MICRO MATTERS

Using Data for Development in the Era of the Fourth Industrial Revolution

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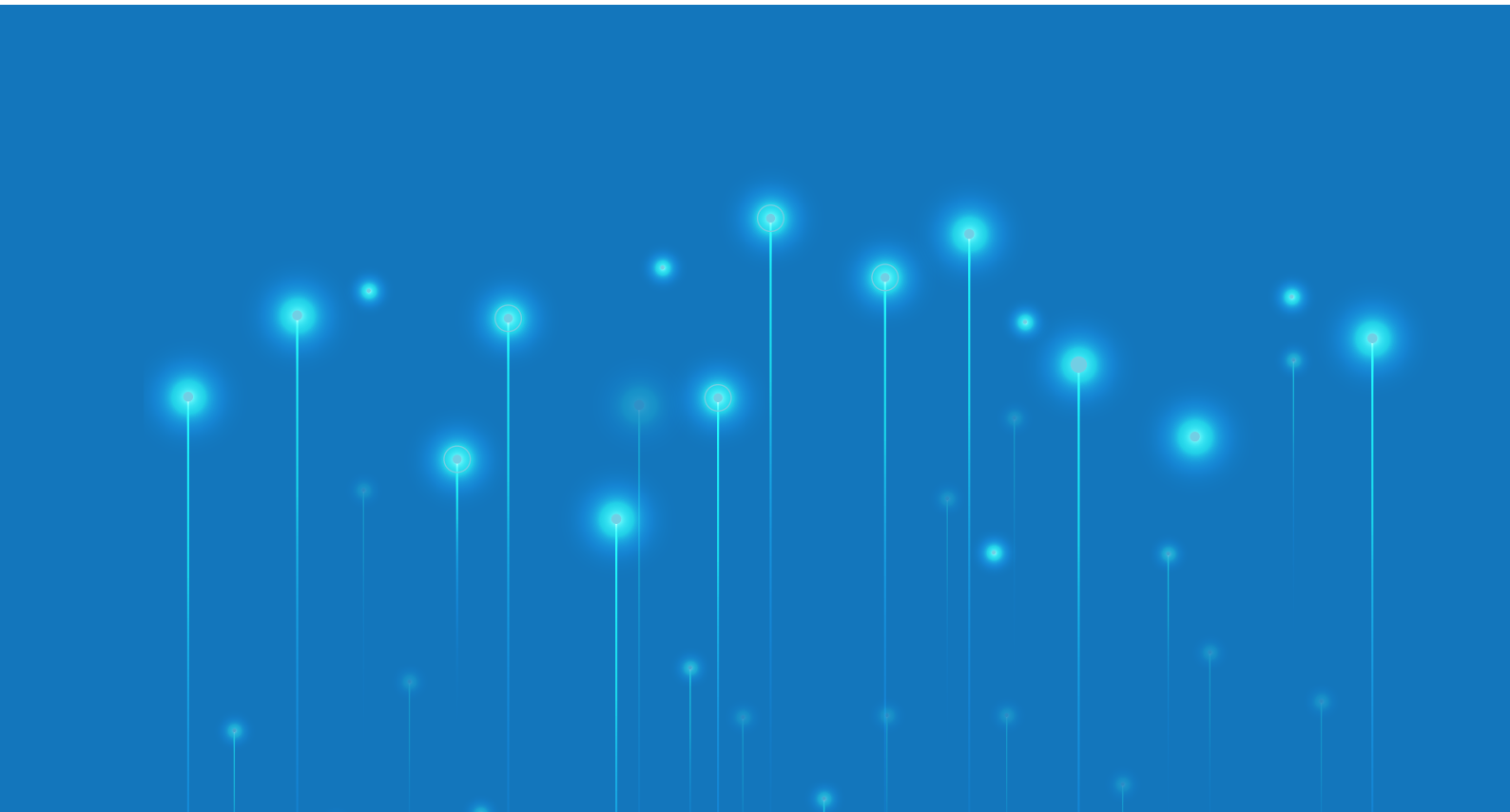

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INTRODUCTION

In November 2022, on the eve of India's assumption of the G20 presidency, Prime Minister Narendra Modi announced that the principle of 'data for development' (D4D) would be integral to India's tenure.[1] His statement was echoed by the G20 Bali Leaders' Declaration, in which heads of state unanimously "reaffirm[ed] the role of data for development" in promoting "economic growth and social well-being".[2]

The importance of D4D, and more broadly of fostering a data-driven culture, has since been foregrounded repeatedly by leading state representatives—by India's G20 Sherpa, who has spoken forcefully of how data-led governance helped transform the country's aspirational districts; and also by a host of Indian business and civil society leaders.[3] While the use of D4D is not a novel approach per se, stakeholders have been quick to grasp that new technologies allow data to be gathered, processed, and applied in ways that were not possible earlier. It was fitting, therefore, that the very first side event of the G20's Development Working Group under the Indian presidency sought to explore how a tech-based D4D orientation might advance efforts to achieve the 2030 Agenda. Clearly, a new wave of interest in the power of data has been unleashed, and a new moment is at hand.

The zeitgeist has been several years in the making. Since the Japanese G20 presidency of 2019, there has been a growing recognition that data must be harnessed creatively to improve public service delivery. Subsequent presidencies have all asserted that the smart use of the growing wealth of data produced by digitalisation could greatly strengthen decision-making and policy outcomes. A corollary of this—also consistently emphasised by G20 nations—has been the need to boost technologies for data collection and analysis. In this regard, artificial intelligence (AI), big data analytics, the Internet of Things, and other emerging technologies continue to push the frontiers of the possible.

India's status as a global digital powerhouse makes it an important voice in the evolving discourse on D4D. Indeed, data-driven applications are intrinsic to the Digital India programme, which is building a "digitally empowered society and knowledge economy", and recalibrating "governance and services on demand".[4]

The 2022–23 period—the run-up to India's G20 presidency—witnessed the launch of several potentially game-changing data initiatives. In May 2022, for instance, the NITI Aayog unveiled the National Data and Analytics Platform (NDAP) and opened it to the public in order to improve access to and the use of government data.[5] The NDAP is a user-friendly web platform that aggregates and hosts datasets from across India's vast statistical infrastructure. It is democratising data delivery by making government datasets readily accessible, implementing rigorous data-sharing standards,

enabling interoperability across the Indian data landscape, and providing users with helpful tools for analysis and presentation.[6]

In the same month, the Indian government published a draft National Data Governance Framework Policy (NDGFP) that aims to ensure that non-personal and anonymised data from government and private entities can be made available to the country's innovation ecosystem.[7] Once the NDGFP is finalised, the government intends to share anonymised datasets collected and harmonised under the framework with India's research, startup and AI communities.[8] The database could be used by companies to train their AI models, and it is expected that access to this rich and varied corpus of data will spur innovation, have far-reaching impacts on development projects at all levels, and usher in a new era of digital governance.

Undoubtedly, one of India's most eagerly anticipated data-related developments of 2022 was the introduction of the Digital Personal Data Protection Bill in November. Recognising the importance of data for the development of the digital economy, the new Bill strikes a sensitive balance between the rights of individuals and the interests of businesses, which may lawfully use the personal data of individuals. While the Bill does not foreclose the use of personal data, it stipulates that data can be processed only after organisations have sought consent from individuals, or in cases where such consent can be assumed. Several other clauses extend substantial rights to individuals and offer them more decisional autonomy and control over their data than ever before.[9]

India's advancements in the domain of data use and its commitment to D4D are being lauded on the world stage. The 2022 BRICS Forum on Big Data for Sustainable Development saw the five member states agree to enhance collaboration around big data as a tool for sustainable development, and Indian voices were instrumental in helping the Forum agree that increased data-centric cooperation among nations is imperative.[10] The country's prowess at deploying drones for development-focused data generation has led the World Economic Forum to estimate that drones and the data economy they are establishing could boost India's GDP by US$100 billion and create nearly half a million jobs in coming years.[11] And the United Nations has recognised India's data-based SDG India Index and Dashboard as a "crucial tool in India's SDG monitoring efforts" and an "advocacy tool to propagate the messages of sustainability, resilience and partnerships".[12]

Finally, India is rapidly emerging as a leader in the use of geospatial technologies, or the tech-led acquisition of data referenced to the Earth and its use for analysis, modelling, and visualisation. Addressing the UN World Geospatial Information Congress in October 2022, Prime Minister Modi declared that "geospatial technology has been driving inclusion and progress" and went on to outline how it had become a key enabler of development.[13] A month later, India put in place its far-sighted National Geospatial Policy, with a set of ambitious milestones to be met by 2035.[14]

The tactical use of "micro data" or sub-state-level data—whether related to individuals, households, villages, cities, or districts—lies at the heart of bottom-up development approaches. This gives philanthropic institutions and civil society organisations (CSOs) a natural role as a bridge between communities and local governance initiatives on the one hand, and the government's macro vision and steps to promote D4D on the other. Indeed, with their on-ground presence, entrenched relationships with community-level stakeholders, nuanced understanding of local contexts, and management heft, CSOs are uniquely placed to execute D4D projects in partnership with administrative bodies, or to achieve outcomes that support the latter's work.

What often makes CSOs' D4D interventions extraordinary and extraordinarily challenging is the velocity of technological change they have contend with. As Klaus Schwab points out in *The Fourth Industrial Revolution,* "Contrary to the previous industrial revolutions, this one is evolving

at an exponential rather than linear pace. This is the result of the [...] fact that technology begets newer and ever more capable technology." Schwab goes on to observe that the speed and scope of change apart, "the fourth industrial revolution is unique because of the growing harmonization and integration of so many different disciplines and discoveries."[16] This then, is the milieu in which CSOs—and every other development actor—must strive to make a difference.

Micro Matters explores eight interventions by CSOs in India that are advancing the country's D4D agenda by gathering data; processing it to evolve insights; translating insights into actions; and making a social impact. Their modus operandi reflect many of the priorities articulated by the government, and are examples of the D4D ethos that India is keen to promote as president of the G20.

As the eight case studies in this volume traverse the expanse of India, eight lessons emerge:

1. Amalgamate tech-based data collection with the use of legacy datasets and knowledge

To offer actionable insights, the data being collected needs to be focused but wide-ranging, offering a multifaceted perspective of the issue under consideration. While tech-based methods are often used to gather data, a second layer of data generation—drawing on secondary sources, legacy datasets, and even focus group discussions or stakeholder interviews—is crucial. Digital Green's Kisan Diary Enterprises (KDE) mobile application, for example, is used to collect primary details about members of farmer producer organisations (FPOs) and the crops they cultivate. But it is only when this information is collated against a large body of data about FPO profiles, harvest patterns, cultivation practices and market trends gleaned from state agriculture departments, livelihood missions and frontline workers, that KDE's strategies for boosting FPO productivity can effectively be implemented at scale.

2. Communicate real-time data and trends to decision-makers through dashboards

Even as data-based insights shape the field-level execution of projects, real-time data analytics, when made available to decision-makers, enable policy decisions and course correction. Dashboards and other e-platforms are increasingly being used to track and display data, identify trends, and decode volatility with impressive results. For instance, under the Alliance for Saving Mothers and Newborns (ASMAN) project in Rajasthan and Madhya Pradesh, officials are using a dashboard to monitor performance indicators related to maternal and neonatal care at health centres. This helps them take swift remedial action when needed, and is improving the quality of care for mothers and newborns. Going forward, the construction of dashboards ought to become a core element of D4D projects, given their impact on transparency, accountability, and efficiency.

3. Optimise the use of emerging technologies

Emerging and disruptive technologies hold great promise for national development, and geospatial technologies and AI are chief among them. The country instituted its National Geospatial Policy in December 2022; the draft National Strategy for Artificial Intelligence explores the application of AI to healthcare, education, agriculture, smart cities, and transportation;[17] and the Union Budget 2023 included a special focus on how to "make AI work for India".[18] A new generation of Indian D4D initiatives is beginning to leverage emerging tech with powerful outcomes. As part of its disaster preparedness work in Assam's flood-prone Cachar district, Reliance Foundation has geo tagged the district's critical infrastructure and public facilities where community members can be sheltered or evacuated during natural disasters. And Wadhwani AI's app for cotton farmers, CottonAce, uses AI to analyse images of cotton pests and other details uploaded by the farmers and generates instant agricultural advisories for them.

4. Incorporate ancillary services into the design of D4D interventions

D4D programmes afford opportunities to strengthen ecosystems by rolling out targeted ancillary services. These services, such as the systematic sensitisation and capacity-building of stakeholders, should be built into the very design of the intervention. For instance, Anudip Foundation's data-led efforts to empower women digitally became an occasion for the organisation to sensitise its partners and field workers about data hygiene and cyber fraud. The Mindspark edtech platform enhances learning outcomes for schoolchildren using data, but its creators also run associated teacher training programmes and cybersecurity awareness campaigns for parents. Similarly, the e-training tools built into the ASMAN app have encouraged self-paced learning among healthcare providers, boosting their confidence and allowing them more time for patient care.

5. Build trust by ensuring data confidentiality and security

The credibility and success of D4D projects will hinge on how well they maintain data confidentiality and security, and ensure an individual's fundamental right to privacy.[19] Several organisations interviewed for *Micro Matters* observed that there is a strong perception that the government is the most dependable custodian of data. As a result, arrangements whereby data is stored by government entities tend to generate a higher degree of confidence among citizens. This makes it doubly necessary for non-governmental institutions to ensure that any data in their possession remains secure.

This volume showcases several approaches to data protection. For example, Digital Green's KDE initiative follows the principle of informed consent, and it is only when farmers' express consent is received that their data is uploaded to the KDE app and further security measures applied. In Cachar, the local District Disaster Management Authority (DDMA) retains all personal survey data and has expressed its intention to share only anonymised data with trusted partners. And Wadhwani AI tries to minimise the amount of personal information required by its CottonAce app, and pushes for data compliance through stringent non-disclosure agreements with partners.

6. Visualise scalability and replicability from conception

Tech-enabled D4D projects have an inherent capability to be scaled and reproduced. It is prudent, therefore, to visualise outcomes at scale from the outset. Several cases bear this out. PATH's public-private agency programme began as a data-centric initiative to diagnose and treat tuberculosis (TB) patients in Mumbai. Its digital approach allowed the government to scale its model nationwide. Today, PATH's learnings from the local and national levels are helping it strengthen the pan-India TB response, refine a private sector engagement model that can be applied across health challenges, and operate a pilot with the National Health Agency to bring private healthcare providers on board the country's Digital Health Mission. In a similar manner, the innate scalability and inspiring results of the Mindspark programme that began in Lucknow have prompted the NITI Aayog to replicate it in other parts of Uttar Pradesh.

7. Offer alternate solutions where connectivity and access are a challenge

Poor internet connectivity and the lack of access to affordable devices continue to plague D4D programmes in parts of the country, particularly in rural heartlands. In these environments, alternate solutions must be provided so that no one is left behind. Anudip Foundation used a variety of formats to collect data, and where connectivity was a challenge, they switched to manual forms. Sporadic connectivity and the challenge of reading off screens led the Mindspark team to create mobile audio clips and SMS-based questions which students could respond to by typing out answers.

And the ASMAN project gave healthcare providers SIM cards to ensure uninterrupted access, and created an offline version of its app so that data entry could continue unhindered.

8. Work collaboratively and adopt a multi-stakeholder approach

D4D projects are almost always intensely collaborative, and partnerships must be built at various levels and across diverse stakeholder groups. A direct correspondence exists between multistakeholderism, scale, and success. Reliance Foundation's disaster management initiative in Assam, for instance, involves sustained cooperation with the Cachar DDMA, other CSOs, Community Resource and Facilitation Centres, and the Inter-Agency Group (a heterogeneous group of stakeholders that undertakes humanitarian activities in the region) For PATH's TB programme too, the journey from city to state to nation has been marked by an array of partnerships with governments, the private sector and civil society.

The practices that this volume describes are all replicable in other settings. The methods used by a specific organisation and the lessons learned from its work could be adapted elsewhere, especially in countries of the Global South.

Beginning to catalogue case studies of D4D during India's term as G20 president assumes particular significance because for the first time in the group's history, its presidency will be held by four developing nations in succession—Indonesia, India, Brazil, and South Africa. With India already being hailed by many as the voice of the Global South, both within the G20 and beyond, there could not be a more consequential time to start mainstreaming the D4D approach into the international development agenda. *Micro Matters* could serve as a step in this direction, and guide policymakers and practitioners alike.

For Reliance Foundation and Observer Research Foundation, this book is the third in a series about transformations in development and governance. The first two focused on narratives of women-led change at the community level. The present volume marks a shift by exploring the interventions of organisations rather than individuals. The publishers will continue to promote research into progressive models of engagement and action, and build platforms that celebrate personal and institutional leadership. These stories of innovation and triumph must be brought to the widest possible audience, and the publishers remain committed to doing so.

- Jayashree B, Anirban Sarma, Vanita Sharma, and Shoba Suri

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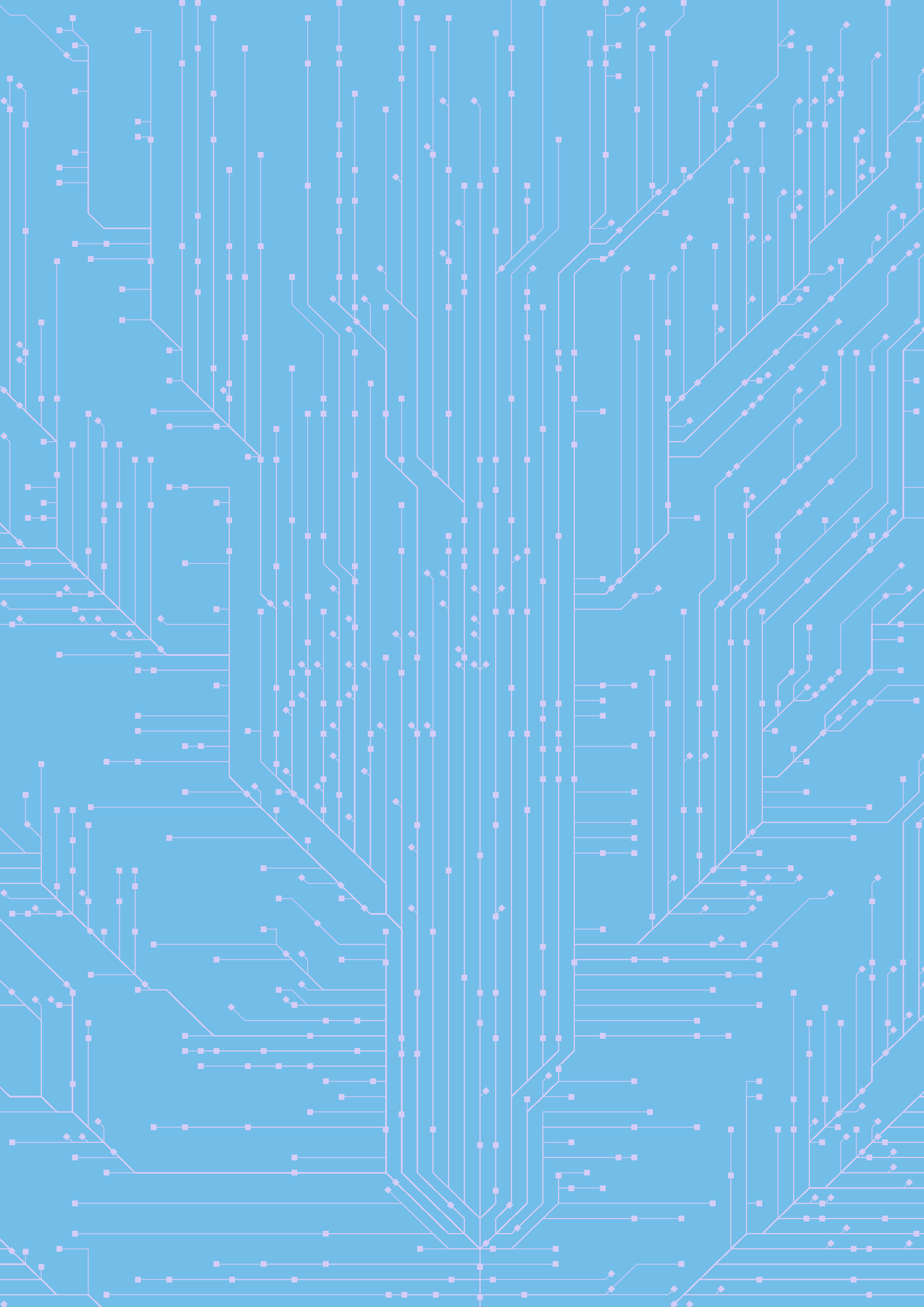

DATA-INFORMED DECISIONS:
THE 'ASMAN' INTERVENTION FOR BETTER MATERNAL AND NEWBORN CARE

Ketaki Hate

Maternal and child health are critical aspects of healthcare that have a significant impact on the survival and wellbeing of women, newborns, and children. Providing quality care during pregnancy, childbirth, and the postpartum period is essential in reducing maternal and neonatal mortality rates, as well as improving the overall health of mothers and their children. Despite significant advancements in the field of maternal and child health, there are still many challenges that need to be addressed, including access to healthcare, inadequate staffing, inadequate resources, and quality of care. In 2021, India's fertility rate was two births per woman.[1] According to the National Family Health Survey-5, 88.6 percent of all births in the country are institutional births (births occurring in health facilities), with 89 percent of all births being attended to by a healthcare personnel.[a] In 2020, India witnessed 23,800 maternal deaths, with a maternal mortality rate of 99 per 100,000 live births.[2] This combined with the fact that 62 percent of neonatal deaths occur in the first three days after birth[3] means that the initial 48 to 60 hours after delivery are critical. It is in this scenario that the Alliance for Saving Mothers and Newborns (ASMAN) was formed in 2015, with the aim of reducing infant, neonatal, and maternal mortality rates. ASMAN partner organisations included the Bill & Melinda Gates Foundation, MSD for Mothers, Reliance Foundation, Tata Trusts, and United Stated Agency for International Development.

The ideation process for ASMAN coincided with the introduction of the Sustainable Development Goals (SDGs) in 2015, to focus on building upon the Indian government's existing efforts to reduce maternal and infant mortality. The third SDG encourages global efforts towards ensuring healthy lives and promoting well-being for all. The first target of SDG-3 concerns reducing the global maternal mortality ratio to less than 70 per 100,000 births and an increase in the proportion of births attended by skilled health personnel. Additionally, one indicator of the second target of SDG-3 is to reduce neonatal mortality to at least as low as 12 per 1,000 live births.[4]

In 2015, Bihar, Uttar Pradesh, Rajasthan, and Madhya Pradesh were the four most acutely affected states in terms of maternal mortality rate, neonatal mortality rate, and infant mortality rate.[5] ASMAN's goal was to provide training and mentorship to healthcare providers in public facilities and implement technology-based solutions to improve the quality of care across eight districts in Rajasthan and Madhya Pradesh. ASMAN's mission was to utilise the combined knowledge and skills of its partners to develop tailored solutions for each

[a] In addition to doctors and nurses, the NFHS considers auxiliary nurse midwives, lady health visitors, and midwives as healthcare personnel.

state's needs. In alignment with the government's goals to decrease mortality rates, this unique partnership was designed to assist in implementing effective interventions in healthcare facilities. In this context, it is important to note that encouraging and promoting effective public-private and civil society partnerships, and building on the experience and resourcing strategies of partnership is one of the targets of SDG-17.[b]

The ASMAN intervention is a form of Computerised Clinical Decision Support (CDSS), a digital information system designed to improve clinical decision-making by healthcare providers.[6] It utilised technology to streamline the process of patient care and reduce the time spent on recording and reporting case details. It was implemented from June 2017 to May 2020, across 81 high delivery load public health facilities across four districts in the states of Rajasthan (Ajmer, Bhilwara, Kota, and Jhalawar) and Madhya Pradesh (Jabalpur, Khargone, Ratlam, and Vidisha). These facilities essentially included sites that catered to pregnant women from low-income households, such as district hospitals, sub-district hospitals, community health centres, and primary health centres.

LEVERAGING DATA FOR DEVELOPMENT

In 2015, when the Alliance was formed, the maternal mortality rate per 100,000 live births was 199 in Rajasthan and 173 Madhya Pradesh, while the neonatal mortality rates were 38 per 100,000 births in Rajasthan and 32 per 100,000 births in Madhya Pradesh.[7] The intervention was launched in 2017 and was built around the tablet-based ASMAN app and its components—case management, dashboard and reports, e-learning, ASMAN game, safe delivery app, and remote support centres.[8] The app allowed healthcare providers to record and report case details in real-time, and to access digital registers and reports from admission to discharge during labour. Data confidentiality was observed, and data is owned by the government.

[b] SDG-17: "Strengthen the means of implementation and revitalize the Global partnership for Sustainable Development".

ASMAN—pegged on three features, namely facilitating the capacity-building of healthcare providers, utilising technology-based solutions, and real-time monitoring to enable prompt decision-making—aimed to use data to save lives by improving maternal and newborn healthcare during the critical first 48-60 hours after childbirth.

The capacity-strengthening component of the programme sought to empower healthcare providers with the knowledge and skills related to best practices in maternal and newborn healthcare. Providers were trained on the Indian government's Dakshata module, and post-training, mentoring, and support visits were conducted to assist them.

As a CDSS tool, ASMAN was designed to enable providers to make informed and evidence-based decisions. The app contained digitised maternity case sheets, e-partographs, and digital registers and reports. It enabled healthcare providers to make direct voice calls to a remote support centre that provided round-the-clock specialised guidance and decision-making support (provided by specialist doctors from medical colleges) in managing complicated cases. This helped to ensure continuity of care and initiation of correct treatment without delays during the intrapartum and immediate postpartum period. The programme also incorporated gamification for learning via the ASMAN Game, a simulated peripartum case scenario game, and an e-learning platform hosting interactive tools, such as training modules and the Safe Delivery app. These tools encouraged self-learning among healthcare providers and allowed them to learn at their own pace without structured lessons. Describing the utility of the app, Ashwini Sarathe, staff nurse at a district hospital in Vidisha, Madhya Pradesh, said, "Constant use of ASMAN app and its e-learning features has increased our confidence and allows us more time for patient care. The training modules include a variety of diverse scenarios, helping us understand and inculcate best practices in the management of different cases. We are now able to give focused attention to mothers and newborns."[9]

The app dashboard presented a visual display of key performance indicators in real-time, helping district and state officials in data-driven decision-making. The dashboard allows programme managers, government officials, and other important stakeholders to track patterns, recognise problems, and act promptly. It plays a crucial part in making data more accessible and understandable, which leads to improved decision-making at the policy level and increased transparency and accountability among all stakeholders involved.

ASMAN had three categories of beneficiaries—pregnant women and their families, the hospital staff being trained to use the application, and the healthcare facilities that were being strengthened using technology-based solutions. All three groups of beneficiaries faced extreme stress during the COVID-19 pandemic due to the many demands placed on the healthcare infrastructure and healthcare providers, often at the cost of pregnant women. However, the ASMAN app unexpectedly created new opportunities for engagement; although the app was not designed for dissemination of information related to pandemics, COVID-19-related protocols were built into the app at an accelerated pace to facilitate better communication between government agencies and healthcare providers and facilities.

Another challenge for healthcare providers was technological, including their limited experience with technology. Internet connectivity issues and freezing tablets acted as a hindrance along with data loss caused by bugs in the ASMAN game.[10] Infrastructural challenges related to inadequate power supply and low internet connectivity often hampered the adoption of the ASMAN app. To combat this, ASMAN gave the healthcare providers SIM cards to ensure uninterrupted internet access. Moreover, an offline version of the app was made available to facilitate continued data entry and backup. Healthcare providers had limited digital literacy and experience in the use of technology. These were addressed through one-on-one sessions with trainers and grievance redressals though text messages.

IMPACTS AND OUTCOMES

The ASMAN intervention has had an impact on healthcare systems in 81 high delivery-load public health facilities across eight districts in Rajasthan and Madhya Pradesh. An external process of monitoring and evaluating the programme from 2017 to 2020 in Rajasthan and from 2018 to 2019 in Madhya Pradesh found that there was a definite improvement in quality of care.[11] In Rajasthan, healthcare providers showed increased knowledge regarding initial assessment of labour, abdominal examination grips, and danger signs during the hospitalisation of mothers, along with knowledge surrounding routine newborn care. In Madhya Pradesh, it was found that nurses trained to use the ASMAN app performed better with regards to knowledge and skills of maternal and newborn care when compared to nurses with no knowledge of the app.

Similarly, positive trends were observed regarding practices during normal birth and labour, active management of the third stage of labour, routine newborn care, postpartum monitoring, and complicated deliveries, facility readiness, availability of supplies, and labour room environment. The ASMAN intervention allowed healthcare providers to make better clinical decisions due to the easy availability of the mothers' medical history. The training and technology implemented through the intervention resulted in stronger intra-partum and postpartum care at ASMAN facilities, resulting in better health outcomes for mothers and newborns. During the period in which the programme was implemented, there was a decrease in the number of fresh stillbirths that occurred in the 81 healthcare facilities. From April 2019 to June 2020, the rate of fresh stillbirths per 1,000 live births decreased from 7.0 to 6.4 in Madhya Pradesh, and from 7.6 to 6.7 in Rajasthan.[12]

Figure 1: Rate of fresh stillbirths per 1,000 live births

Source: ASMAN[13]

The success of the programme has encouraged scaling beyond Rajasthan and Madhya Pradesh. Scalability and sustainability were designed into the very fabric of the ASMAN programme to ensure its longevity. A plan for transitioning the initiative was created to guarantee its continued success and sustainability. This plan includes building state capacities by creating a pool of master trainers for clinical skills training and the ASMAN app, facilitating knowledge transfer to states, training state IT cells on ASMAN app management, and transitioning the ASMAN app and database to states. Moreover, the ASMAN app is also designed to be easily integrated with the Indian government's maternal health online portals such as MCTS (Mother Child Tracking System), PCTS (Pregnancy, Child Tracking & Health Services Management System), RCH (Reproductive and Child Health) and SNCU (Special Newborn Care Unit, the national newborn online portal). The goal of the process is to aid state governments in assuming responsibility for and expanding the initiative. The project's capacity-building element ensures longevity, replication, and scale.

ASMAN's data-driven decision-making allowed for recognition of birth complications, and timely interventions resulted in improved care provided to mothers and newborns. Dr Deepak Paldiya, Block Medical Officer from a community health centre in Madhya Pradesh, said, "Our facility has really benefited from the e-partograph - eliminating the previous trend of manual plotting. The monitoring of key vitals has improved, leading to better maternal and neonatal outcomes. This has impacted our referral rate, which has reduced from 60-70 per month to 25-30 per month. The facility has gained newfound respect and appreciation that is heartening."[14] A timely recognition of complications is important because a third of maternal deaths, almost half of all stillbirths, and a quarter of neonatal deaths occur due to complications during labour, childbirth, or the immediate postpartum period.[15] By efficiently storing and tracking data related to to the health of pregnant women, ASMAN reduced pregnancy-related complications and saved time, thereby saving the lives of many mothers and their newborns.

KEY LESSONS

- Health outcomes can be improved by strengthening first-point entry facilities, such as Community Health Centres by training healthcare providers to collect and utilise health-related data and using technology-based solutions.
- Technology-based solutions such as the ASMAN app streamline access to healthcare, save time, and improve clinical decision-making, thereby saving the lives of many mothers and newborns. If scaled and applied to other health outcomes, this data-driven approach has the potential to save numerous lives.
- Before implementing technology-based solutions, it is important to train future users and provide resources to overcome limited digital literacy and infrastructural barriers.
- Investment in public-private partnerships plays an important role in utilising institutional strength to leverage data-driven approaches and technology-based solutions to achieve improvement in health-based outcomes like reducing infant, neonatal, and maternal mortality rates.

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‘COTTONACE’:
WEAVING AI INTO AGRICULTURE

Shimona Mohan

Indian cotton has aptly earned itself the moniker ‘white gold.’ Cotton has significant commercial and cultural importance for the country—India has the highest cotton acreage in the world and accounts for around 25 percent of the total global cotton production.[1] Indian cotton has also been recognised as the healthiest fabric, and India remains the only country to cultivate all four species of cotton on a commercial scale.[2] These statistics are all feathers in the cap of the estimated six million farmers in India whose livelihoods revolve around cotton cultivation.[3]

However, growing cotton comes with its own set of challenges for a majority of these farmers who are smallholders (those who own and cultivate less than two hectares of land) or are landless (those who are simply agricultural labourers but do not actually own any land), and thus lack the resources to adopt sophisticated pest management measures. Despite the high acreage, the average cotton yield in India is 451 kg/ha, which is significantly lower than the global average of 768 kg/ha,[4] because approximately 30 percent of crops are lost every year to hard-to-detect pests like pink bollworms (PBW) and American bollworms (ABW).[5] For smallholder farmers, this results in a significant loss of income and leads to the indiscriminate and often ineffective use of pesticides.

Wadhwani AI, an independent non-profit institute developing AI-based solutions for underserved communities in developing countries,[6] took cognisance of this issue in 2018 when the Maharashtra government brought it to their attention. The institute spent the next few years developing the CottonAce application, an AI-powered early warning system that can be downloaded on a smartphone, to help smallholder cotton farmers protect their crops from pests like PBW and ABW. When the app was piloted in 2021, it was used by nearly 6,000 farmers and extension officers across 10 cotton-growing states[a] and 60 districts in India.

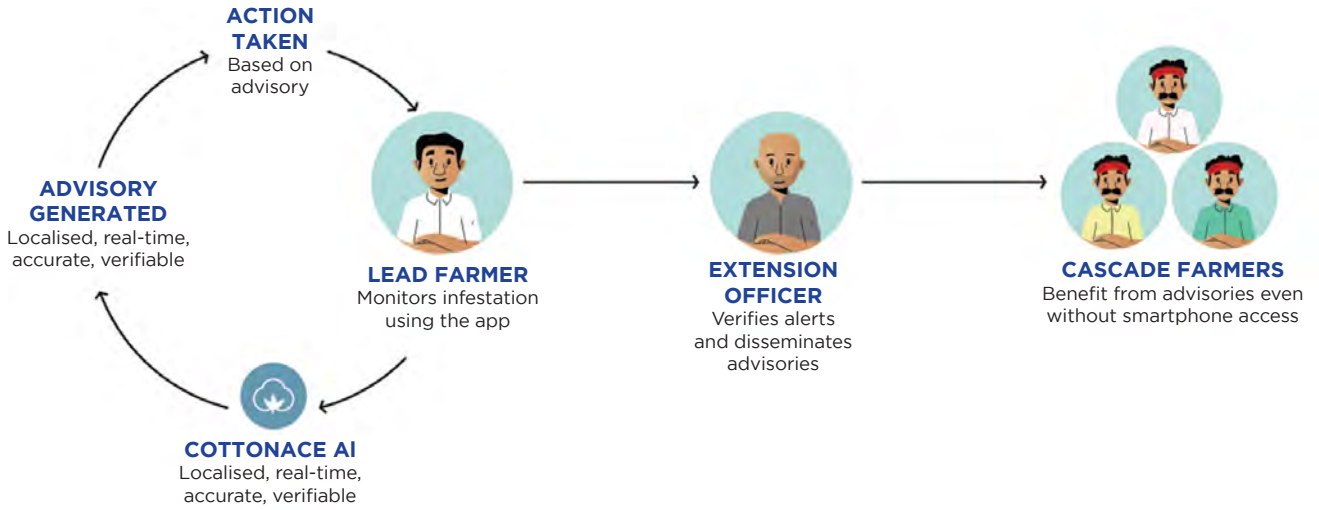
LEVERAGING DATA FOR DEVELOPMENT

While CottonAce is free to download in nine vernacular languages, it works on a registration model for ‘lead farmers’, who may be landowners with access to a smartphone, an internet connection, and the resources to buy pest traps. The lead farmers are recognised and registered on the app by Wadhwani AI’s local partner organisations and work closely with farmer welfare programmes run

[a] The 10 states are: Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, and Telangana

by the latter to manage pest infestations in the areas they service. Another category of farmers, 'cascade farmers', may not have the app or the required traps, but receive alerts and advisories about the pests from the lead farmers. The lead farmers upload images of pests from the farm onto CottonAce, and the app issues contextual alerts and/or advisories on recommended actions.

Figure 1: Village-level dissemination of advisories used by CottonAce



CottonAce uses both primary and secondary data to generate insights for its users. During the initial phases, Wadhwani AI's partner organisations provided relevant information and meta data that was needed to lay the groundwork for the app. After it became functional, primary data has been collected from the farmers' use of CottonAce, and the partner organisations have been providing secondary data for backend operations. The data encompassed under each of these categories is as follows:

- **Primary data:** This comprises images of pests caught in the traps that are taken and uploaded by cotton farmers in the course of using the CottonAce app. The AI used by CottonAce has been trained on about 40,000 images and functions on a detection and rejection machine learning (ML) model for pest types. It can also recognise when the image is not properly taken or the insect is not clearly visible, and recommends that farmers take another picture in such a situation. If the farmers feel that the insects have been incorrectly identified, they have the option to report this on the app and the AI learns from these errors as well. Since CottonAce uses an AI-based solution that is built into the app, it does not need a constant internet connection. It only requires an internet connection when the app needs to be downloaded and installed.

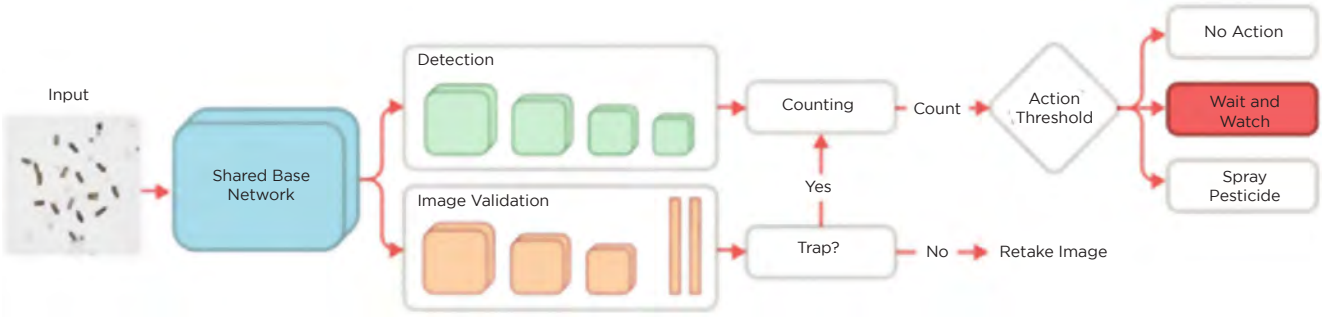
- **Secondary data:** This is localised data provided by Wadhwani AI's partner organisations, who run the farmer welfare programmes. They maintain information regarding the farms, extension officers, and farmers under their purview. This data is used solely to facilitate the private web-based administration portal used by the programme administrators to monitor the usage of the app and the level of infestation over the duration of the season.

In all phases of data collection and use, Wadhwani AI is conscious of data privacy and the responsible use of AI. "We ensure that no personal data or metadata is used for our machine learning model, and that responsible AI is used with the involvement of both internal and external experts so that no community is put at risk," said a member of the Wadhwani AI team engaged with the technical

aspects of CottonAce. The institute also follows this by signing non-disclosure agreements with its partner organisations and ensuring that they follow compliance-related measures during the collection and processing of farmers' personal data. While CottonAce receives some personal information (such as names and phone numbers) when the farmers install the app, no other information is required, and the app's data servers are located in India itself to ensure data sovereignty.

After the pictures of the pests are uploaded on CottonAce, the app instantly generates an agricultural advisory taking into account when the farmer last sprayed pesticide, which kind was used, for what purpose, and how much. This is particularly useful for farmers who would otherwise have to wait about 10-15 days for their regional agricultural departments to issue an advisory, or who would need to call the *Kisaan* (farmer) call centre for advice. Faster advisories are required in agricultural timelines, and with CottonAce, farmers are constantly informed and do not need to depend on anyone else to take quick and critical actions to preserve their cotton crops.

Figure 2: Working of the CottonAce app



While CottonAce is a novel solution for any cotton farmer seeking to improve their yield, Wadhwani AI initially had to persuade farmers to change their traditional way of working. "It was hard to convince them that their efforts and our efforts are for the mutual goal of the welfare of the community. Not everyone understands AI – without data, we have no solutions, and without solutions, we have no data to build further on," said a member of the CottonAce execution team.

However, CottonAce has gradually overcome this. Local communities are no longer as resistant and are willing to try it since working with the app results in time conservation and money savings. The team also feels that younger farmers are more receptive to new tech interventions. About 1,500 farmers learnt about the CottonAce app through the grapevine and downloaded it, even though they could not use the app since they needed to be registered through the backend by Wadhwani AI's partner organisations. The institute is currently working on new rollout plans to fix this so that any interested cotton farmer across India can use the service, even if they are based where there is no partner organisation.

IMPACTS AND OUTCOMES

Wadhwani AI regularly collects feedback based on an exhaustive questionnaire of over 100 questions on performance, which is analysed by a dedicated team. The partner organisations then increase or reduce monitoring and initiate course correction based on the information provided to them at the end of every monsoon season (June-October). Over the past two years, CottonAce has worked with 15 partners, 30,000 cotton farmers (of which 10,000 are lead farmers, and 20,000 cascade farmers) spread over 140 *talukas* over 30 districts in all 11 cotton-growing states.[b] However, the COVID-19 pandemic has slowed things down. "Our numbers could have been higher, the adoption could have been faster, and the feedback we received could have been stronger," said a member of Wadhwani AI team involved with CottonAce.

Despite the challenges, Wadhwani AI has retained the three principles on which CottonAce is based:

- Improving the efficiency of the cotton cultivation system;
- Ensuring the farmers get context-specific advisories that they can use to take informed decisions; and
- Helping ecosystems understand how AI works for them.

The last principle is an organisational mandate for the institute. Wadhwani AI also believes in the positive impact of open-source datasets and technologies on development endeavours, and have put this into practice by releasing an open-source scaffolding of their ML model to which anyone can contribute. The institute's efforts and results with CottonAce have made state agriculture departments aware of how AI can be used for their benefit. Wadhwani AI signed a memorandum of understanding with the Indian government in May 2022, and have also reached out to and collaborated with research organisations working on similar projects. The institute's experience with CottonAce has also motivated them to delve into similar services for other crops, the foundations for which are underway.

Amidst new developments, a few factors that have helped them bring AI to the fore in terms of agriculture and build CottonAce into a useful development for cotton farmers in India are: building trust, generating comprehensive solutions, and sharing lessons with relevant stakeholders.

[b] The 11 states are: Haryana, Punjab, Rajasthan, Gujarat, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Madhya Pradesh, and Odisha

KEY LESSONS

- It is essential to help multifarious communities and professions understand how data and AI can be used in consonance with their existing ways of working to help them improve their efficiency.
- Updating and upgrading any data-based solution according to sectoral specificities should be a regular practice.
- Ethical and responsible use of data and AI is crucial in any scalable model that uses data for development.

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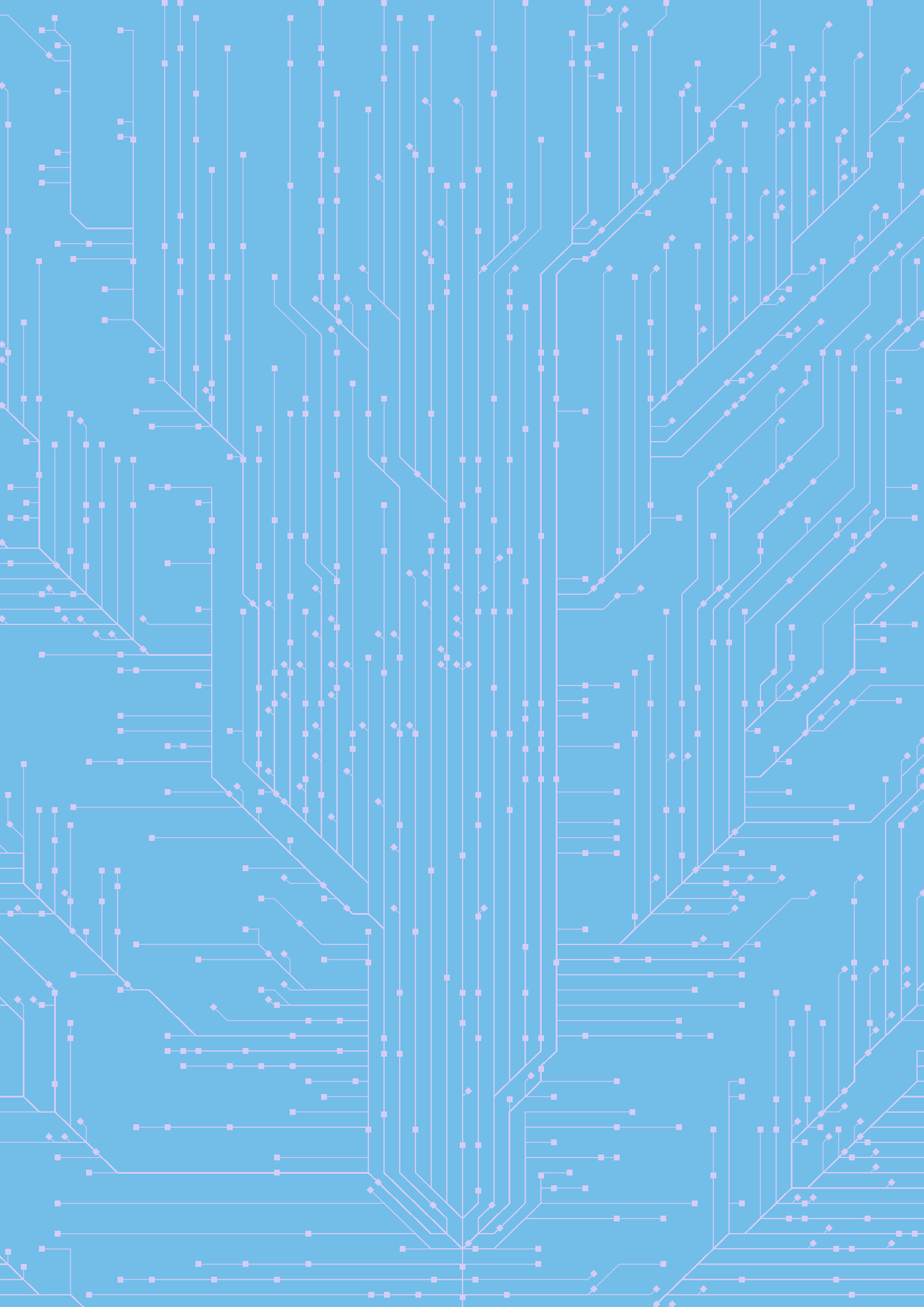

E-SOLUTIONS AS A WAY TO EMPOWER COMMUNITIES WITH DATA

Sitara Srinivas

Of the 43 percent of Indians with access to the internet,[1] a smaller percentage is female (only 15 percent of the total female population have access to the internet). The National Family Health Survey-5 (2019-21) highlighted the significant gender gap in internet usage, suggesting that only 57.1 percent of the male population and 33.3 percent of the female population had ever used the internet.[2] Seen through the urban-rural lens, this gap becomes even more prominent, with 51.1 percent of urban females and only 24.6 percent of rural females qualifying as having used the internet.[3] Demographic identities like caste, class, and religion could further skew this gap.

Today, with the world accessible through a phone screen, the internet empowers many. But, unfortunately, given issues around access, this empowerment remains a challenge to many.

Anudip Foundation, a Kolkata-based organisation, "creates digital livelihoods for underserved communities through technology and skills". Through a project launched in 2021, Anudip aimed to help bridge the digital gender divide in India to encourage greater female decision-making power, shape role models who can empower others, and help create a transformed community with a reduced digital gender divide. Data was the bedrock of this project; Anudip collected data first to survey the field, and then used this data for targeted development interventions.

Using their proprietary Computer Management Information System (CMIS) and Learning Management System (LMS), Anudip worked with over 75,000 women across five states (West Bengal, Jharkhand, Odisha, Assam, and Rajasthan). These states were picked because of their high (and, thus, troubling) gender divide.[a] According to Narendrayash (Naren) from the Anudip programme management team, "The whole project was localised in terms of mobilisation and how training was conducted, but on reach, we wanted to reach as deep and far as possible. That was our concept. How far can we reach, and how many lives can we impact? The impact we have – if it is on scale, the whole community benefits from it. And initial results have shown us that some of these changes have happened."

[a] Each state also had additional distinctive reasons. For instance, Assam was picked since working there would help create an impact in India's Northeast. Odisha and Jharkhand both have a high level of community-based marginalisation. Rajasthan has some of the lowest gender parameters overall. West Bengal is both Anudip's home and a state with some of the lowest socioeconomic parameters in certain rural pockets.

LEVERAGING DATA FOR DEVELOPMENT

Anudip is heavily reliant on three main software packages for its work. The first is their CMIS system, which acts as a repository of all its beneficiaries and as a tracking, analysing, and monitoring system. Bittu Adikari, cluster head at Anudip, explained, "Since we are working with a big set of numbers, the CMIS was an essential piece of the data collection process." The second piece of software is the LMS, a training and monitoring software that direct beneficiaries can access. Through the LMS, Anudip also conducts assessments of the direct beneficiaries and tracks individual scores, the percentage of modules completed, and other insights. The final piece of software is Google Forms (Anudip has a licensing agreement with the company), used to collect baseline and inline data processes.

About 24 community mobilisers work through Anudip with *panchayat*[b] and self-help groups to connect with communities. Within these communities, Anudip facilitators train direct beneficiaries on how to use Google Forms. Data (names, ages, addresses, other contact details, and accessibility and availability of phones) is then collected and stored temporarily in a Google response sheet, with a validation test being conducted to check for any errors. Once the information is checked and processed, it is added to the CMIS database.

Anudip works directly with women as data collectors, not taking on the service of any other third party or NGO. Without the help of software, this reliance would be tricky. In empowering others, data is helping women empower themselves.

Data privacy, confidentiality, and security were crucial to Anudip throughout the process. To maintain the sanctity of the data, the organisation has instituted parameters for data privacy and protection that all employees need to maintain. The CMIS is locked, with each employee being given credentials for only their projects, ensuring that only those authorised receive access. For those working for or with Anudip on the field, the LMS included training modules on data hygiene, with everyone being made to take the data oath.[c] To ensure that people were made aware of cyber fraud in an accessible way, Anudip produced posters visualising safe internet practices. Additionally, data is not stored, only recorded through Google Forms, with only the project team able to access this data.

Anudip uses the data collected to enrol these women in governmental insurance schemes, as sellers on e-commerce platforms, and as beneficiaries of other government schemes. Once registered, Anudip stores screenshots and confirmation proofs to continue to monitor that the women receive funds.

Anudip also analyses the data to study demographic distribution in their work regions. In particular, two critical transitions among the women in the area from pre- to post-enrolment have been tracked, the first being phone ownership (as many women do not have their own or are allowed access to their phones) and the second being changes in occupation and income. Changes in behaviour due to increased incomes, including the propensity of social media usage and search activity on web browsers,[d] were also observed. Finally, Anudip tracked women's role

[b] The panchayat, composed of the words panch (five) and ayat (assembly), is the group of five that govern at the village level in India.

[c] Similar to the Indian government Cyber Awareness Security pledge, Anudip's cyber oath lists and commits to the basic safeguards and measures one can take to avoid cyber fraud online.

[d] For instance, what were people looking for online.

in their households' decision-making structure to see if there had been any changes post their intervention.

In Haripur, a village in Odisha about 40 kilometres from the nearest township, Anudip witnessed how women were not allowed access to phones or social media. After convincing the village panchayat, Anudip held a seminar for the women in the village (and the men in their families), where they shared details about the potential of the tech and data. Slowly, women here began using social media. Jasminara Begum, a single mother who sold saris, would earlier go door to door from village to village to sell her saris. Today, she sells saris sitting at home through Facebook Live and receives payments through digital platforms. Because of Haripur's off-grid location, villagers would spend a day going to the closest bank for even the most minor transactions. Through Anudip, Mandakini opened a Customer Service Point (CSP)[e] in collaboration with Canara Bank. This CSP now caters not just to Haripur but also to several villages in the vicinity. Similarly, Priyanka Debnath has been able to fund her treatment for thalassemia by engaging in reselling on online platforms.

Narendrayash said, "With data, the awareness and transformation you can bring to the whole community through just one participant is incredible. A success story snowballs through the whole community bringing in many more." While there are many big examples, Naren also suggests that the smaller, less heard stories tell the story of how data has impacted both Anudip and their beneficiaries' world.

Data has also brought governance closer to people. Earlier, there was a general lack of awareness and intimidation regarding knowledge of government schemes and programmes. Through data, Anudip could identify pockets where intervention was required and introduce platforms such as Haqdarshak.[f] Adikari explained, "Education has been done on the ground, and now people can ask for their rights from the government". During COVID-19, when people faced problems accessing funds, Anudip trained them on digital banking. Anudip also established connections with popular e-commerce sites and ensured last-mile delivery connectivity.

In a survey, Anudip asked the women they worked with if their position in the household had changed. Over 80 percent responded yes. Community members now reach out to these women for mobile phone recharges and other transactions. As such, the involvement of women in the community has grown tremendously.

Innovativeness, challenges, and solutions

The project's innovativeness emerged from three key sources. The first was the diversity of the states that Anudip worked with. This diversity did involve challenges, given local variances and nuances that could often be a barrier. But with the programme aiming to be as pervasive as possible, they worked with local government agencies to overcome these. The data collected was localised by bringing in mobilisers from those very communities. This attention to detail helped improve data quality and accuracy. Anudip also used a variety of formats to collect data. In places where the internet was scant, they relied on manual forms. Using an amalgamation of methods also helped in places where the full use of tech would not have worked.

The second source was the key audience—women. Anudip deliberately chose to work with women from rural pockets who had not had or usually had limited access to data.

[e] Customer Service Points are mini banks that can be opened and run by people who live a distance from the closest bank. It can be used for to create bank accounts as well as to deposit and withdraw money.

[f] The Haqdarshak platform can be used to check the availability and eligibility for government schemes.

Finally, Anudip aimed to engage and change mindsets. This was at two levels—first, that women should be kept from tech; second, that digital platforms were unsafe. Because of stigma and the challenges of patriarchal norms, it was often hard to collect the required data from women. To encourage changes in mindset and to address the apprehensions, Anudip engaged with local government agencies and conducted seminars and workshops which involved both women and men from the community. Another challenge was that some people were adversarial towards technology. They were intimidated by technology through miscommunication and misinformation; thus, they would use conventional methods instead of tech.

Often using big data erases individual issues. However, because of the localised nature of Anudip's programme, they were able to engage with and alleviate individual issues to ensure that everyone was able to participate in the programme entirely.

For Anudip, COVID-19 was an opportunity because of how common digital platforms became and because people saw how tech benefited others in many cases.

IMPACTS AND OUTCOMES

Through this project, Anudip had a transformational impact on the lives of the people they worked with. The change occurred not just at the individual but also the community level. While it was initially difficult for Anudip to get women to work on this project, women are now keen to work with the organisation because of the programme's impact. Over 3,000 women working as online resellers have a Facebook group where they regularly engage and share their experiences. There are also WhatsApp groups where women stay in touch with each other and the foundation. As a result, people have been inspired to be digitally literate and fully embrace tech.

Impact surveys conducted by Anudip show the level at which these women have been made financially independent. Because these women have taken up various occupations—managing a CSP, working as a government scheme enroller, or even as a merchant—the community has benefited overall. Earlier, they would have to leave the village and travel distances to complete simple tasks. Today, they most likely just need to ask their neighbour for help.

For Adikari, "Data is an important pillar for development. Through data, you can analyse the ground realities, the gaps one has to overcome, and the areas one needs to work in. with data, the complete scenario is made available." For Narendrayash, "Data is the fuel of the 21st century. It is imperative to look at data for any intervention. Through data, we understood the demographics we were working with and were also able to measure the shifts in the programme. Data was integral for us to understand if we were working in the right direction. Data has been important for any intervention in the development sector, and it will grow to be more significant."

KEY LESSONS

- To empower women, it is crucial to involve men in the household as well, and to focus on creating mindset changes.
- Empowering women often indirectly or even directly empowers the whole community as the benefits and advantages are often quickly spread far.
- While using data for development is useful to understand the macro picture, engaging with the micro level is also crucial for a successful intervention.

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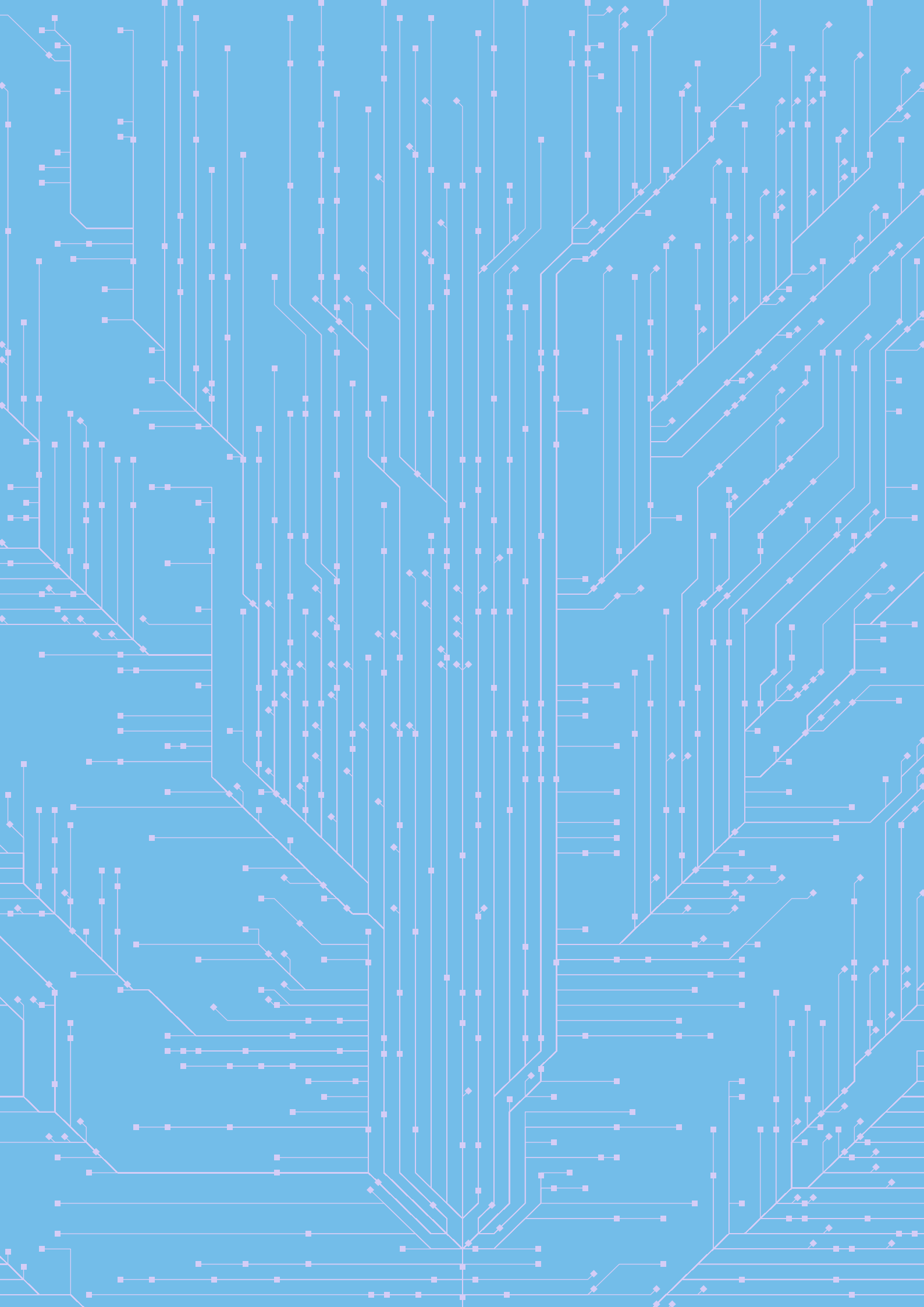


‘KISAN DIARY ENTERPRISES’:
A MOBILE SOLUTION FOR INDIA’S SMALL FARM SECTOR

Saji Kadavil

Over the last decade or so, India’s agricultural sector has seen a change with the emergence of digital technologies. This comes on the back of growth in India’s digital economy. In a December 2022 report, the Reserve Bank of India noted that between 2014 and 2019, the country’s digital economy grew 2.4 times faster than the overall economy.[1] Agriculture and allied sectors accounted for about 16 percent of the gross value added in FY 2022,[2] and employed 42.3 percent of the population in 2019-20,[3] with smallholder farmers making up a large share (about 78 percent). Additionally, the sector has seen a robust annual growth rate of 4.6 percent over the last six years.[4]

However, India’s small-farm sector faces numerous challenges, including market uncertainties, increasing land fragmentation, and high production costs.[5] One solution is the formation, development, and commercialisation of Farmer Producer Organisations (FPOs).[6] FPOs are village-level associations of farmers, especially small and marginal farmers, with between 15-20 members, established after the amendment of the Companies Act in 2003.[7] Over the years, FPOs have shown that they have the power to create a better ecosystem for farming,[8] improve economies of scale, strengthen the agricultural community and sustain their livelihoods.[9] About 30 percent of all FPOs are running profitably, while 50 percent are still in the development stage.[10] Still, certain issues need to be addressed to make FPOs a sustainable business model.[11] These include a lack of technical skills and market linkages, inadequate knowledge about government and other grants, weak finances, insufficient professional management, and a lack of risk mitigation mechanisms.[12]

In 2019, Digital Green, a development organisation that works with smallholder farmers, started the Kisan Diary Enterprises (KDE) mobile app to help FPOs gather and share data to facilitate buyer collecting and group decision-making, and aggregate farm-level data for input and output markets. KDE has been instrumental in ensuring inclusive data and innovative technology usage to address some of the challenges of the FPOs, especially those represented by women in India’s South and East. Since 59.5 percent of the 30,718 active FPO members are women, the organisation uses the app to ensure continued inclusion among small farmers. KDE was first implemented in Odisha, and was later expanded to Jharkhand, Bihar, Telangana, and Andhra Pradesh, covering 30 FPOs in total. All these regions are represented by the 64 crop profiles on the app. During the COVID-19 pandemic, various app-based solutions emerged for India’s agricultural space.[13] The data collected by KDE enabled Digital Green to partner with many agricultural service providers and curate better services for the farmers.[a]

[a] For instance, in Telangana, about 30 percent to 40 percent of farmers use the KrishiTantra app services for conducting the soil test.

LEVERAGING DATA FOR DEVELOPMENT

KDE involves four phases of activity to collect and use data for the platform.

In the first phase, the organisation uses secondary data to identify the beneficiaries. The data collected includes the profile of FPOs, details of their members, list of dominant crops, crop intensity, cultivation practices and related issues, challenges related to managing pests and weeds, and market studies. This serves as a foundation for the generation of data and for the development of service assistance features to address the major problems, particularly about crops and geographical areas. The platform also relies on frontline workers, the livelihood missions of the state that are part of the National Rural Livelihood Mission, and the state's agriculture department to provide services at the farm level.

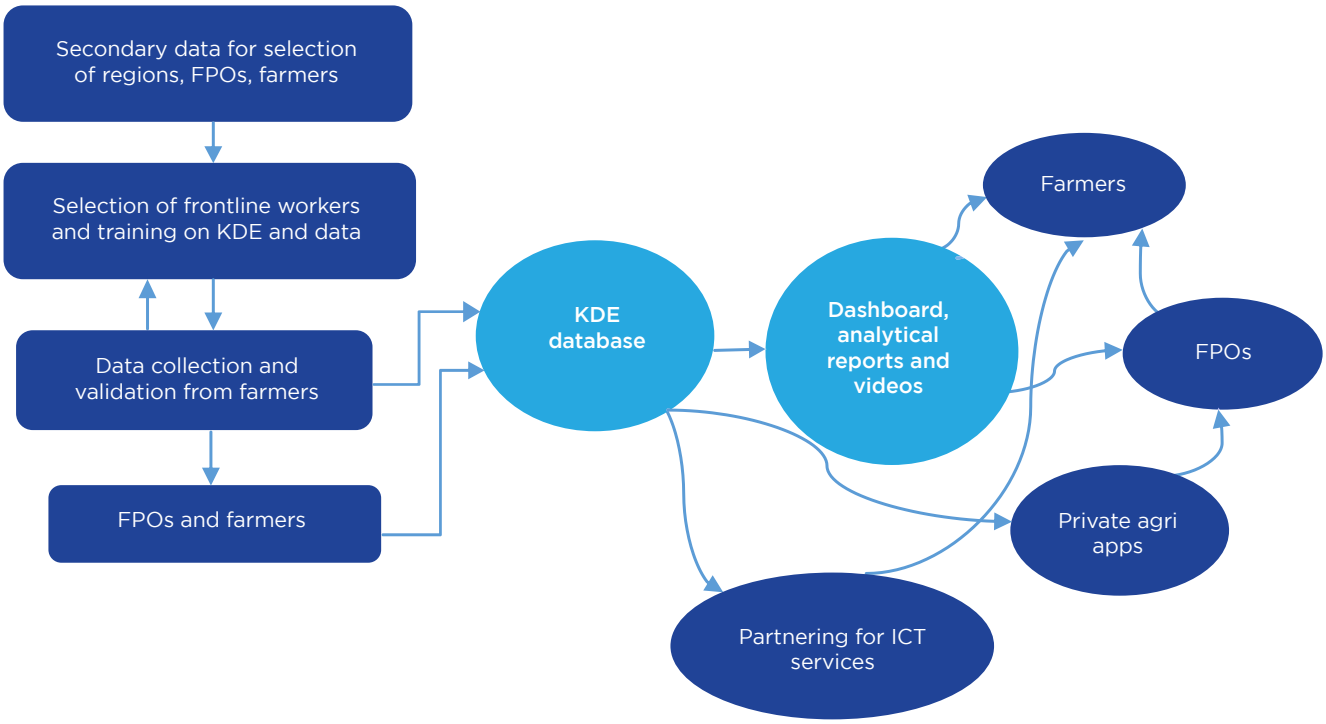
The next level involves identifying and training frontline workers on using the KDE app and the data collection and operating process. Through frequent group discussions, the frontline workers raise awareness about the app and the value of the data platform among FPOs and members.

The next step is to directly approach FPOs and their members. Data is collected on farmers' profiles, basic information related to cultivation of crops, details on sowing, reported pests and weeds, outputs (including crop name, area of cultivation, allocation of products for FPOs, storage for self-consumption, and estimated harvested data), and the required inputs. Farmers are encouraged to upload this information from their smartphones. This is done with the farmers' informed consent.[b] Data is validated during FPO meetings with producer groups of the relevant FPOs in each region.

The final phase of the process is generating a dashboard and analytical reports for FPOs and farmers. The KDE app generates a dashboard using the aggregated data for FPO leaders/directors to leverage for collective decision-making, sharing with public institutions, and for input and output market transactions. The aggregated data on the quantity of harvested crops available to FPOs and the requirement for inputs like seeds and fertilizers is readily available to the FPO head. Frontline workers/community resource persons get a summary of queries from the farmers on sources, plant protection, and required equipment, along with other information on final products available for sale. A separate summary of practices adopted by the farmers under each category of the production cycle is available for further assistance.

b The frontline workers take consent from farmers before the survey.

Figure 1: Generation of data via KDE and its use



For an analytical and interactive dashboard, disaggregated data is analysed and visually represented. The data gathering and analysis processes happen continuously. Data is periodically updated in accordance with the crop season, and is used to generate analytical reports and in-depth comparative analysis of crops' financial profit and loss. The insights are used at various levels, from decision-making and information transmission processes at the farmer and institutional levels, to designing projects funded by the state agriculture department.

During the COVID-19 pandemic, farmers used the mobile app to update information on seed requirements and harvested produce. Importantly, this allowed the FPOs to partially enable trade and curbed the number of distress sales during this period.

Data-based decisions help the FPOs to negotiate effectively with buyers and service providers based on sheer volume. The economies of scale that are built into the structure of FPOs are becoming more and more apparent. The board of directors has access to precise information on the production of a certain crop in a certain region, including its quantities. With reliable information on quality and quantity, the FPOs can negotiate with buyers for a more competent price. The KDE dashboard helps the directors make quick decisions while negotiating with buyers.

FPOs are also able to bargain more effectively with input suppliers because of the aggregate data on farm size and crops. This new approach decreases input waste, as farmers do not spend money on making significant purchases without having the necessary background information. Importantly, the KDE app has made the process of harvesting, selling and buy produce less time consuming. FPOs get adequate time to identify suitable buyers since the data can predict the quantity of a crop that will be produced. Frontline workers and FPOs upload information on behalf of individual (or member) farmers regarding their crop, which also facilitates easy decision-making by the buyer. Buyers have access to exact product quantities, product variety, and pricing range information.

IMPACTS AND OUTCOMES

KDE has had many positive impacts since its roll-out.[c] It has been instrumental in helping FPOs tackle some of the issues that plague them, including of inadequate professional management and low-price realisation in input and output markets.

The FPOs can successfully bargain with purchasers and service providers based on aggregate data and analytical reports with the aid of data. The leader of *Maa Murgasuni,*[d] an FPO of tribal women in Odisha's Mayurbhanj district, noted how KDE helped her negotiate a better price for pumpkins harvested from 311 marginal farmers who cultivated 391 acres of their land with buyers: "The market is generally dominated by men. Earlier, we faced a problem in negotiating better prices without accurate data. KDE provides us with accurate and aggregate data on total harvested crops with the image showing the products' quality. It helps us to negotiate better with buyers based on data, consistently fetching about 20-30 percent higher prices."

Farmers have reported that regular data collection has raised greater awareness on the importance of meticulous record-keeping. An Odisha paddy farmer remarked, "I am confident to meet with officials from the National Bank of Agriculture and Rural Development (NABARD) and banks to discuss financial subsidies and credit now. Because I am talking based on data, not based on a vague idea. The inputs we provide to the KDE database give us back production and productivity forecasts." Indeed, even officials from NABARD have advised other farmers to document their farming methods in a similar way.[e]

KDE is not a project-based initiative; it generates a large-scale live database of farming practices, financial transactions, and profiles of farmers. According to KDE's growth pattern, it has built a sizable database that serves as a platform for cooperation, public-private partnerships, and the development of small farmers into commercial farmers.

The KDE mobile app has now been expanded into a broader database platform. Digital Green uses KDE for some of its major agricultural projects.[14] Under the 'Saagu Baagu' project for the chilli crop in Telangana, an AI chatbot is frequently used for knowledge distribution based on the KDE database. The 'Atlas' (Advancing Tribal Livelihoods and Self Reliance) project in Odisha and Jharkhand for tribal women farmers also uses the KDE database. 'eMircha' is another project that uses the KDE database to deliver digital advisories to more than 31,073 chilli farmers in Andhra Pradesh and Telangana.

[c] KDE's success is in part attributable to the implementation process. Ronali Pradhan, Digital Green's operations head for Odisha and Jharkhand, and her team played a pivotal role in facilitating systematic capacity building along KDE's chain of operations, and the intensive implementation of the programme across all regions.

[d] Maa Murgasuni has been institutionalised by a state-level civil society organisation, Centre for Youth and Social Development. The FPO also receives technical assistance from the Odisha Livelihoods Mission, which is part of the National Rural Livelihood Mission.

[e] As told to this author by Ronali Pradhan (Digital Green's operations head for Odisha and Jharkhand) through her personal communication with farmers in September 2022.

KEY LESSONS

- Digital technologies present innovative opportunities to ensure inclusiveness while addressing the prime issues facing India's smallholder farming sector.
- There is scope for live database platforms to collaborate with other agritech solutions.
- Technology upgradation and integration (the constant improvement of an app) is vital to ensure continued assistance to farmers.
- The easy availability of aggregated data empowers women FPO leaders and marginalised farmers to negotiate better market prices and economies of scale.

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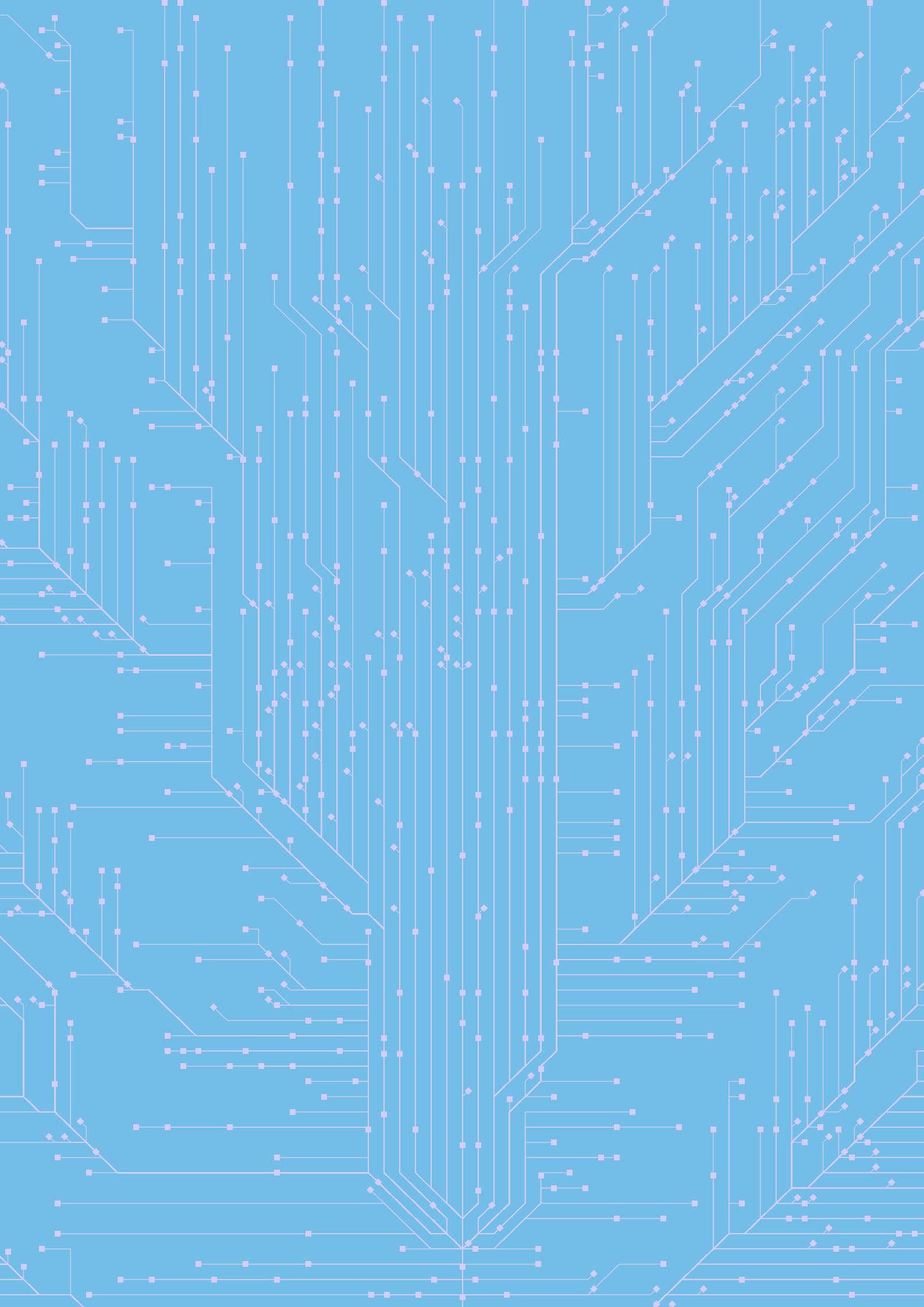


ENABLING DISASTER PREPAREDNESS WITH GEOSPATIAL DATA

Mohini Ganguly

In December 2022, the Indian government notified the National Geospatial Policy, which aims to build a national framework that supports the liberalisation and commercialisation of the sector. This has foregrounded the increasing importance of geospatial data for various purposes, including in disaster risk reduction.

Assam, a state in India's Northeast region, is vulnerable to a host of disasters due to its topography. According to the Center for Study of Science, Technology and Policy's Climate Atlas, which analyses historical data and presents near-future scenarios, all of Assam's districts will see increasing rainfall and nearly all will see increasing high-intensity rainfall events[1] as climate change intensifies, under the scenarios they have analysed.

Cachar district is a landlocked region, bordered by the states of Meghalaya in the north, Manipur in the east, and Mizoram in the south. The Barak River runs through the district and, as such, it is vulnerable to flooding, landslides, and earthquakes. During such disasters, communication becomes challenging, heightening the area's vulnerability.

In May and June 2022, Assam experienced extensive floods, with over 55 lakh people impacted.[2] Reliance Foundation engaged in relief operations in the Cachar and Nagaon districts, with the assistance of volunteers to support the district administration and NGOs, benefiting approximately 30,000 people. Disasters can have a multigenerational impact, and it can take years for families to recover to their pre-disaster conditions. Working at the grassroots for many years, Reliance Foundation's Disaster Management programme also understands the importance of moving towards disaster preparedness in addition to disaster response to mitigate the worst impacts of recurring flooding.

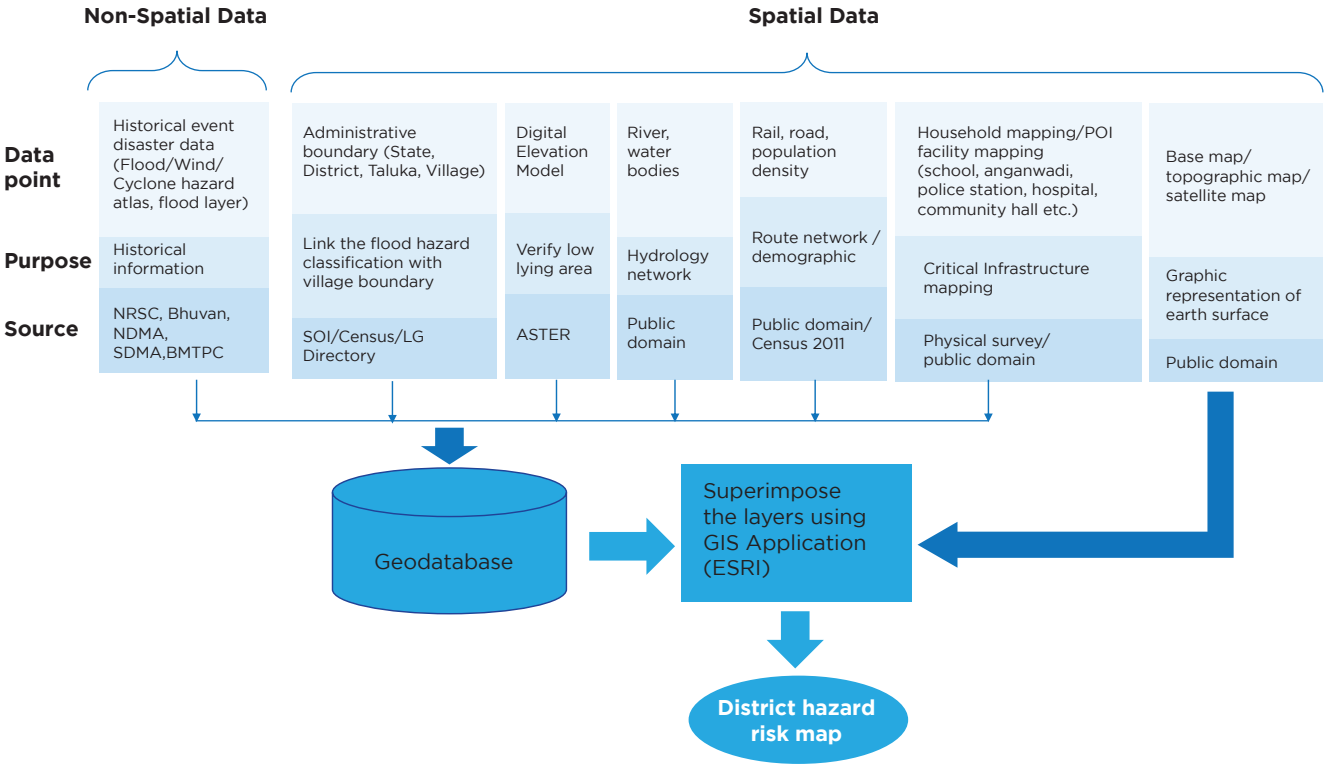
After the relief efforts, Cachar District Disaster Management Authority (DDMA) approached Reliance Foundation to be a knowledge partner in developing disaster management strategies. The approach takes into account the importance of incorporating extremely localised challenges and creating similarly localised responses and plans, not only at the district level, but at the community or hyperlocal level. A holistic disaster management approach saves lives and livelihoods. Supporting public institutions in disaster preparedness and community resilience-building for disaster risk reduction are key paths to reducing losses when disasters strike. Supporting the community and the local government in identifying key areas of vulnerability and developing tools and gathering data to make decisions quickly during disasters are important aspects of holistic disaster management. Reliance Foundation's approach to this programme is also built on these pillars. Using a Geographic Information System (GIS), it aims to use geospatial data for facilitation of disaster planning and preparedness by decision-makers. While the district's database contained GIS based maps, and infrastructure related data, it required support in developing methods to use these resources systematically, and identifying and

addressing gaps. For instance, support in reducing information chasms, or the lack of mechanisms for providing early warning advisories in floodprone areas.

LEVERAGING DATA FOR DEVELOPMENT

A GIS can have numerous uses in all phases of disaster management (mitigation, preparedness, response, and recovery). In respect to disaster management, risk is now understood to be a function of both the geography of an area and the human environment. The approach being used in Cachar brings together both facets, using household-level surveys and critical infrastructure-mapping to identify human environment risks, and likelihood of flooding or other hazards to identify geography risks.

IMAGE 1: Process of Creating a District Hazard Risk Map



Source: Illustration provided by Senthilkumaran Krishnan and the Reliance Foundation disaster management team.

The first step of the programme was conducting a sector-specific needs assessment between 31 October and 4 November 2022 through focus group discussions. Ninety-one participants, including people in vulnerable occupations and government stakeholders from three Cachar gram panchayats,[a] attended the four discussions. Hazard seasonality mapping was a key part of the needs assessment. Respondents reported their assessments of the likelihood of flood, river erosion, earthquakes, drought-like situations, hailstorm, and Nor'westers occurring in each month of the year, and the impact this would have on infrastructure and livelihoods.

[a] The gram panchayat is a village-level governing body under India's Panchayati Raj system of rural local self-government.

Deshabandhu Club, which is one of the Cachar DDMA's network NGOs for disaster management, also attended the discussions. Other attendees included members of the Inter Agency Group (IAG)[b] Cachar, and representatives from the Community Facilitation and Resource Centres (CFRCs).

The CFRCs began in October 2022 as a joint initiative of the DDMA and panchayat and rural development departments in collaboration with the IAG to build disaster resilience in the community. Ultimately, CFRCs are intended to become the repositories of data and information, able to give advice during and after disasters to officials regarding the panchayat, and to the families residing within it.

In November, the needs assessment was presented to the Cachar DDMA, which then shared these findings with the heads of departments working at the district level for disaster management (such as the departments of social welfare, state rural livelihood mission, and agriculture), and grassroots NGOs. A crucial conclusion was that the community that would be affected by disasters did not have adequate information on the basic facilities available in the vicinity for protection and shelter, while the government departments lacked updated information. Reliance Foundation also demonstrated the capabilities of critical infrastructure mapping through geotagging (the process of adding geographical metadata, most often geographic coordinates, to a map).

Public facilities like health centres, hospitals, schools, *anganawadis*[c] and panchayat offices are crucial during disasters, serving as shelters for vulnerable people who need to be evacuated. To be able to plan accurately, each space's existing amenities (including sanitation facilities) and its holding capacity (the number of people that can be accommodated during a disaster) need to be assessed. The Reliance Foundation team conducted critical infrastructure mapping and geotagged these public sites. Critical infrastructure mapping would ideally support local governments in planning. For instance, Panchayati Raj institution members or community planners will be able to identify any existing gaps and make a development plan to add facilities to enhance community-level preparedness and crisis management.

For example, in Balichara Grant Pt - II village in the Borkhola panchayat of Cachar's Silchar taluk, geo-coordinates of 33 vulnerable households and public utilities such as a school, health centres, roads, community halls, and water canals were mapped.

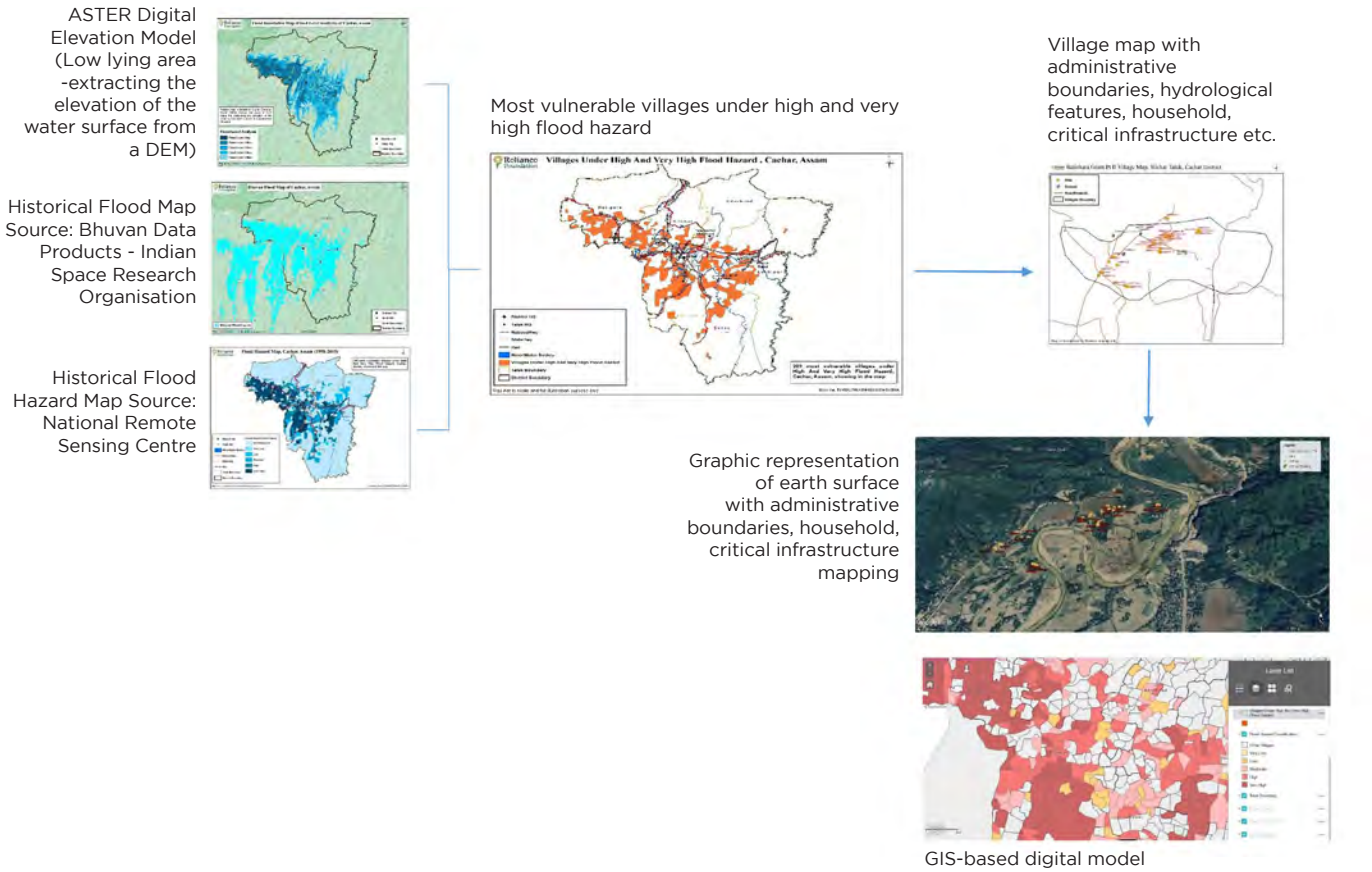
Reliance Foundation used secondary data and historical information to identify which parts of the district were at risk of flooding, marking villages as being at 'very high,' 'high' and 'moderate' risk, and created a flood layer map with GIS. Then, using a digital elevation model from ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer), a flood inundation map was created. Villages that came under the 'very high' and 'high' risk categories are the most vulnerable, with 209 such villages being identified so far.

These geo-coordinates were superimposed on a flood inundation map and the map was presented to the DDMA, to demonstrate the potential of geotagging and GIS as a tool for their use.

[b] A group of organisations that includes civil society bodies, government representatives, representatives from UN organisations, and others who work towards humanitarian activities in a particular region.

[c] Anganwadis are a type of rural childcare centre. They were started by the Indian government in 1975 as part of the Integrated Child Development Services programme to combat child hunger and malnutrition.

Image 2: Process diagram for Balichara Grant Pt – II village



Source: Illustration provided by Senthilkumaran Krishnan and the Reliance Foundation disaster management team.

Similar maps can be created for cyclone risk or other hazards. Reliance Foundation has already begun creating multi-hazard maps, taking into account that facing multiple hazards increases an area's vulnerability.

The CFRCs had begun household surveys since their inception. The process of collecting household level data became easier and was made more secure, with Reliance Foundation assisting the Cachar DDMA in preparing surveys using mobile phones. Detailed data on every household is collected to identify indicators that make them vulnerable in the event of a disaster. The data points include the number of members; their age, gender, education levels, and occupation; if there are any persons with disabilities; if the houses have temporary and unsafe roofs; and if the household has access to social security and has government identification cards. Geotagging is automated, with individuals filling in the data via a phone.

Once there is data identifying the vulnerable households, evacuation plans can be prepared on maps. By identifying how many persons are present in the household that would need to be evacuated, mapping out a safe spot for them, and the path to reach such shelters, the residents and officials can be prepared for when the next disaster strikes. The information can also be used to assist people in accessing social entitlements, such as a disability or old-age pension and or ration cards, reducing their vulnerability.

The DDMA retains the raw data and intends to share only anonymised data with appropriate partners, including Reliance Foundation, for the purpose of data analysis and planning for interventions. They were initially cautious regarding the collection of data, as some of the data is sensitive, but the development of the survey and data collection process was reassuring since no one but the government can access the raw data.

IMPACTS AND OUTCOMES

Local volunteers and stakeholders, including the Border Security Force, were key in supporting relief operations in Cachar during the 2022 floods. Manar Shylla, a volunteer, said, "It was humbling for me to work for the Tribal Khasi community who are one of the most vulnerable community." Understanding the various aspects that lead to vulnerability, including socioeconomic, is vital to reduce risks and is a first step towards building resilience.

Reliance Foundation has conducted two training sessions, one with local NGOs (including the IAG, and the Deshbandhu club) and the other with members of the Cachar DDMA. The training focused on the collection of primary data—how to use the household surveys that have been prepared, how to accurately collect the data, and how to use the geotagging feature—enabling them to conduct the data collection activity. Subrata Das, community volunteer in Cachar's Katigorah, said, "For our community resilience building planning, we needed information on the details of vulnerable households and its members. This information would help us in providing social entitlements."

While the Cachar DDMA retains the collected data, it has partnered with nodal non-government agencies such as Deshbandhu Club to mobilise the community. Reliance Foundation is also assisting the organisation in some areas, such as initiating 'lightning safety' advisories and livelihood advisories to over 61,000 individuals during Cyclone Sitrang (October 2022).

It is well-recognised that disaster risks are localised, and responses must be so as well. In 2022, the Ministry of Panchayati Raj developed the Disaster Management Plan with the aim of developing disaster resilience at the grassroots level among the panchayats. A key aim was to ensure a participatory planning process, and community-based disaster management. The ongoing work in Cachar is an example of how partnerships between local governments and all stakeholders can drive progress in disaster management.[4] Cachar district's existing data on infrastructure and GIS based maps could not be utilised systematically. With detailed assessments of household-level of vulnerability and infrastructure, and superimposition of appropriate geographical features, the district will be able to plan better and the community will be better prepared.

As the impacts of climate change continue to be increasingly felt, humankind must prepare for more extreme conditions and worsening disasters. Already vulnerable communities can no longer rely on their traditional knowledge of disaster risks and protection. Systematising the process of assessing vulnerability, providing knowledge to the local governments, and planning to make and process quick decisions during disasters is vital.

KEY LESSONS

- Partnership with multiple stakeholders, including local governments and humanitarian organisations, can create a multiplier effect. It aids in gaining the trust of the communities and in using localised knowledge, and the network allows for greater outreach. Additionally, it is expected that aiding local government stakeholders in planning will create a stronger and more sustainable model than working alone.
- Disaster management requires localised solutions, with the support of local stakeholders who are aware of the needs and concerns of the region. Disaster management at the state level needs to be supported further at the local levels.
- Geospatial data combined with data on vulnerability can be used to enhance community preparedness.

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Zebra
Bear
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‘MINDSPARK’:
WORKING TO DELIVER EDTECH FOR ALL

Antara Sengupta

The COVID-19 pandemic adversely affected one of the world’s largest schooling systems, with millions of children being left out of school when India went into lockdown in March 2020. Although e-learning solutions were already being experimented with pre-pandemic, it emerged as a potential solution to tackle the learning losses induced by the pandemic. Unfortunately, most resource-poor schools could not access education technology (EdTech) solutions and adapt to the change, resulting in further deterioration of learning levels among children in the country.

In India, even before the pandemic, only about 44 percent of children in government schools in Class 5 could read a Class 2 level text. Indeed, “The pool of children that government schools were drawing their students from...became steadily more disadvantaged.”[1] In order to enhance learning levels and make EdTech accessible to children from low-income communities, Pratham InfoTech Foundation (PIF) and Educational Initiatives (EI) launched a computer-based adaptive learning programme in 2019 in government schools in Lucknow, Uttar Pradesh (UP). EI and PIF collaborated with the UP government to run a pilot of the initiative in the state to address the low enrolment rate (around 43 percent)[2] and learning outcomes in government schools. UP is India’s most populous state, with around four crore school-going children (0-8 years), which is 19 percent of the country’s total school-going population (as of 2018). Lucknow is UP’s most populous city, and as such is a good representative for potential scale-up and replicability in the rest of the country.

Additionally, Lucknow was chosen as the area of intervention as, in 2019, none of the government schools within the intervention sample had any digital infrastructure nor were these being provided by other NGOs. Under this intervention, learning labs were established in 55 government schools in urban and semi-urban areas in the city. Students from Class 1 to 8 were exposed to Mindspark with around 30 hours of learning per year per subject. It also involved providing support to teachers on platform management for long-term sustainability. To be able to accurately understand the change in learning outcomes, this intervention needed to rely on data throughout (from the design stage to the assessment stage) so that the programme could be improved at intervals to help children learn effectively.

The EI-PIF intervention is part of the Quality Education India Development Impact Bond (QEI DIB), led by a consortium of partners, including the British Asian Trust, Michael & Susan Dell Foundation, and UBS Optimus Foundation. Impact bonds essentially places a focus on outcomes rather than outputs. In addition, these programmes transfer risk from government (as the payer of results) to the NGOs delivering the results. As these NGOs often cannot bear such financial risk, they may choose to engage with private sector investors to assume this risk. The resulting structure creates strong incentives for the education partner and for investors (if these are engaged) to deliver results. This leads to an improved procurement process and better value for money for government spending.

LEVERAGING DATA FOR DEVELOPMENT

The accurate measurement of data and results are the cornerstone of outcomes-based financing. The Mindspark programme began with clear outcome indicators (enrolment and learning gains) specified in the evaluation design. The specific outcome targets were discussed with individual implementation partners yearly, which helped them register a baseline and continuously track progress.

At the ideation stage, EI-PIF teams studied the Annual Status of Education Report (ASER), a yearly survey by Pratham that provides data on the status of schooling for children and their learning levels in rural areas in India. "ASER data indicated the need for an EdTech intervention in this region but we wanted to design something that would not only match the existing learning levels of the students, but also help teachers track and improve their performance consistently," said PIF co-founder and CEO Prem Yadav. The Mindspark intervention aimed to achieve at least 10-15 percentile of grade-appropriate learning levels for the target group. Using ASER, the team had insights into UP's status on enrolment and attendance patterns, learning levels, and school facilities.

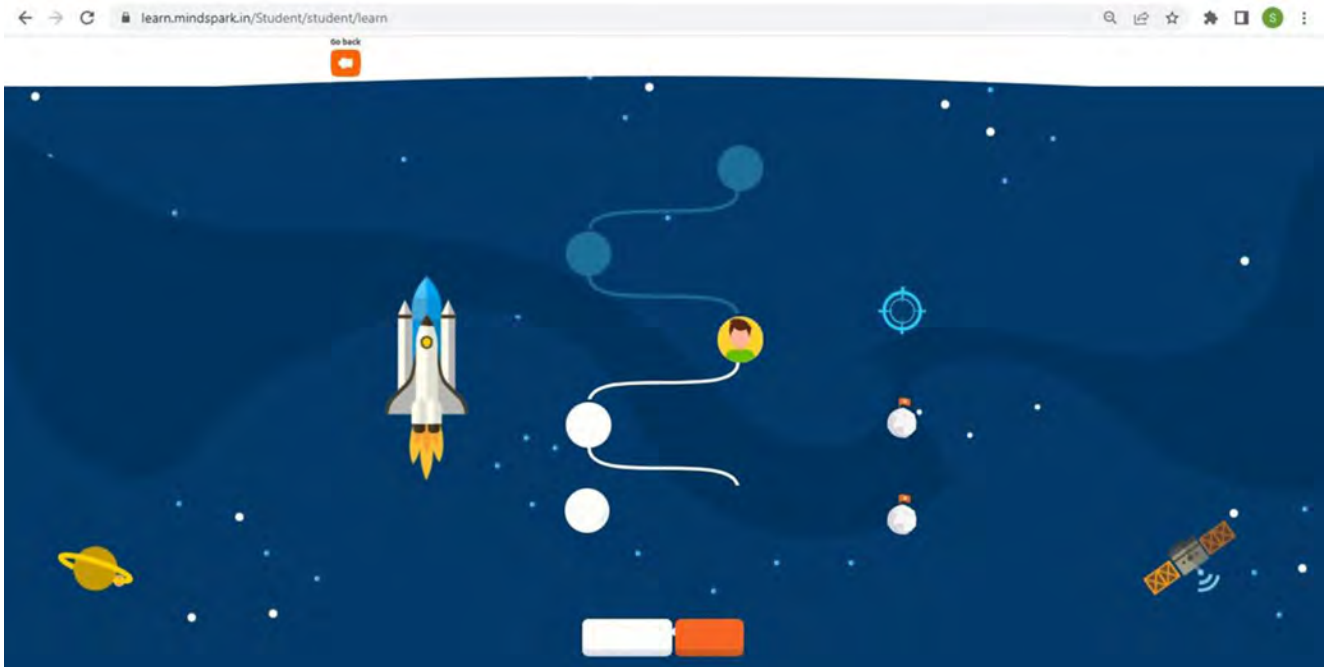
Besides the ASER data, they also conducted recces and surveys in about 110 schools in Lucknow (from a list provided by the state government) to understand the baseline data. The survey helped them understand that the availability of smartphones at home was not a useful indicator to gauge if children can optimally use it to learn effectively. "Hence, we provided up to 25 Chromebooks to each school so that students can operate the device themselves and learn on them in some dedicated periods within their classroom hours," said Yadav.

They were also aware that teachers needed continuous support and training in the software as well as platform management to effectively deliver the lessons. This was also pertinent to ensure the sustainability of the initiative.

"We employed *sancharaks* (communicators) for each school, who would help run the programme and assist teachers," Yadav explained. "They are local youth aged between 25-30 years, who are trained and skilled under this programme on how to use the digital medium to use EdTech." However, *sancharaks* cannot be replaced by teachers as they do not have subject knowledge.

In the first year, the team conducted internal assessments to understand each child's learning levels for Math and Language. Children were grouped based on these assessments to facilitate peer learning. After each lesson, tests were generated based on students' learning levels, which helped the EI-PIF team track each child's progress.

Figure 1: An assessment page on the Mindspark interface



Implementation

Under the QEI DIB, EI-PIF developed clear assessment metrics to improve the performance tracking of schools and students. This helped in early problem detection and deploying targeted solutions that were informed by data. For instance, EI-PIF tracked the daily usage of Mindspark software as well as indicators on the quality of usage (the number of consecutive questions answered correctly by students). This directly impacted student learning outcomes and informed EI-PIF's actions in schools or students that were lagging. Notably, "Whenever a child solved three questions correctly, the student would get a 'spark' on the screen. This motivated them and seeing their excitement the others were also motivated," said Roopa Billava, Programme Lead at PIF.

Students were given log-in credentials to access the lessons and the Mindspark software on the Chromebooks, which was connected to a server and would be synced before and after the class each day. All 55 labs generated data on students each day, which was collected and stored in a central database.

Based on the data, the five best and worst performing schools were identified. The schools with the best outcomes were motivated to share best practices, whereas an executive committee at the programme level deliberated on solutions to mitigate challenges encountered by the five worst schools in terms of achieving learning outcomes. The EI team also conducted workshops to train the PIF team on understanding and reading the system-generated data. "The EI team created functions as per our requirements and the data generated comprised both quantitative and qualitative data. These were simple data points, which were broken down for us to understand the gaps," said Billava.

The teachers were then further trained and capacity-building exercises were designed to help them find solutions to the problem. "In a physical

classroom, teachers cannot pay complete attention to all students and cannot possibly know the weaknesses of each child," Yadav said. "As they were trained in platform management, they could also understand the challenges that students face, including which topic they are lagging behind." These teachers would then take extra classes to help the students overcome their gap areas.

In the first year of operations, the team had set a target of completing 20-hours of EdTech usage for each child annually. "However, we soon understood that the teachers find it difficult to understand the breakup and we were not able to achieve the minimum usage hours," said Yadav. After analysing the user generated data, the team launched 'Mission 35', encouraging 35 minutes of computer use per day per child.

The level of data access differs across stakeholders—teachers and school management had access to school-level granular data; the district or block offices had access to aggregate data for all schools within the block or district; *sancharaks* had school-level data; and the EI-PIF team have access to aggregate data and granular data for all students in each school across locations. Each stakeholder tracked and took ownership for their part of data and helped students achieve grade-level learning outcomes.

As for data privacy, the EI team explained that the data collection is non-invasive and based on an algorithm. "It is in situ data capturing, hence there is no need to ask for permissions," said EI Vice President Ritesh Agarwal. "We do not share any individual data publicly and only aggregated data is shared with the programme stakeholders."

Challenges and solutions

Given the nature of technology, the remote location, and strength of the internet, the team sometimes faced challenges in system synchronisation, which delayed the process of data generation.

Often, children faced difficulties in reading the questions on the screens. To address this, the EI team created audio clips, so they could listen to the questions and answer it by typing it out or selecting the correct option on screen.

However, the team encountered the most significant challenge when the country went into lockdown due to the COVID-19 pandemic and schools were shut.

"We went to each stakeholder, including the government officials, management, principals, parents and *panchayats*[a] to understand how we can reach the students," Billava said. "It was heartening to see that all of them were keen on continuing education." The community offered space to the EI-PIF teams to conduct community classes.

EI-PIF launched an app version of Mindspark that could be accessed by students with smartphones at home. In addition, they delivered SMS-based lessons for parents to conduct learning activities at home. They tracked weekly usage and attendance data, informed teachers about questions that were routinely answered incorrectly and built SMS-based lessons on such questions.

[a] Village-level governing bodies in India.

The intervention transitioned from an in-school model to community classes, conducted in homes, temples, or community halls.

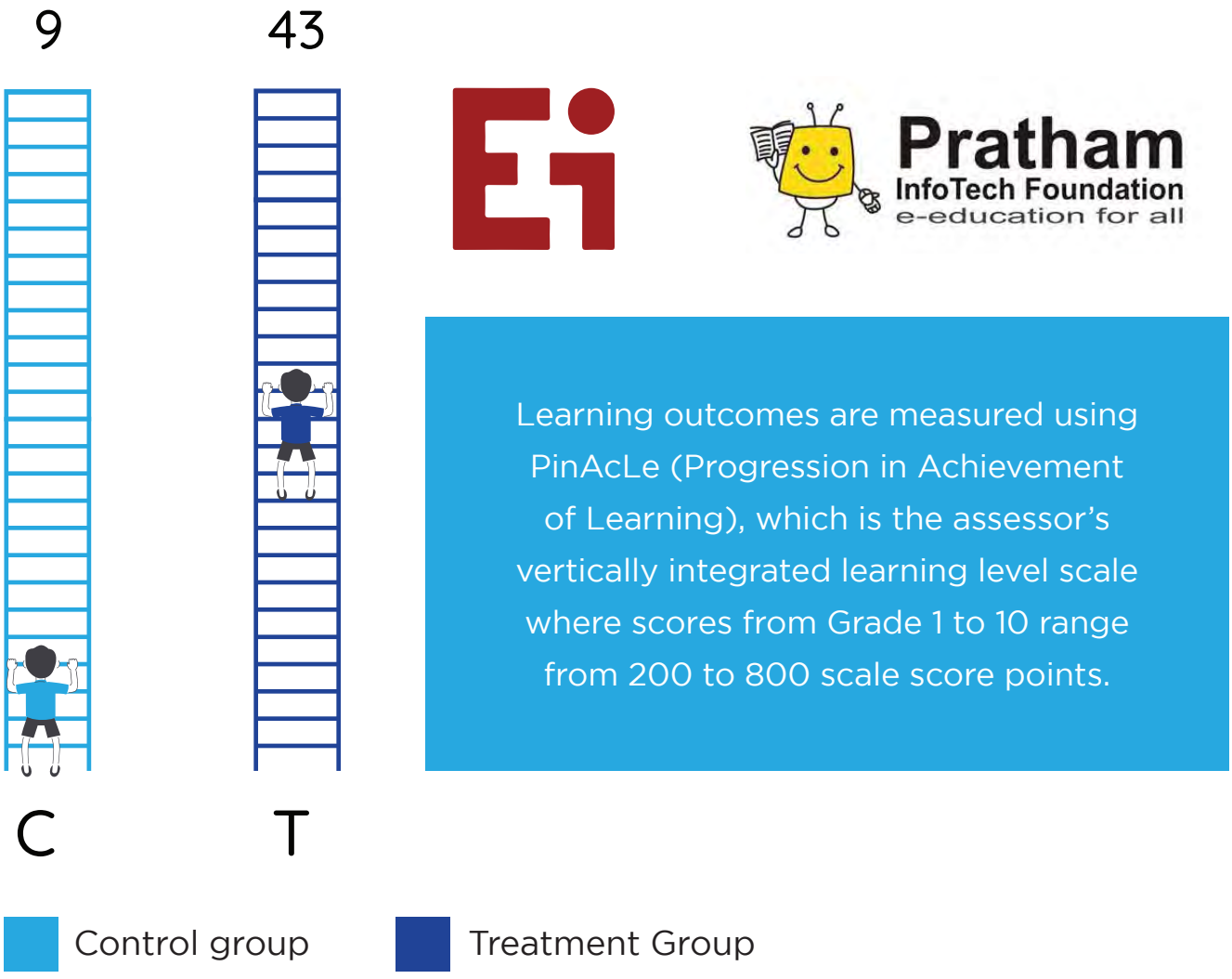
Om Prakash Yadav, Operations Lead at PIF, recalled, "The volunteers worked a lot. They charged the laptops in their homes if needed and carried extension boxes to the community. They taught children, and carried the laptops back in the evening, only to return the next day. The community members also helped us a lot. In an hour, 10 children would learn with the volunteers on Mindspark. And so, over six hours each day, 60 children would be taught. We tried our best to reduce any losses in education for the children."

IMPACTS AND OUTCOMES

The team adopted a mission-mode culture and used data extensively to improve performance on outcomes. This allowed them to exceed learning and enrolment targets each year.

By the end of the QEI DIB, in 2022, students under the EI-PIF intervention recorded a near fivefold improvement in literacy and numeracy skills in comparison to non-participating students (See Figure 2).

Figure 2: Average learning gain per year over four years



Learning outcomes are measured using PinAcLe (Progression in Achievement of Learning), which is the assessor's vertically integrated learning level scale where scores from Grade 1 to 10 range from 200 to 800 scale score points.

"The computers were an entirely new thing for them. They learned language and mathematics using them, in classes that lasted about 45 minutes. From the books they used to solve about 15 questions before they got bored and distracted. Now they are completing around 50 in each session," said Yogendra Kumar of PIF.

Although students were the direct beneficiaries of the intervention, teachers and parents too benefitted through various awareness and capacity-building exercises. For example, during COVID-19, EI-PIF teams conducted a cybersecurity awareness campaign for parents since students were using the mobile app version of the Mindspark software. Teachers were also trained in platform management and in running the software. Since teachers have been trained to handle the operations on their own, the number of sancharaks has now reduced by half.

"We have been able to affect behaviour change in the intervention schools for using edtech and now even control schools are asking us to implement the programme in their schools," said Billava.

Besides, the 'division of labour' for data collection has created marked efficiencies in implementation. "The aggregated data was shared even with the local administration, which helped them conduct regular meetings and workshops to address critical gaps," said Yadav. The data empowered each stakeholder in the ecosystem and enhanced the overall performance levels.

PIF has now taken this learning forward and instead of recording monthly attendance manually, all their other school programmes track daily attendance through technology.

"It is most important to build a culture of data-driven decision-making in the programme ecosystems," said Yadav. "The idea of enticing children with sparks is to ignite enthusiasm in children to perform better. Similarly, categorising schools as best and worst also helps them enhance or improve performance, with respect to other schools."

While the EI-PIF programme concluded in March 2022, PIF continues to support the 55 schools. Importantly, given the programme's exemplary results, NITI Aayog is now replicating the programme in other parts of UP.

KEY LESSONS

- Real-time data generation helps generate micro insights and facilitates quick and timely decision-making.
- It is important to build capacities of each stakeholder in understanding data points. This helps in faster collective action and reduces any time lags in decision-making.
- An outcome-based financing mechanism is a strong driver for better educational performance, but it relies on data and accurate measurement. Edtech solutions, by their nature, are well suited to be integrated into such a financing structure and can drive better learning outcomes.

ENDNOTES

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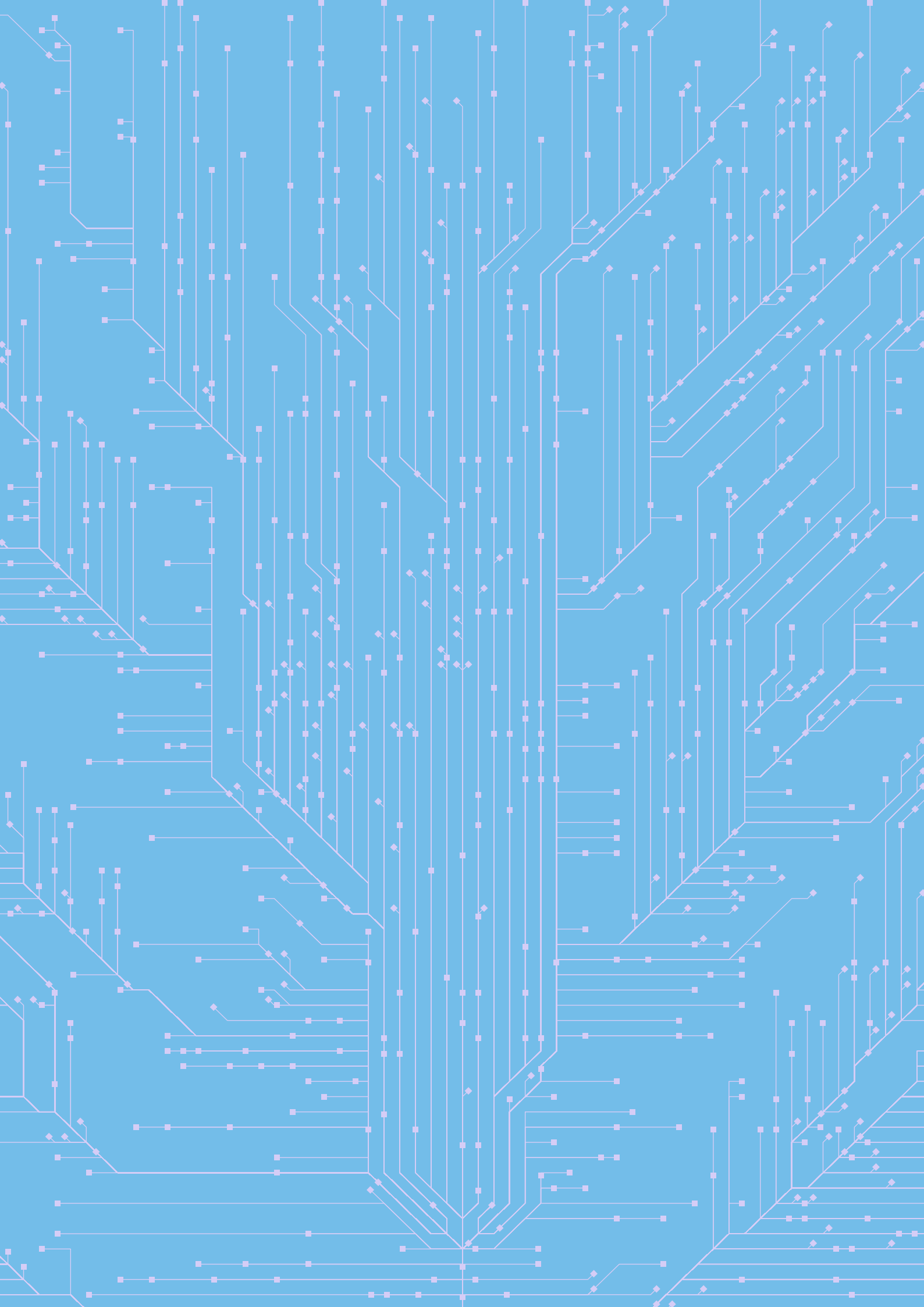

THE 'PATH' TO USHERING A NEW ERA OF DIGITAL HEALTH

Noyontara Gupta

In 2021, eight countries accounted for more than two thirds of global tuberculosis (TB) cases.[1] About 28 percent of these cases were concentrated in India, with Indonesia, China, the Philippines, Pakistan, Nigeria, Bangladesh, and the Democratic Republic of Congo also having a high incidence of TB.

TB has persistently been among the most persistent public health challenges in India. Even so, the country has committed to eradicating TB by 2025, ahead of the target set under the 2030 Agenda for Sustainable Development.

In its efforts to tackle the disease, the Indian government has undertaken several measures—implementing the Revised National TB Control Programme, providing free TB diagnostics and drugs to patients, and making it mandatory for practitioners to notify TB cases through the government's web-enabled patient management system for TB (Nikshay). The government also developed the National Strategic Plan 2017-2025,[2] which outlined various approaches to eliminate TB by 2025. One key strategy noted in the plan was private-sector engagement.

According to the National Sample Survey Office, as of 2014-15, over 70 percent of healthcare services in India were provided by the private sector. About 72 percent of rural residents and 79 percent of urban residents used private healthcare services.[3] Moreover, nearly 81 percent of India's doctors work in the private sphere. The diagnosis of TB and treatment status of patients in the private sector was neither recorded nor notified in government information systems, inevitably leading to underreporting, which in turn led to the suboptimal monitoring of treatment completion rates. Many of these challenges have persisted, and close analysis of patient care in private-sector TB treatment has revealed more concerns, such as delayed diagnosis, less-than-optimal quality of care, and financial burdens due to high out-of-pocket expenses, leading to a high rate of treatment drop-out. In a country like India, where public health facilities are overburdened, for health initiatives to see true success, have large-scale impact, and be wholly inclusive, acceptance in private healthcare is crucial.

LEVERAGING DATA FOR DEVELOPMENT

PATH, an international non-profit founded in 1977, involves a global team of innovators to accelerate health equity. The organisation identified a lapse in TB response across the country, especially among private-sector healthcare providers. What began as a pilot to address this gap in high slum population wards in Mumbai was eventually scaled up across the country, firmly establishing PATH as a leading force in private-sector engagement efforts in India's fight against TB.

The story begins in 2014 with PATH's Private Provider Interface Agency (PPIA) programme, which was launched as one of the initiatives under the larger umbrella of 'Mumbai Mission for TB Control' under the aegis of the Municipal Corporation of Greater Mumbai. Through PPIA, PATH reached out to private healthcare providers to enable early diagnosis, prompt response, and timely and increased notification of TB patients, enabling patients to see through the entirety of their treatment. Identifying the key role played by disruptive innovations like technology and by leveraging market forces, PATH actively worked towards developing a collaborative relationship with the private sector to facilitate TB control in Mumbai. The PPIA model utilised digital health, management principles, data, research, information and communication technologies (ICTs), and frequent stakeholder inputs to work towards achieving its goals. The model was designed to enable TB patients in the private sector get access to free public-sector drugs and subsidised state-of-the-art TB diagnosis.

According to PATH representative Rishabh Chopra, the objectives were simple: increasing the number of TB notifications from private healthcare providers; ensuring that providers maintain appropriate quality of healthcare as per the Standards of TB Care in India; tracking and ensuring treatment adherence (to see if the patient actually went through with treatment post-diagnosis), and analysing the post-treatment outcomes.

PATH deployed field officers, who were often former pharmaceutical representatives, led by personnel in the pharmaceutical market, to approach private-sector healthcare providers and patients. A service delivery model was adopted, wherein incentives were offered to patients in the form of vouchers (to get access to free World Health Organization-approved diagnostic tests and medicines from PPIA-networked laboratories and chemists) and for treatment support for patients to complete their treatments. Patient support services were led by Maharashtra Janvikas Kendra and ALERT-India, two organisations that have been working in Mumbai slums for over three decades. By suitably leveraging technology, patients were also sent daily reminders via SMS and through dedicated call centres to ensure treatment adherence.

The data collection process was not easy. The project involved the collection, storage, and monitoring of data that was related to private providers and TB patients. With over 13,000 medical facilities in the Greater Mumbai area in 2014, manual databases were not feasible. Further challenges emerged while mapping geographies and narrowing down data that could be relevant. In 2015, a platform was developed that could host the end-to-end patient data—beginning with the notice of a potential TB diagnosis and ending with the outcome(s) of the treatment. The platform, named Universal Access to TB Care (UATBC), offered services like notifying confirmed TB cases to Nikshay, generating electronic vouchers (replacing the paper voucher incentives that were distributed earlier), providing CB-NAAT tests[a] and first-line anti-TB drugs,[b] reminding patients to follow up on treatments, and checking in on patients periodically to monitor treatment. The UATBC also helped provide digital identification numbers to the providers, and facilitated the generation of e-prescriptions.

[a] Widely accepted diagnostic test for TB.

[b] First-line drugs are first choice drugs for treating a condition with the least likelihood of causing side effects. Of the approved drugs, isoniazid (INH), rifampin (RIF), ethambutol (EMB), and pyrazinamide (PZA) are considered first-line anti-TB drugs and form the core of standard treatment regimens.

The PPIA TB pilot programme, which ran from 2014 to 2017, saw the successful engagement over 13,212 private providers (which included practitioners, specialists, chemists, labs, and more). The numbers are also impressive in terms of patient coverage—about 1,80,000 people availed PPIA services, 60,366 TB patients were notified, and nearly 80 percent of those who underwent treatment completed the course successfully.

The effective use of data and technology for development is abundantly clear. For example, according to PATH, since it was possible to capture events in a patient's course of treatment, once aggregated, such data would provide population-level insights into treatment adherence. The model also enabled the quicker notification of cases and transfer of data from the private sector into the public sector health systems, leading to the inclusion and greater adoption of ICT tools in government notification systems across the country.

Three years into the pilot programme, with the support of the Indian government, a pan-India scale-up of the PPIA model was rolled out, finding a new identity as the Patient Provider Support Agency (PPSA).

The evolution from PPIA to PPSA served as the basis for the Joint Effort for Elimination of TB (JEET) project. Jointly implemented by the William J. Clinton Foundation, Centre for Health Research & Innovation (a PATH affiliate), and the Foundation for Innovative New Diagnostics, with funding from the Global Fund to Fight AIDS, Tuberculosis and Malaria, Project JEET upheld one main mantra, "go where the patients go," says Chopra.

By scaling up the programme, India's 'trace, track, and treat' strategy to combat TB has been informed by the data and insights that emerged out of PPIA, and subsequently the PPSA. Project JEET has been a significant contributor to total notifications from the private sector of TB cases, increasing from 29 percent in 2018 to 68 percent in 2020.[4]

Further enabling the case notification and treatment of patients, the government has incentivised the process through the Nikshay Poshan Yojana, a direct benefit transfer scheme for TB patients.[5] Under this scheme, patients receive INR 500 per month for the treatment duration of six months. The government has also made concerted efforts to engage providers in case notifications, offering INR 100 for every TB case that they notify. These efforts have gone a long way towards increasing the visibility of TB cases and treatment adherence for patients.

In 2022, based on the learnings from the PPIA, PPSA, and JEET (2014-2021), PATH launched a pilot in Mumbai to support the National Health Authority to onboard private sector healthcare providers onto the Ayushman Bharat Digital Mission (ABDM), a task that includes the registration of health professionals and health facilities (clinics, nursing homes, hospitals) on relevant ABDM registries, the creation of Ayushman Bharat Health Accounts (ABHA) for patients, generation of electronic health records, engaging with stakeholders, and more. The pilot aims to explore new ideas on how to increase the adoption of digital tools in healthcare and improve access to healthcare for patients by utilising technology.

Like the PPIA and JEET, the new pilot is built on the premise of leveraging technology to strengthen and develop India's health ecosystem. As of January 2023, the pilot has onboarded over 300 health professionals and facilities, resulting in the generation of 3,000 ABHA-linked electronic health records.

Notably, the goal of the ongoing pilot is not just to onboard healthcare professionals onto the ABDM, but to truly digitise their practice and develop a model for engagement and onboarding of private-sector healthcare providers on the platform. Moreover, through ABHA-linked e-health records, the patient will have access to longitudinal health records that can be easily shared with healthcare providers, creating a feedback loop and transparency that would help inform diagnosis, treatment, and follow-ups.

By leveraging the pre-existing networks created during PPIA, and with support from the Municipal Corporation of Greater Mumbai and the state public health department, a list of doctors has been mapped across selected wards in Mumbai. The list is not exhaustive, but gives a broad idea of the contours that have to be covered. PATH deployed a field interface agency to reach out to the clinics, identifying the number of doctors in the process and onboarding them to ABDM.

According to Tanu Gupta from PATH, an internal dashboard has been created to maintain records and monitor progress, which the field staff update on a daily basis. The dashboard maps various data points—from progress updates to notes on which doctors are more receptive and which are more reactionary. The database offered significant insights on whether the pilot was working, and what could be done to make it more effective.

The pilot has been a massive undertaking—bringing in local ward-level medical officers and associations to engage doctors on the need to digitise their practice by means of in-person sessions, interactive videos, flipcharts, posters, and pamphlets. The process has not been without challenges. Extensive training has been provided to the field officers, such that they could approach and inform the clinics and doctors accordingly. Moreover, constant feedback is being obtained on the user experience for continuous improvement and evolution of digital solutions.

Under the new pilot, PATH is working towards the targeted sensitisation of doctors to adopt digital solutions by telling them about ABDM, immediate and long-term benefits of digitisation, and addressing their inhibitions and concerns by giving further details about the mission and citing examples from Indian digital success stories (such as Aadhaar, Unified Payments Interface, and CoWIN[c]).

IMPACTS AND OUTCOMES

While the Mumbai pilot is still at a relatively early stage, it has begun to demonstrate impressive outcomes. More and more benefits will become visible once the Unified Health Interface becomes fully operational.[d] The project has already begun to stand out as a critical step towards transforming the digital healthcare landscape in India, particularly in light of the COVID-19 pandemic.

Stakeholders in healthcare provision cannot work in silos. PATH's efforts have shown the value of driving a multi-partner initiative and collaboration for impact. Digital tools can enable data-informed corrective actions that help improve service delivery and reinforce the confidence of the end users. This supports improvements in the quality of care while simultaneously easing the burden on an already-strained ecosystem by bridging the divide between public and private providers. Through these efforts, PATH is paving the way for change.

[c] Unified Payments Interface is a mobile payment method, wherein your smartphone can essentially function as a debit card. CoWIN is the Indian government's web portal for COVID-19 vaccination registration.

[d] The Unified Health Interface is a network of open protocols that enable the interoperability in health services.

KEY LESSONS

- A system of periodic assessments ought to be established at the state and national levels to identify gaps in public health delivery. Based on their findings, strategies ought to be evolved for engaging and incentivising private healthcare providers to address these gaps.
- Civil society organisations could play a critical role as intermediaries connecting private service providers to large-scale government initiatives, or helping them build applications or tools based on existing digital public infrastructure.
- The potential for scalability and replicability must be integrated into the basic design of digital health pilots or proof-of-concept projects. If found to generate value, such initiatives often need to scale-up rapidly across geographies.
- Dashboards can be indispensable to the management of 'data for development' initiatives. By presenting real-time data and trends to decision-makers, they enable policymaking, course correction, and strengthen transparency and efficiency.

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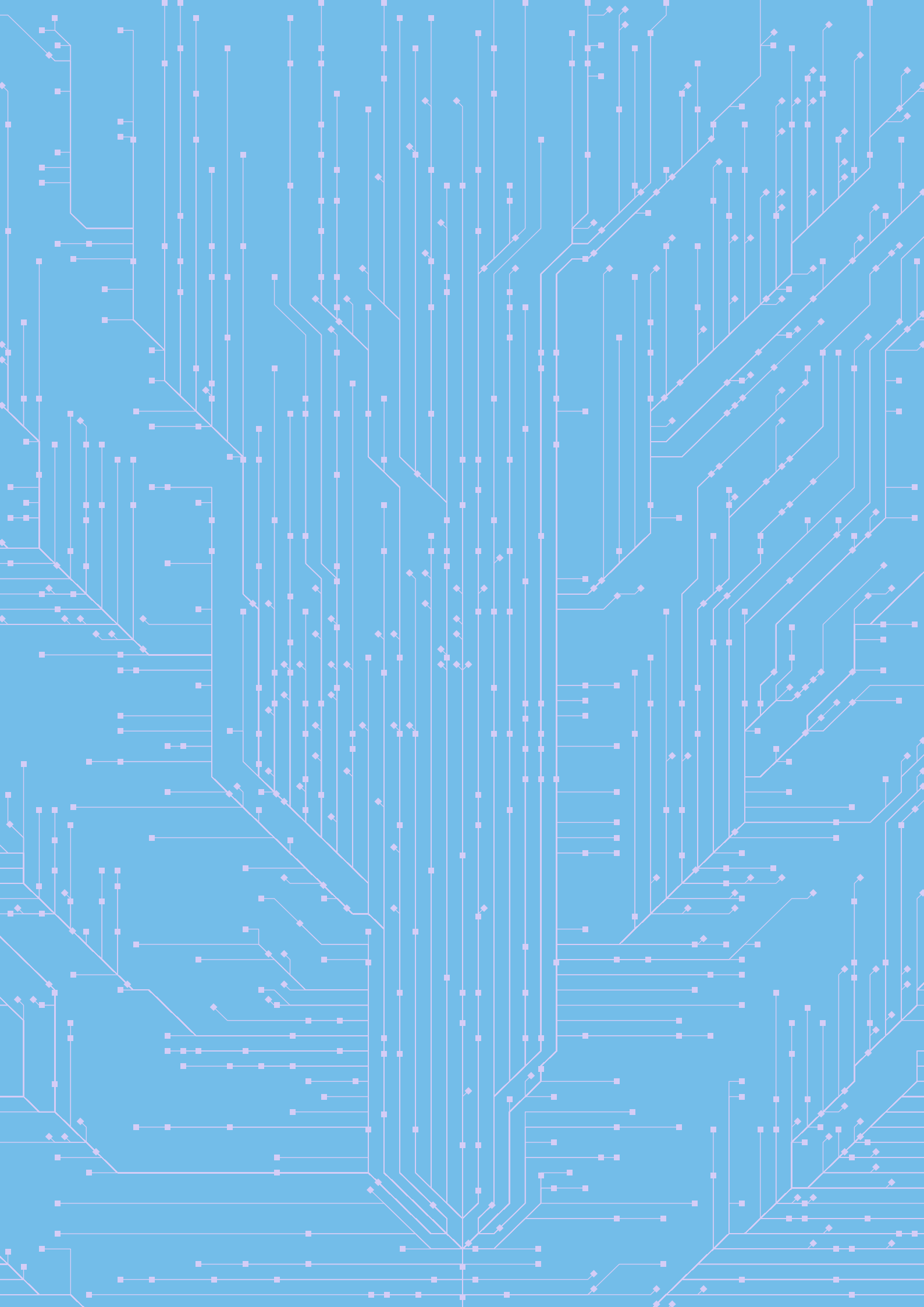

‘CLOTH FOR WORK’:
USING DATA TO BUILD A CIRCULAR ECONOMY

Swati Prabhu

Community development is considered the bedrock of good governance and sustainable societies. A powerful and effective tool, it can potentially help tackle a host of social challenges, ranging from poverty to livelihood generation.[1] However, the Indian social sector faces several challenges while fulfilling this goal.[2] One critical problem is in ensuring the successful delivery of support and effective logistics management at the grassroots level in emergency situations, such as a pandemic or disaster event. Indeed, disasters can wipe out years of development by destroying habitat, crops and infrastructure, resulting in vast human displacement.[3] In such a context, a circular economy may prove particularly effective. Offering a systems solution framework, a circular economy promotes the reuse of waste products by turning these into critical resources, in turn facilitating resilient economies.[4]

Goonj, an independent Delhi-based non-profit organisation, attempts to use data to ensure smooth supply chain management, particularly at the grassroots level. This can be a disaster-stricken area or a remote village. Demographically, their efforts cut across barriers of caste, age, religion, and gender. Goonj’s activities centre around the ‘Cloth for Work’ model—a bottom-up community-led development approach underlining the importance of material as a tool of social development. Here, the central objective is to utilise urban surplus material through community sensitisation, which acts as a motivator to enable large-scale development activities on the ground. It collaboratively devises solutions with communities to address issues as diverse as menstrual health and hygiene, education, employment, agriculture, water, and the like. ‘Cloth for Work’ promotes the repositioning of urban discard as a development resource. Through this model, Goonj has been collecting and disbursing tonnes of material in 5000+ areas every year across 27 states and union territories.

LEVERAGING DATA FOR DEVELOPMENT

The ‘Cloth for Work’ model relies on hybrid data collection techniques. The conventional mode of conducting surveys (circulating questionnaires and conducting structured interviews) for gathering information helps, but Goonj’s advantage in data collection is its local grassroots workforce, which is well acquainted with the cultural milieu, on-ground knowledge, and the rural world’s sensibilities. By engaging in freewheeling conversations and dialogues on pertinent issues of sanitation, health, local infrastructure, water and community spaces, Goonj’s field teams help the local communities identify and prioritise their material and social needs. In most cases, these team members are from the village where they undertake extensive observation surveys to identify resource-deficient areas. This also has a

ripple effect on neighbouring areas, which often assess their specific needs, thus contributing to the data-collection process.

The data collection process is different in urban areas—it is more focused on sensitisation and creating awareness about meaningful giving, about avoiding mindless charity, and encouraging civic participation to provide material to meet the basic needs of rural communities. Importantly, data is collected to streamline the processing of urban material to carefully match the needs of the rural communities.

Jigisha Maheta, a Goonj representative working with the organisation's Chennai chapter, notes how during the 2014 floods in Jammu and Kashmir, the relief material collected from the urban centers failed to match the dietary and clothing needs of those displaced. For instance, people from Delhi and Mumbai sent basmati rice and saris, but this did not meet the needs of those affected. In such situations, data collection and reconnaissance exercises can help sensitise the urban population about regional usage patterns, but this must be done before a disaster strikes. According to Abhinav Dutta, a Goonj representative from the head office in Delhi, "Collecting data post disasters is a near impossible task because of the obvious bottlenecks in access, communication, and the like in a real-world scenario. One learns, observes, and understands the cultural practices and traditions of a specific region beforehand—this is disaster preparedness. For instance, during the pandemic, no one had the time to collect data and match it with their implementation strategies." Now, the relief kits made by the Goonj processing centres are carefully curated to match the needs of the communities on the ground by being mindful of specific regional requirements.

Goonj's data collection efforts involve gathering various sets of hard information, as well as soft data in the form of experience and local knowledge. The selection of partner grassroots organisations is usually carried out by word-of-mouth and background checks through information available in the public domain, such as media reports. This is essential from a functionality perspective. A judicious mix of both hard and soft data is crucial for the onboarding of partners. It also serves as a system of checks-and-balances to maintain the accountability and integrity of partners.

IMPACTS AND OUTCOMES

A primary challenge for Goonj is data storage. Given that the organisation handles over 6,000 tonnes of material each year, it is tedious to maintain data related to this manually. Additionally, there is a risk of human error during the process of data entry. For Goonj, the solution lies in going digital. According to Dutta, "In the coming financial year (2023-24), Goonj intends to digitise its data collection processes, thus doing away with the overwhelming and complicated paperwork. During the second wave of the COVID-19 pandemic, we took a giant leap and migrated to Enterprise Resource Planning (ERP). Considering the scale achieved during COVID-19, it has proved to be quite helpful in managing the material collection, inventory, distribution, and reporting." Dealing with more than 30,000 kgs of material every day, Goonj has realised that a user-friendly ERP tool facilitates the efficient and effective management of resources.

Over the past two decades, Goonj's grassroots data collection networks have become deeply embedded in the rural system. Grassroots organisations have an excellent understanding of the rural cultural environment and have personalised methods of data collection. Villagers find it comfortable to share their opinions and experiences with the Goonj team. This is also a result of the goodwill generated by the organisation over the years. An awareness of the data collected in one village has a cascade effect on adjoining areas. People voluntarily communicate their needs, thus facilitating the process of project implementation.

However, data collection assumed a different meaning for Goonj during the COVID-19 pandemic. Given the urgency of the situation, materials had to be dispatched and delivered quickly, with no scope to conduct recce and surveys. Here, Goonj's familiarity with working in specific regions came in handy. Still, another lesson learnt, was that prior data collection and analysis may not always be useful in ascertaining the needs of a community in a specific situation; for instance, during the pandemic, there was a greater need for medical items rather than food.

KEY LESSONS

- Data collection at the grassroots level should be conducted independently, transparently, and autonomously, with the minimal involvement of external agencies to avoid any dilution of information. The lack of clear administrative data—such as on health, education, or nutrition—creates functional difficulties for the social sector.
- The COVID-19 pandemic has shown that data collection can attain varied meanings and forms in different disaster-like situations. Experience and local knowledge accumulated over the years will serve to address the needs of the communities.
- Human-centric models of data collection can ensure the demands of communities are met in a positive manner. This can be achieved by involving members of the local community.
- Logistics data collected from rural centres must be complemented by sensitising the urban population to achieve a balance between demand and supply of the needed resources.

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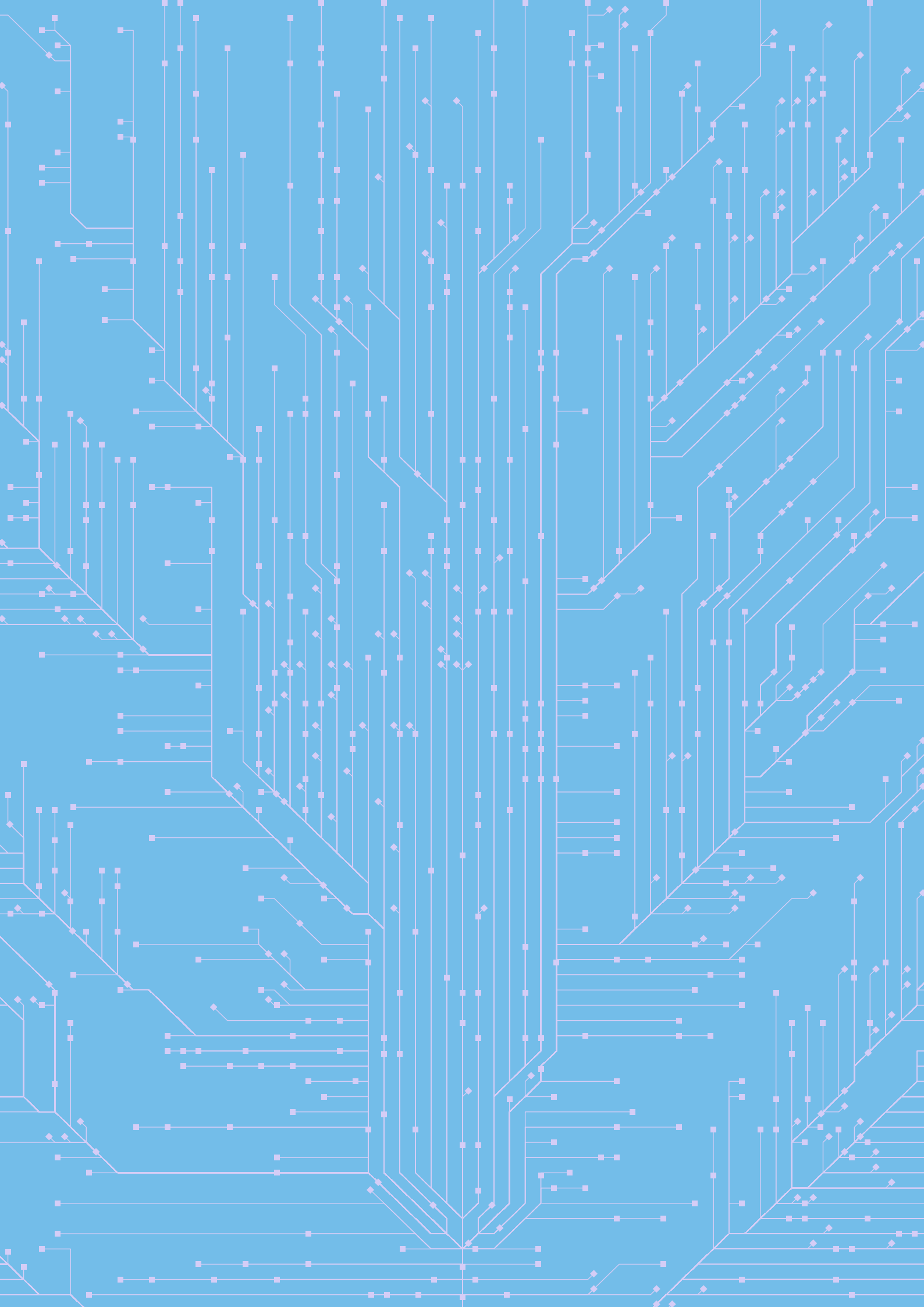

OUR APPROACH

Micro Matters is the third publication in a series by Reliance Foundation and Observer Research Foundation about transformations in development and governance.

The idea for the publication began to germinate when India announced, in late 2022, that the principle of data for development (D4D) would be integral to its upcoming term as G20 president. It struck us that while the D4D approach is not new in itself, the evolution of new technologies is allowing institutions to gather data and apply insights in ways that were not possible earlier. We felt that presenting these models to a wider audience could help export innovative D4D practices not just to underserved locales across India but also to other parts of the Global South.

Accordingly, in January 2023, we began to enter into dialogues with several India-based philanthropic and civil society organisations (CSOs) to better understand some of their high-impact D4D initiatives. These conversations led us to identify the eight exemplary case studies showcased in *Micro Matters.*

Through January and much of February, we conducted video interviews with the programme managers and project leads steering these eight interventions. The findings from each interview were supplemented with secondary documentation provided by our CSO partners, and other information gathered independently from government sources, academic studies and media reports. We remain grateful to our partners for entrusting us with the details of their initiatives.

Each case study follows a similar format. We begin by introducing the context and aims of the D4D project in question. We go on to describe its execution with particular reference to the methods of data collection and analysis used, the application of data-driven insights to specific challenges, and the various innovations employed. We conclude by exploring the project's impacts and outcomes and deriving a few key lessons.

ACKNOWLEDGEMENTS

At the very outset, a special word of thanks to the philanthropic institutions and civil society organisations who shared their cases on data-led development for this volume. Not only is *Micro Matters* about their interventions, it is a guide to advancing development by collecting data, processing it to evolve insights, translating insights into actions, and making a social impact.

This publication would not have been possible without the time and support of several partner organisations: the Alliance for Saving Mothers and Newborns (ASMAN), Anudip Foundation, British Asian Trust, Digital Green, Educational Initiatives, Goonj, Michael and Susan Dell Foundation, PATH, Pratham InfoTech Foundation, UBS Optimus Foundation, and Wadhwani AI.

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