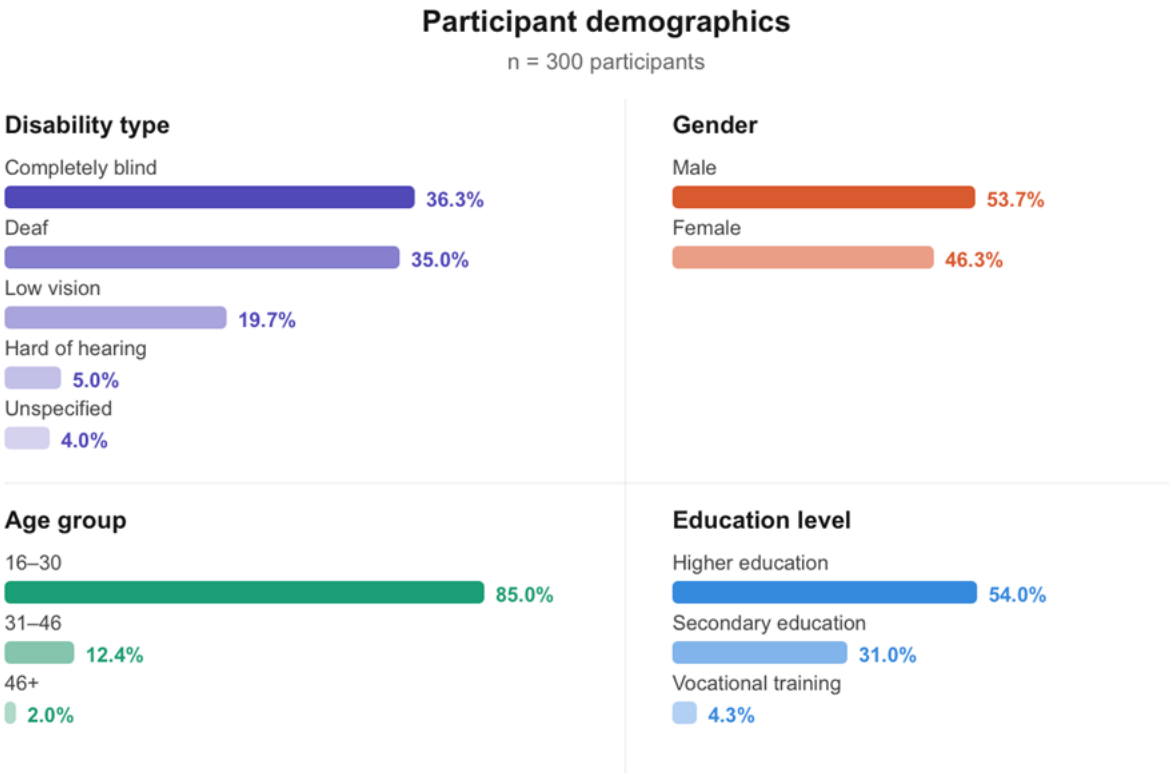
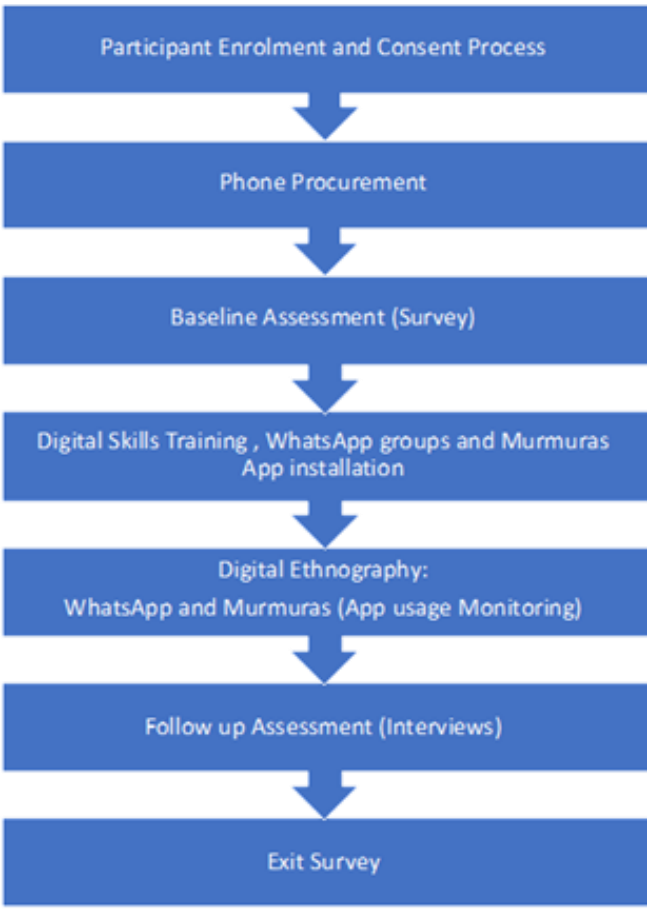


Figure 1 Participant demographics by disability type, gender, age group and education level

These figures describe the composition of this specific sample. The sample's profile, predominantly young, educated, and student-heavy, shapes the findings and should be considered when thinking about how insights might apply in other contexts.

Research Design

Figure 2 graph showing user journey of the survey



The study used a mixed-methods design combining a baseline survey, structured digital skills training, usage monitoring and WhatsApp group observation, monthly qualitative interviews with a rotating subset of participants, and exit surveys.

Device provision:

- Each participant received a Samsung Galaxy A14 5G running Android 13, with protective accessories, procured through a competitive quotation process

Training:

- Sessions were delivered in groups of 15-20 participants, with separate groups for visually and hearing-impaired participants. Training was adapted accordingly: tactile and speech-based methods for 89visually impaired participants, and sign language delivery for Deaf and hard-of-hearing participants. A total of 17 training sessions were conducted.

Interviews:

- Qualitative interviews were conducted with approximately 5% of participants each month for five months. 70 interviews were held in total, comprising 45 with visually impaired participants and 25 with hearing-impaired participants.

Survey Data: Scope and Context

The baseline survey captured participants' demographics, prior device ownership, expectations, and self-reported digital skills. For visually impaired participants, surveys were administered via one-on-one phone calls; for hearing-impaired participants, in group settings of 15 to 20, facilitated by sign language translators.

Several patterns in the data, including high rates of "unsure" responses to questions about smartphone ownership duration and usage independence, reflect how participants related to a new and unfamiliar device at the start of the study, and point to the value of designing future survey instruments that better account for participants' varying familiarity with technology before training begins. These insights are woven into the relevant sections of this summary. Survey figures are used throughout as descriptive context, with the qualitative data carrying the primary evidential weight.

Findings: Digital Skills Training

Baseline Skills and Starting Points

Prior to training, participants' digital skills varied considerably across disability type, age, and prior device experience. A substantial gap existed between what participants could do independently and what the smartphone could offer them, a gap that was large for both groups, though for different reasons.

For visually impaired participants, the primary challenge was unfamiliarity with touchscreen interaction and Android accessibility features. Around 60% were unaware of TalkBack, Google Assistant, Lookout, and text-to-speech services at the start of the study. For participants transitioning from feature phones, the absence of physical buttons and the reliance on gesture-based navigation were both unfamiliar and, initially, disorienting.

During early training sessions, several participants expressed visible frustration. One became upset when their SIM card fell during setup. Another said directly, *"I want to switch back to my button phone."* A third struggled to make a basic phone call. These responses reflected not a lack of capability, but a significant mismatch between existing mental models of mobile devices and a new interface, a challenge that required patient, individualised support to work through, and that underscores how important appropriate onboarding design is for this population.

For hearing-impaired participants, the setup process was comparatively straightforward; they could follow visual instructions with relative ease. A different challenge emerged, however: around 30% were unaware of Android accessibility features relevant to hearing impairment, and none were aware of Live Transcribe. Language barriers also shaped starting points for this group, with many participants

having limited proficiency in spoken and written regional languages, a consequence of gaps in accessible language education that affected how much they could benefit from certain features.

Training Delivery

The training curriculum was modular and adaptive. Participants with no prior smartphone experience were taken through foundational content before being introduced to advanced material. Those with existing skills moved more quickly. This differentiated approach was important. The gap between first-time users and those with some prior experience was wide enough that a single-pace curriculum would have served neither group well.

For visually impaired participants, learning TalkBack required a high degree of one-on-one support. Progress was initially slow, and trainers played a crucial motivational role, consistently reassuring participants and reframing difficulties as a normal part of learning. By the second day of training, a clear shift was visible. Participants were more comfortable with the device, making phone calls and sending voice messages.

The Live Transcribe feature generated a particularly positive response among hearing-impaired participants during training. Seeing speech rendered as text in real time was genuinely exciting for many. Several participants were visibly moved when simple phrases appeared on screen as a trainer spoke. One reacted with delight when the phone vibrated at the sound of their name. These moments of discovery were significant: they demonstrated not just utility but the capacity of accessible technology to address specific, felt gaps in daily life.

A practical constraint observed during hearing-impaired training was that sign language interpreters were often unfamiliar with the technical vocabulary they were asked to translate. This slowed delivery and, in some instances, reduced precision. Preparing interpreters specifically for digital skills training contexts and building their familiarity with relevant terminology before sessions begin is an important design consideration for future programmes.

Extended Learning and Peer Support

WhatsApp groups, one created per training batch, including the trainer and research team, served as a channel for extended learning after classroom sessions ended. Trainers shared advanced materials and responded to queries; participants used the groups to ask questions, share discoveries, and support each other.

These groups were significantly more active among visually impaired participants, averaging five messages per day compared to roughly one message every two days in hearing-impaired groups. Participants in the visually impaired groups posted practical queries, resolved each other's problems, shared links to accessible services, and discussed government benefit processes and civic participation. The groups functioned not only as learning spaces but as social infrastructure through which participants connected around shared concerns.

Representative exchanges illustrate both the practical nature of the queries and the quality of peer responses:

> *Participant: "I need help. I am unable to read PDF with the apps that I have."*
>
> *Peer: "In the phone given to you, 365 Microsoft Viewer app will be there. It can read every PDF. Explore that app."*

Participants also shared how they were applying what they had learned to everyday situations, including some that extended well beyond the original scope of the training:

> *"I renewed my bus pass for one more year using my phone. I learnt how to search routes for different locations."*
>
> *"Today I set a location from Sattur to Lakshmeswar. I said 'Hey Google, give me directions from Sattur to Lakshmeswar'."*

These examples reflect a shift from learning as a classroom activity to learning embedded in daily life: participants testing their skills in real-world contexts and sharing those moments with the group.

Over time, participants' dependence on trainers visibly reduced. Many resolved their own queries, explored new applications independently, and began teaching others. Some went further still: one participant connected their laptop to the internet using their phone as a mobile hotspot, a skill entirely self-taught. Another shared with their group:

> *"Today I installed three new applications on my phone: Messenger, Swiggy and ChatGPT."*

These moments illustrate participants moving from guided learners to confident, curious users, building on their training in directions the programme had not anticipated. This trajectory, from supported learning towards self-directed and peer-driven growth, reflects the effectiveness of the training model and points to the potential of digital platforms as a durable learning infrastructure beyond any single programme.

Findings: Smartphone Use and impact

The following findings draw on qualitative interviews and available quantitative data collected across the study period.

Descriptive Patterns from the Baseline Survey

- ~44% of participants owned a smartphone at baseline; ~23% owned a feature phone and a similar proportion a basic phone.
- ~40% reported sharing access to a smartphone, most commonly within the family.
- Only 35.7% could access a phone at any time, indicating that constrained access, not just ownership, was a meaningful barrier.
- A gender gap in ownership was present: more male participants owned mobile phones, while more female participants reported not owning one, reflecting broader national patterns.
- High rates of "unsure" responses to questions about ownership duration and independent use likely reflect unfamiliarity with the questions rather than a lack of experience.

This points to the value of framing future baseline assessments around specific observable tasks rather than general self-report.

App Usage Patterns

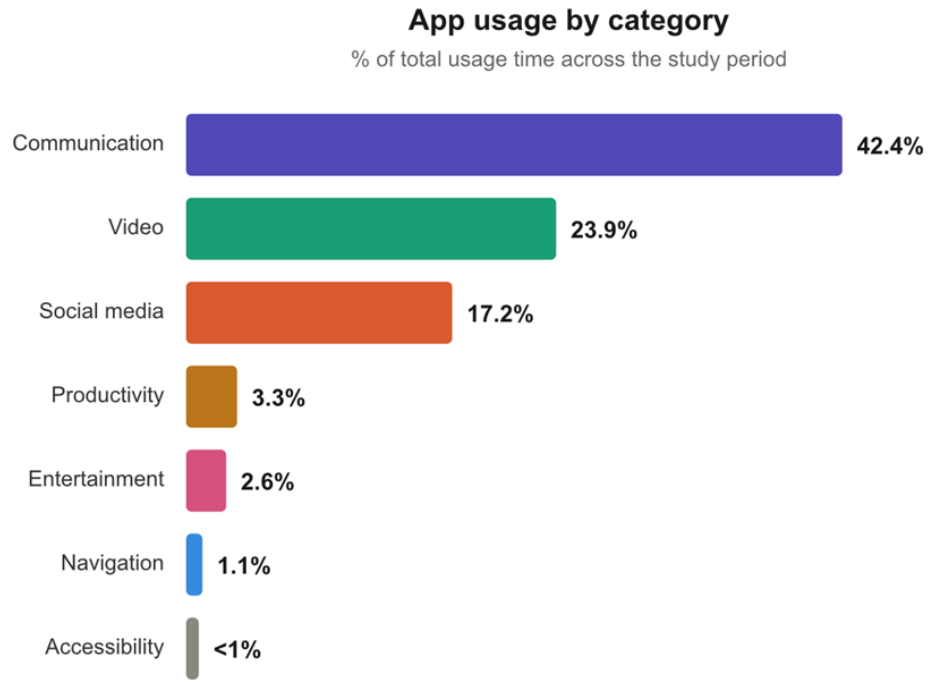


Figure 3 showing app usage by category

Available data suggests that:

- Communication dominated participants' smartphone time, accounting for 42.4% of cumulative usage.
- Video accounted for 23.9%, social media for 17.2%.
- Productivity accounted for 3.3%, entertainment 2.6%, and navigation 1.1%.
- Accessibility-specific apps for both vision and hearing accounted for less than 1% of total duration — reflecting how these features operate as background infrastructure rather than discrete apps users open and close.

Top apps by category:

Communication & social: WhatsApp, YouTube

Navigation: Google Maps

Vision accessibility: TalkBack, Envision AI

Hearing accessibility: Live Transcribe, Sound Notifications

Finance: Google Pay and related payment apps (used regularly by a subset of participants)

Motivations for Smartphone Use

Qualitative analysis of the 70 interviews identified various categories of motivation driving continued smartphone use. For most participants, multiple motivations operated together.

Independence and learning

The most consistently expressed motivation was the desire for independence: to carry out everyday tasks without depending on sighted or hearing family members. For participants who had long navigated reliance on others for access to information, navigation, reading, and communication, the smartphone represented a meaningful shift.

"Need not depend on anyone and do my work independently." (VI participant, male)

"Earlier I must take help from my seniors or from others for studying. Now I have my phone, so I enjoy seeing the videos and it is very helpful for my studies." (VI participant, male)

Learning was closely related. Participants described using YouTube for lessons in Kannada, economics, and political science; using voice search to find information; and pursuing academic study through accessible reading apps. For several participants, the smartphone was enabling post-secondary education in ways that had previously been inaccessible.

A third motivation was belonging: the desire to participate in communities from which participants had previously felt excluded. WhatsApp enabled membership in church groups, disability networks, and study circles. Daily news access became routine for participants who had previously depended on others to relay information.

Education and employment

Education and employment emerged as powerful motivators. Participants described using their smartphones to prepare for competitive examinations, attend online classes, share notes, and communicate with tutors. One participant had begun using the PDF and InstaReader apps for postgraduate coursework; another described remote, video-call-based sales work as a realistic near-term goal.

"I want to write banking exams and other competitive exams for jobs." (VI participant, male)

Finance, navigation, and services

For visually impaired participants in particular, the ability to manage money independently was a significant practical motivator. Managing physical cash presents particular challenges without sight, and apps such as Google Pay and currency-reading tools (Lookout, RBI MANI, TechFreedom) addressed a concrete, felt need. The ability to make payments and identify currency notes without assistance was described as both practically important and personally significant.

Navigation was similarly transformative. Apps such as Google Maps and Lazarillo enabled participants to travel independently, finding routes and locating destinations without a sighted companion.

"Lazarillo tells us where we are. Where is the direction, whether I should take right or left?" (VI participant, male)

Entertainment and social connection

Entertainment and social connection emerged as important motivators, and ones that are sometimes underweighted in AT research. Participants described having had limited

access to both prior to receiving their smartphones; YouTube, streaming platforms, and social media offered relaxation and a window onto a broader world. For hearing-impaired participants, WhatsApp video calls were extensively used to communicate in Indian Sign Language, a practice at once practical and deeply personal.

> *"I am so excited after getting this phone. This is my phone, and I can learn anything and everything from this phone." (VI participant, male)*

Across the interview data, independence consistently ranked highest in the motivational hierarchy. Other motivations, such as learning, earning, communicating, and travelling, were often seen as expressions of independence. This suggests that smartphone AT interventions are not simply about feature utility but about expanding personal agency, and that this framing should shape how programmes are designed and evaluated.

Impact Across Life Domains

Participants described smartphone use affecting five key areas of daily life. These findings are drawn from qualitative interviews and reflect participant experience.

- ***Communication:*** Smartphones were frequently described as essential to staying in contact with family and friends. Completely blind participants rated smartphones as particularly helpful for communication, with many describing smartphones as significantly expanding how they could stay in touch. Hearing-impaired participants found smartphones helpful for communication, especially for WhatsApp video calls in sign language, though the relationship depended on whether their contacts used that channel.

- ***Finance:*** For visually impaired participants, mobile banking and payment apps represented significant functional gains. Currency-reading tools addressed a specific and practical challenge. Deaf participants showed more varied engagement with financial apps, with some reporting infrequent use, pointing to the need for accessible financial services to be designed with Deaf users' specific needs in mind, not only those of visually impaired users.
- ***Travel:*** Completely blind and low vision participants were the most frequent users of navigation and transport apps, with some reporting daily use. Deaf participants used these features less consistently, though the reasons for this were not fully explored in the interview data and warrant further investigation.
- ***Education:*** Smartphones were widely described as beneficial for accessing educational content, with features including YouTube, InstaReader, PDF readers, and WhatsApp study groups all cited. Live Transcribe supported hearing-impaired participants in following spoken classes, a meaningful gain, though one shaped by the language constraints described elsewhere.
- ***Employment:*** For participants seeking employment, smartphones provided access to job search platforms, exam preparation resources, and professional networking tools. The predominantly student profile of the sample means that employment-related findings are indicative rather than representative of the wider population of working-age people with disabilities.

Findings: Accessibility Feature Use

Visually impaired participants

For visually impaired participants, TalkBack was foundational. Without it, independent smartphone use was not possible for completely blind users; the entire device experience depended on learning to navigate through gesture and audio feedback. This steepened the initial learning curve, but once established, TalkBack proficiency unlocked a wide range of subsequent capabilities. Google Assistant complemented TalkBack, enabling voice commands, device navigation, and information access. Currency-reading and navigation apps were among the most practically valued.

Hearing-impaired participants

For hearing-impaired participants, Live Transcribe was the standout feature, generating genuine enthusiasm during training and was described as transformative by multiple participants. The ability to attend meetings, follow spoken conversations, and engage with audio content without a sign language interpreter represented a qualitative change in access and autonomy. Live Captions served a complementary function for media. WhatsApp video calls were widely used for sign language communication, with participants noting that camera clarity was important for clear signing visibility.

The hearing-impaired group's engagement with accessibility features, however, was shaped by language barriers. Many Android accessibility features function primarily in spoken and written language, which remains a barrier for Deaf users whose primary language is Indian Sign Language. This points to a structural gap in the current ecosystem, one that affects the utility of even well-designed features when the linguistic bridge between the user and the technology is not fully in place.

Nearly 90% of hearing-impaired participants were not using hearing aids, citing social stigma, discomfort, and cost. While smartphones are not a substitute for hearing aids, Sound Notification features offer some functional value in specific situations by detecting environmental sounds and alerting users through vibration.

Challenges and Learnings

Device Setup and Onboarding

- The initial setup process presented a significant barrier for completely blind participants. Activating the phone, inserting a SIM card, and entering an email address all required sighted assistance, as these steps occurred before TalkBack could be reliably used. This is a structural limitation of current Android onboarding and a meaningful area for improvement. Future device design should consider how to make the initial setup achievable solely through voice guidance.
- Participants also noted that TalkBack behaviour differed across Android devices from different manufacturers. For users who may not always have access to the same handset, this creates an unnecessary re-learning burden and points to the value of greater standardisation of accessibility settings across the Android ecosystem.
- App placement on the home screen presented ongoing difficulties for visually impaired users, who found it hard to locate apps that had moved position following updates or new installations. Several participants developed workarounds using Google Assistant voice commands, a practical adaptation that nonetheless depends on reliable internet access.

App-Specific Limitations

- The Lookout app struggled in low-light environments, limiting its usefulness for nighttime navigation. Several low vision participants avoided the magnification tool because they believed prolonged close-up use could harm their eyesight, a perception that affected uptake regardless of its clinical basis, suggesting that clearer user guidance on the safe use of these tools would be beneficial.
- Live Transcribe's single-language constraint was raised by multiple hearing-impaired participants, who called for the ability to display at least two languages simultaneously. In linguistically diverse contexts, this is a meaningful limitation.

- WhatsApp group video calls presented difficulties for hearing-impaired users, as the interface did not support pinning an individual signer to a prominent position on screen, making it hard to follow group sign language conversations.

Trust and Third-Party App Accessibility

- A number of visually impaired participants expressed caution about downloading unfamiliar apps, citing concerns about privacy and the risk of inaccessible or fraudulent applications. Some applied a conservative approach, sticking to a small set of trusted apps. While understandable, this limits the smartphone's potential as an expansive AT platform and underscores the importance of accessible, trustworthy guidance on app discovery for this population.
- The Play Store's app verification process does not currently screen for accessibility compliance, meaning inaccessible apps are routinely available to users who depend on accessible interfaces. This is a systemic gap that affects users well beyond this study and warrants attention at the platform level.

Differential Outcomes Across Disability Groups

The most consistent pattern across the data is that Android smartphones function more effectively as AT for people with visual impairments than for those with hearing impairments in the current ecosystem. Visually impaired users have access to a richer set of native accessibility features, a broader range of accessible third-party applications, and a clearer pathway to functional independence through TalkBack.

For hearing-impaired participants, the benefits were real but more constrained. Language barriers limited the utility of transcription-based features. The relative

scarcity of Indian Sign Language content and tools meant that the smartphone, while useful, was less fully integrated into daily communication practices. Parents of hearing-impaired student participants also raised concerns about smartphones as a distraction from studies, a tension between educational potential and entertainment affordances worth acknowledging in programme design, rather than dismissing.

Recommendations

For Technology Developers

Improve accessibility of the onboarding process.

Initial Android setup should be achievable without sighted assistance. Voice-guided, minimal-input onboarding, available before account configuration is complete, would significantly reduce first-use barriers for completely blind users.

Standardise accessibility settings across Android manufacturers.

Inconsistent implementation of TalkBack across devices creates unnecessary re-learning burdens. Baseline accessibility performance standards across the Android ecosystem would reduce this.

Bundle an Accessibility Learning App with devices.

A pre-installed, regularly updated app providing audio-guided tutorials on accessibility features, with peer- and community-based learning components, would support the kind of gradual, self-directed skill-building observed in this study. Gamification elements could further support engagement.

Expand multilingual support for Live Transcribe.

The ability to display transcription in multiple languages simultaneously would significantly enhance the feature's utility in linguistically diverse contexts.

Improve third-party app accessibility standards.

The Play Store should require accessibility compliance as part of app review, reducing the burden placed on users to discover inaccessibility themselves.

For Training Programme Design

Design modular, ability-based curricula.

Training must be tailored to participants' existing skills. The gap between first-time smartphone users and those with prior experience is significant enough to require genuinely differentiated pathways.

Plan for a longer initial onboarding period for completely blind participants.

The time needed to build a reliable mental model of the device and develop TalkBack proficiency is longer than standard training timelines typically allow.

Prepare sign language interpreters for technical content.

Interpreters working in digital skills training should be familiarised with relevant vocabulary before sessions begin. A separate preparation session for interpreters prior to each training cohort is a practical and effective approach.

Treat WhatsApp groups as core infrastructure, not supplementary.

The peer learning communities that emerged through WhatsApp were among the most valuable outcomes of the training model. This should be treated as a structural component of programme design.

Design survey instruments around observable tasks.

Where studies aim to capture baseline digital skills among participants who may be new to the technology in question, task-based assessment is likely to yield more reliable data than general self-report questions about frequency and confidence.

For Policy

Recognise smartphones within AT provision frameworks.

The evidence supports including smartphones in government and insurance-based AT provision schemes. The relatively low cost of entry-level Android devices, compared with specialist AT, strengthens this case considerably.

Address the gender gap in device access.

Differential ownership patterns between male and female participants in this sample reflect broader national trends. Programme design should actively consider how to reach women with disabilities through device loan models, community-based access points, and gender-responsive training structures.

Invest in Indian Sign Language digital resources.

The language barrier faced by Deaf participants is structural rather than technical. Investment in ISL digital content, accessible media, and language learning tools would substantially extend the reach of smartphone-based AT for the Deaf community.

Conclusions

This study set out to understand whether Android smartphones, provided alongside appropriate training and support, could function as meaningful AT for people with visual and hearing impairments in India. The evidence gathered points to meaningful impact for many participants, particularly those with visual impairments, across communication, independence, and access to information and services.

The study generated important learnings about how to deliver and evaluate this kind of intervention effectively. The high levels of uncertainty in some baseline survey responses suggest task-based assessment approaches for future studies. The differential engagement between hearing and visually impaired groups points to the need for programme design that is specific to impairment type, not generic across disability. The emergence of durable peer-learning communities on WhatsApp underscores the value of investing in social learning infrastructure alongside device provision and training.

What this study demonstrates, ultimately, is not only that smartphones can serve as AT, but what conditions are needed for that potential to be realised: training that is patient and adaptive; peer learning structures that persist beyond formal sessions; accessibility features that are robust and consistent; and a digital ecosystem in which apps and services are designed with disabled users in mind from the outset. Each of these conditions is achievable, and the insights from this research offer a grounded basis for working towards them.

Acknowledgements

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This summary is part of a larger body of research as part of AT2030. For more information about the AT2030 programme, visit GDI Hub.