GSMA Foundry

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CASE STUDY



Building Sign Language into the Digital Future

ConnectHear is developing AI systems that enable Deaf people to access services, information and everyday digital interactions directly in sign language

Executive Summary

An acute shortage of professional sign language interpreters in the Global South is holding back tens of millions of people with hearing loss. Unable to communicate fully, Deaf[1] individuals struggle to access healthcare, financial services, education and employment, and public information and advice during emergencies.

To help close this gap, Azima Dhanjee co-founded social enterprise ConnectHear with Arhum Ishtiaq in Karachi, Pakistan, in 2017. Azima Dhanjee brings deep lived experience as a child of deaf adults and a native understanding of Pakistani Sign Language, while Arhum Ishtiaq leads the technical work of turning that insight into scalable systems, such as SILA - an AI-enabled sign language system to support real-time communication across digital services, physical locations and public information channels.

Designed to be embedded inside organisations' existing apps, websites and service journeys, SILA does not require GPUs, specialised hardware or major infrastructure changes, according to ConnectHear, which believes that accessibility technology has to work in the real conditions where Deaf people live, not just in ideal lab environments.

Banks, retailers, hospitality providers, government agencies and educational institutions have adopted ConnectHear's solutions, including Serena Hotels, Interloop, Standard Chartered and Punjab Police. Over the past seven years, ConnectHear says it has supported more than 100,000 Deaf individuals across Pakistan, delivered over two million minutes of sign language interpretation, and worked with 150-plus organisations. The goal is to make routine communication more scalable, while allowing scarce human interpreters to focus on higher-complexity interactions where human judgement remains essential.

Recognised by the 4YFN Awards

This case study highlights a 4YFN26 Awards finalist - one of a select group of startups chosen from a global pool through a rigorous selection process led by top investors and industry leaders. The 4YFN Awards, held in partnership with the GSMA Foundry, spotlight the most promising digital startups shaping the future of innovation.

[1] Deaf (with an uppercase D) is a term used to refer to people who rely on sign language.

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Working with governments, telecoms operators, and standards bodies, ConnectHear is integrating sign language accessibility into core digital infrastructure — woven into broadcasting, disaster response, public services, and everyday commerce — so that Deaf communities aren't left behind. The result is a public–private partnership in which a Deaf-led social enterprise supplies the AI systems, sign language data, engineering capability and lived expertise; telecom operators supply reach; and humanitarian and community organisations supply trust and last-mile delivery.

The traction achieved by ConnectHear's solutions in Pakistan highlights the importance of creating technology specifically for use in the Global South. Most of the world's Deaf population lives in low- and middle-income countries, which face the same interpreter shortages and connectivity constraints that SILA was built to overcome.

In Pakistan, more than 10.2 million people live with some degree of hearing loss — one of the largest Deaf[2] populations in the world. Yet, by some estimates[3], the country has only about 100 professional sign language interpreters to serve them. That is a ratio of roughly one interpreter for every 100,000 deaf and hard-of-hearing people.

The consequence is millions of people are excluded from many aspects of daily life. Without accessible communication, Deaf individuals are routinely cut off from healthcare, unable to describe symptoms privately in a hospital; and from financial and banking services, unable to transact or get advice independently. Education and employment, where information is often delivered through spoken language or written text, may not be accessible to many Deaf users, who may also be unable to access public information and advice during emergencies.

"The barrier is not the inability to hear — it is the absence of access," says Azima Dhanjee, CEO of Karachi-based social enterprise ConnectHear. "For everyday interactions that hearing people complete independently, Deaf people are forced to depend on a family member, stripping away privacy, autonomy, and dignity. Human interpretation remains essential for complex and sensitive interactions, but it cannot be the only mechanism for facilitating millions of daily interactions across an entire country."

This can also be seen as a language-rights issue. Based on ConnectHear's community experience, many Deaf users are not fully served by written Urdu or English, because sign language is often their first and most accessible language. Therefore, written captions or text alerts do not solve the problem. "Deaf people have a right to receive information in their own language," adds Azima Dhanjee, who is a child of deaf adults (CODA) and whose mother tongue is Pakistani Sign Language. "The world already invests heavily in localising technology and content into spoken languages for hearing people; the same right to native-language access has simply never been extended to the Deaf."

To help this community, Azima Dhanjee co-founded ConnectHear with Arhum Ishtiaq in Karachi in 2017. Arhum Ishtiaq, ConnectHear's CTO, leads the technical evolution of the organisation: from a human interpretation platform into a sign language technology company building AI systems, structured datasets and service integrations for Deaf access. The flagship expression of this work is SILA, an AI-powered sign language system designed to support real-time communication across digital and physical environments.

"Within ConnectHear, Arhum has become the technical force behind one of the few serious attempts anywhere in the world to build sign language technology for real-world use at national scale," notes Azima Dhanjee

Building the foundations for sign language technology

For most spoken and written languages, technology has decades of infrastructure behind it: keyboards, captions, speech recognition, translation tools and large language datasets. Sign language has not had the same foundation. That is the gap ConnectHear is trying to close.

[2] **Source:** World Health Organization. Note Deaf population is a term used to refer to people who rely on sign language.
[3] Estimate by ConnectHear





"SILA is the product of nearly a decade of cumulative groundwork rather than a single short project," explains Azima Dhanjee. "The interpretation platform, the community trust, and the underlying sign language data behind SILA and SUNO were built steadily over those years."

For Arhum Ishtiaq, that groundwork is what makes the technology meaningful. "The difficult part is not just translating one sentence into one sign," he says. "The difficult part is building systems that can understand signs, generate signs, adapt to different settings and fit into real services. That is the work that turns accessibility from a one-off service into something that can scale."

To support SILA and its other AI systems, ConnectHear is building what it believes will become one of the world's largest structured sign language datasets. As well as collecting and analysing videos of signs, the goal is to create a reusable foundation that helps systems recognise, generate and adapt sign language across different sectors and regions. ConnectHear says this dataset allows SILA to add new signs and use cases from small numbers of examples, rather than starting from scratch each time. Each year of data collection makes the wider ecosystem more useful and more scalable.

"What makes SILA difficult to develop is that it has to work outside perfect conditions," adds Arhum Ishtiaq . "It has to be accurate enough to be useful, simple enough for organisations to adopt, and light enough to run without expensive hardware. That combination is where a lot of the real engineering challenge sits." SILA has, therefore, been designed to work without GPUs or specialised hardware, making it easier to deploy through the devices and networks already available to users and organisations.

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Arhum Ishtiaq - CEO of ConnectHear

ConnectHear says SILA's adaptation process is highly data-efficient. SILA can be adapted for new countries or national sign languages in weeks rather than years, according to the company. Its signing avatar can also be tailored to different contexts, brands and regions, allowing the same underlying system to serve multiple sectors.

That adaptability is one reason ConnectHear regards SILA as infrastructure rather than a standalone product: the same technical base is designed to support banking, healthcare, education, emergency alerts, telecom services and public-sector access.

Bringing greater independence to Deaf people

By making SILA practical to adopt, ConnectHear seeks to place sign language access inside the services Deaf people need to use: bank branches and apps, telecom stores, hospital desks, public service counters, classrooms, retail environments and emergency information systems. Over the past seven years, ConnectHear says it has supported more than 100,000 Deaf individuals across Pakistan, delivered over two million minutes of sign language interpretation, and worked with 150-plus organisations. Rather than removing human interpreters from the ecosystem, the aim is to make routine communication easier to scale, while preserving human support for situations that require nuance, judgement or emotional context.

"This embedded model is important," notes Arhum Ishtiaq. "Deaf users should not have to leave a service journey, call a separate helpline or rely on a hearing relative to complete a basic task."

Organisations across banking, retail, hospitality, government, and education have adopted ConnectHear's accessibility solutions, including Serena Hotels, Unilever, Faysal Bank, the U.S. Consulate

General Karachi, and Punjab Police. ConnectHear charges enterprise customers subscription and licensing fees, alongside usage-based AI pricing. This revenue subsidises free access for Deaf users.

SILA is being deployed for a wide range of everyday tasks, from retail and telecoms inquiries to private medical consultations, banking, credit and financial advice. One user describes how, upon entering a store run by mobile operator Ufone, they were greeted by SILA in sign language. “I didn’t need to bring anyone with me as SILA could recognise my signing,” the user says. “I checked my balance, upgraded my package, and got a new SIM, all on my own. It was the first time I walked out of a store feeling like I’d been served in my language.”

When they need healthcare, Deaf people can use SILA to describe symptoms privately, understand a diagnosis, and follow treatment without relying on a relative to interpret. It also helps Deaf people access formal employment by overcoming historic communication barriers. Using SILA, Deaf individuals can interview, train, and work independently.

Other common use cases include delivery tracking, parcel drop-offs, customer support, hotel check-ins, airport navigation, and travel itinerary support, as well as educational applications, such as access to lectures, materials, and examinations in sign language, which is the foundation for literacy and qualifications.

“The core impact is simple and profound,” notes Azima Dhanjee. “SILA gives Deaf people access to communication in their own language, on their own terms.

Part of a broader accessibility ecosystem

SILA is part of ConnectHear’s wider accessibility stack, alongside the ConnectHear virtual interpretation app, BOLO, a sign language learning tool, and SUNO, an AI-powered disaster-warning system delivered in sign language. Together, these products underline the breadth of ConnectHear’s technical ambition: live interpretation, AI-assisted communication, sign language learning, emergency alerts and institutional service access. In Pakistan, the company’s telecoms partner, Ufone 4G / PTCL Group, is providing nationwide distribution and zero-rated data access for ConnectHear’s tools.

These solutions have helped Deaf people navigate difficult situations. One user recalls how the technology helped them recover their job, after being sacked following a misunderstanding. “I couldn’t explain my side as a Deaf employee,” the user says. “Through the ConnectHear App, an interpreter communicated my story clearly. The truth came out and I was reinstated. ConnectHear helped me be heard when it mattered most.”

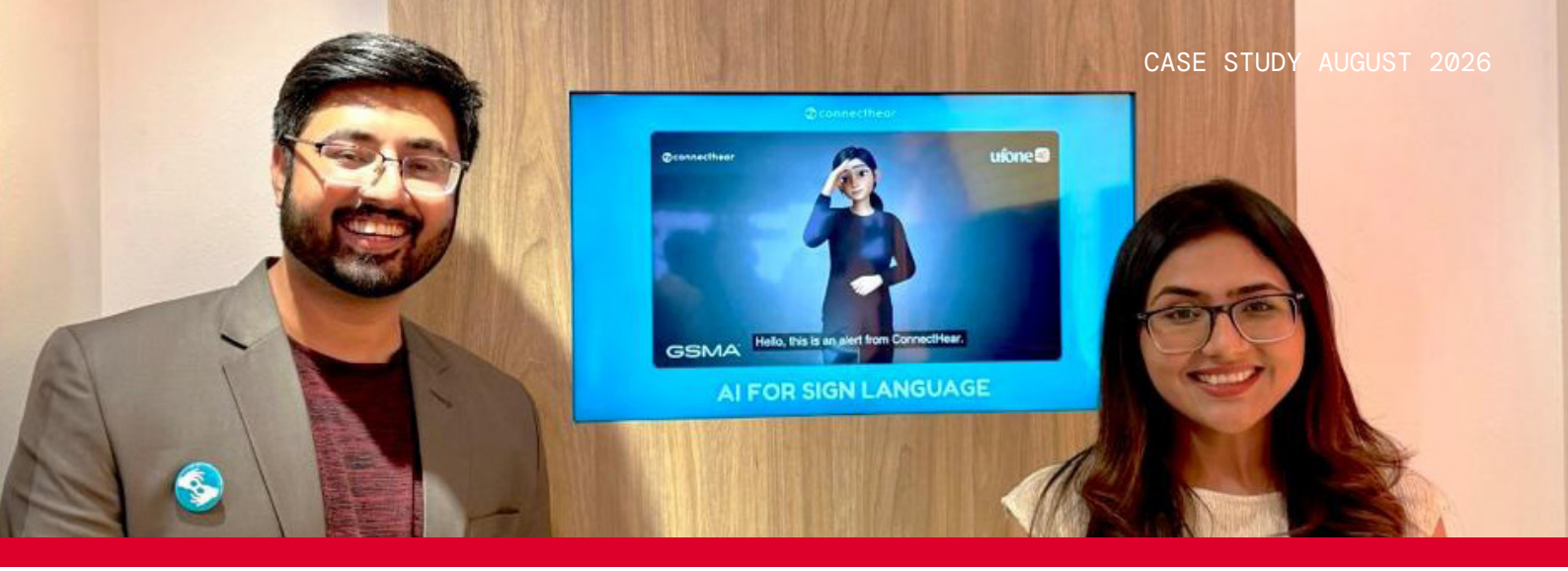
The same foundation being developed for SILA — sign language data, automated sign generation and delivery through partner networks — can also be used to make public-interest information accessible in sign language.

Extending ConnectHear’s solutions well beyond customer service, SUNO is designed to make disaster alerts accessible in sign language for Deaf and hard-of-hearing people who are often excluded from conventional text or audio warnings. For parents of Deaf children, emergencies create a double burden.

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They must first understand the warning themselves, then find a way to explain it clearly to their child. The sign-language alerts created by SUNO can reduce this delay by giving Deaf children direct access to crisis information in a format they understand. “Before this, I had to explain every warning to my child myself, and sometimes I did not know how to explain it properly,”





says Sadia, a parent of a Deaf boy. “When the alert is in sign language, my child can understand what is happening directly, and we can act faster as a family.”

In Pakistan, ConnectHear is working with humanitarian groups, such as HANDS and DeafReach, on community outreach and training, and Deaf-education partners to ensure tools can be accessed and used by the community. HANDS has praised SUNO for providing a practical way to communicate with Deaf and hard-of-hearing communities. HANDS staff report improved confidence after using the ConnectHear App because it gave them a clear pathway to communicate through sign-language interpretation. “The app gives us a practical way to communicate with people with hearing impairments during emergencies, instead of relying on informal arrangements,” says M. Akram, a HANDS staff member.

Looking forward, ConnectHear is planning to develop automated sign-language alerts for emergency, health, and safety announcements, as well ongoing accuracy and speed improvements to ensure the technology works seamlessly on basic smartphones and slower connections. It is also developing an AI customer-service agent to allow Deaf users to independently manage billing, troubleshooting, and booking, and a plug-in offering that enables other companies to integrate sign-language translation directly into their own apps. The long-term vision is to build a “Google Translate for sign language,” establishing it as a third language of the internet alongside text and speech.

Frontier technology from the Global South

ConnectHear is supported by the GSMA’s Mobile for Humanitarian Innovation fund. “Inclusive innovation is key to ensuring that mobile technology delivers meaningful impact where it’s needed most,” notes Kimberly Brown, Head of Mobile for Humanitarian Innovation, GSMA. “We are proud to back ConnectHear’s AI-powered platform, which brings life-saving information to Deaf communities in Pakistan.”

After presenting SILA at MWC26 Barcelona, ConnectHear was awarded the 4YFN Mobile Frontier Award— for startups driving telecom innovation and shaping the future of connectivity. One of hundreds of submissions worldwide, ConnectHear was also selected for the 4YFN26 Top 20. “For us, the award validated something we had believed for years: sign language technology is not a small accessibility feature, but a frontier in how people connect to digital services,” says Azima Dhanjee. “The next step is to make sure these systems are built into services from the start, instead of being added only after Deaf users have already been excluded.”

The recognition was also significant because ConnectHear had reached this point from Pakistan, with a comparatively small team and limited resources. Rather than relying on large research labs or expensive infrastructure, Arhum Ishtiaq’s team has had to build iteratively: combining community data, practical product deployment and AI development into systems that can survive real-world conditions.

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Azima Dhanjee - CEO of ConnectHear

The global recognition for ConnectHear also helps reframe where frontier mobile technology comes from. The company’s work has been shaped by constraints that many high-resource markets do not design for: limited interpreter availability, uneven connectivity, low-cost devices, multilingual service environments and communities that have been excluded from mainstream digital infrastructure. Those constraints have pushed ConnectHear to build systems that are practical, adaptable and potentially relevant far beyond Pakistan.

ConnectHear’s progress highlights the importance of designing technology for the realities of the Global South, rather than adapting systems built for high-resource markets. Engineered for low bandwidth,

low-end devices, and rapid localisation, SILA can be used in communities that lack high-performance connectivity and expensive smartphones.

Most of the world's Deaf population lives in low- and middle-income countries facing the same interpreter shortages, institutional barriers and connectivity constraints that shaped SILA. "A solution proven in Pakistan can be adapted for other countries facing similar barriers," says Azima Dhanjee. ConnectHear is targeting expansion into the Middle East, East and South Africa, and Europe, funded through paid pilots, as well as equity- or non-equity-based investments.

Sign language accessibility as digital public infrastructure

For Azima Dhanjee, SILA points to a future in which sign language is treated as a first-class language for public life, not an afterthought. "When a Deaf person can communicate independently, the downstream effects compound across their entire life," she notes. "It changes how they access healthcare, education, employment, public services and family life."

That is why Arhum Ishtiaq describes ConnectHear's technical work as infrastructure-building rather than product-building alone: each new dataset, integration and deployment makes it easier for sign language access to appear in more places. SILA strengthens the case for treating sign language accessibility as part of digital public infrastructure: present in broadcasting, disaster response, public services, financial inclusion, education and everyday commerce.

ConnectHear attributes its success in Pakistan partly to its collaboration model: a public–private partnership in which a Deaf-led social enterprise supplies the AI systems, sign language data, engineering capability and lived expertise; telecom operators supply reach; and humanitarian and community organisations supply trust and last-mile delivery.

ConnectHear's long-term ambition is not just to make existing services more accessible: It is to help build a digital world in which sign language is a normal way to access communication, commerce, education, emergency response and public life.

> When a Deaf person can communicate independently, the downstream effects compound across their entire life. It changes how they access healthcare, education, employment, public services and family life

Azima Dhanjee - CEO of ConnectHear



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ConnectHear

ConnectHear is an accessibility service provider working with 100+ corporations and government departments. Founded in 2017, we have impacted millions of lives by enabling public and private institutions to communicate and facilitate employees, customers, and individuals with disability through consultation, virtual interpretation, and AI-based technologies.

ConnectHear has trained over 5000 disability champions and provided 1,000,000+ minutes of sign language interpretation through our proprietary application. Recognized by esteemed organizations like The Diana Awards, World Summit Award, Draper University, and Forbes, ConnectHear continues to make a significant impact on global disability inclusion

Learn more at https://connecthear.org/

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