Building AI for Public Good:
Emerging Insights from IFMR and Krea's Research, Policy and Practice Ecosystem

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Foreword

India's digital transformation over the past decade has demonstrated the power of building technology that is population-scale, interoperable, and grounded in public purpose. Digital public infrastructure has reshaped how services are delivered, how markets function, and how citizens engage with the state. As artificial intelligence becomes more deeply embedded across sectors, the central question is no longer whether AI will be adopted, but how it will be governed, applied, and integrated into systems that affect everyday lives.

India's approach to AI has rightly emphasised inclusion, openness, and real-world relevance. Rather than treating AI as a standalone technological leap, it is increasingly being viewed as an enabling layer, one that can strengthen decision-making, improve implementation, and augment human capability across domains such as health, education, livelihoods, finance, climate resilience, and governance. This perspective places institutions, data foundations, and accountability mechanisms at the centre of the AI transition.

The forthcoming global AI Summit offers an important opportunity to reflect on these priorities. Hosting such a dialogue in the Global South signals a shift in how the global AI conversation is evolving, towards development-oriented use cases, context-sensitive deployment, and shared learning across countries. It also underscores the importance of moving beyond abstract principles to concrete examples of how AI systems are being designed, tested, and embedded within public and social systems. This shift also calls for innovation in how systems can experiment, learn, and adapt - through research and innovation collaborations, and evidence-informed scaling.

This compendium by IFMR and Krea University brings together insights from initiatives and real-world applications that reflect this institutional lens on AI. Across research, policy engagement, entrepreneurship, and practice, it highlights work that engages directly with complex, real-world challenges, where data constraints, implementation realities, and social considerations shape outcomes as much as algorithms do. As India advances its national AI mission, such grounded engagement will be critical. I hope this collection contributes to ongoing conversations among policymakers, researchers, practitioners, and industry partners on how AI can be harnessed responsibly—strengthening institutions, expanding opportunity, and delivering measurable public value at scale.

(S. Krishnan)

Place: New Delhi
Dated: 27th January, 2026

Digital India
Power To Empower

Designing AI for Impact: Advancing People, Planet, and Public Purpose

Lakshmi Narayanan
Chancellor,
Krea University

Kapil Viswanathan
President, IFMR; Member,
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Artificial intelligence stands at a defining crossroads. As intelligent systems increasingly shape how societies learn, work, and govern, the choices made today will determine whether AI deepens existing divides or becomes a force for inclusive and sustainable progress. This moment calls for institutions that can engage with AI not only as a technological shift, but as a transformation of public systems, human capital, and governance.

For the IFMR–Krea ecosystem, this transition builds on a four-decade legacy of rigorous, applied research rooted in real-world contexts. IFMR's research centres have long worked at the interface of markets, governments, and communities—across finance, livelihoods, health, governance, and climate resilience—to strengthen institutions and improve outcomes at scale. Krea University extends this institutional foundation through a liberal arts and sciences vision that integrates critical thinking, ethical reasoning, and interdisciplinary inquiry with IFMR's deeply grounded research tradition.

The organising principles of the AI Impact Summit, **People, Planet, and Progress** reflect this shared ethos. The People lens reinforces a central conviction of our work: intelligent systems must be evaluated through human outcomes such as dignity, agency, inclusion, and meaningful participation. The Planet lens compels us to recognise the environmental costs of intelligence itself and to treat sustainability as a design constraint rather than an afterthought. Progress must be measured not by technological novelty alone, but by tangible improvements in the systems that shape everyday lives—education, livelihoods, finance, health, and governance.

Engaging responsibly with AI also demands new institutional capabilities and learning frameworks. AI represents a structural shift in how societies learn and govern, calling for a Learning 4.0 approach—one that prioritises continuous learning, adaptability, ethical reasoning, and accountability. Across IFMR's research platforms and Krea's academic programmes, we are integrating AI literacy with systems thinking and human values to prepare future-ready scholars and practitioners.

This compendium reflects these efforts, offering a window into how the IFMR–Krea ecosystem is engaging with the opportunities and responsibilities of artificial intelligence. We invite policymakers, practitioners, industry leaders, and academic peers to partner with us in strengthening institutions and shaping AI toward outcomes that are globally relevant, locally grounded, and firmly oriented toward the public good.

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A Research and Innovation Ecosystem Geared to Address Complex Development Challenges

Established as Asia's first institution dedicated to finance and economic research, IFMR was set in 1970 as a not-for-profit society focused on research, training and education in the areas of macro and micro economics, finance and management including a full-fledged business school. Since its inception, a core mandate of the institute was to provide research-based inputs to industries and the government in the areas of finance and economics.

IFMR Society has also been recognized as an Institution of Importance across India and a Scientific and Industrial Research Organization (SIRO) recognized by the Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India.

Today the ecosystem is home to a diverse constellation of centres that share a common orientation towards advancing inclusive economic growth and addressing some of the most persistent development challenges in India and the Global South. The centres form a distinctive research architecture that combines disciplinary depth with systems thinking and sustained field immersion. Their work spans the full evidence-to-action cycle: generating primary data at scale, designing and testing innovations, strengthening implementation capacity, and translating research into institutional reform. Across domains such as gender equality, livelihoods, financial inclusion, water and climate resilience, mental health and poverty reduction, IFMR's centres work closely with national and state governments, multilaterals, and philanthropic organisations to co-create solutions that are context-sensitive and scalable. This ecosystem is increasingly engaging with data science and artificial intelligence as enabling tools to strengthen measurement, improve decision-making, and expand inclusion, while remaining attentive to questions of equity, ethics, and governance.

Our Ecosystem

Rooted in the legacy of IFMR, Asia's pioneering finance training and research institution, Krea University continues over 50 years of impactful research and education. In 2017, IFMR integrated with Krea, combining its rich history with Krea's innovative approach to prepare for an unpredictable world.

Synergies

- Collaborations with faculty for interdisciplinary research
- Thought leadership across centres
- Building capacity of young researchers

Schools

1. School of Interwoven Arts and Sciences (SIAS)
2. IFMR Graduate School of Business (GSB)
3. Doctoral College

Centres

CHAPTER 1

Krea University

Image Credit: Krea University/Official Archive

Research Overview

The digital and artificial intelligence (AI) research program at Krea University encompasses the application of AI to understand manufacturing and biological processes with a vital emphasis on responsible AI principles. First, the research work comprises the development of digital twins for manufacturing processes and systems. This work focuses on how digital technologies, such as the Internet of Things (IoT), Machine Learning (ML), Deep Learning (DL), and Robotics, can bring a positive impact by improving the overall efficiency and throughput of the process.

Furthermore, the program also incorporates the integration of computational neuroscience and artificial intelligence (AI) methods to understand biological pathways, disease mechanisms, and phenotypic variability, with the overarching goal of improving long-term health outcomes for the affected population. The focus is on neurological disorders (such as traumatic brain injuries (TBIs) and epilepsy), alongside gut microbiome analysis, where complex biological processes give rise to heterogeneous disease trajectories and comorbidities in the patient population. A significant gap in the current clinical AI literature is the prevalence of black-box (opaque) models that offer strong predictive performance but limited explainability, thereby reducing clinical trust and translational application. There is also a lack of systematic benchmarks for comparing explainable AI methods, particularly in graph-based biological models. A central goal of this work is to move beyond black-box prediction toward interpretable, mechanism-aware AI models that can enhance clinical understanding and facilitate the development of translational applications.

Another aspect of the research program at Krea lies at the intersection of AI and social studies. This body of work comprises a sustained program of inquiry at the intersection of science and technology studies (STS), digital labor, and critical AI studies, with a particular emphasis on how algorithmic systems reorganize work, expertise, and precarity. This work combines theoretical synthesis with empirically grounded analysis of emerging sociotechnical infrastructures, especially within platformized and surveillance-oriented labor regimes.

The last body of work focuses on formal methods, a field of computer science that uses mathematical logic to prove the correctness of AI systems. As AI becomes central to governance and infrastructure, one must ensure these systems are not just “likely to work,” but are mathematically guaranteed to behave as intended. Traditional AI and software development rely on empirical testing, where a system is run against various scenarios to determine if it fails. However, in high-assurance and safety-critical applications, “mostly correct” is a liability. Researchers at Krea address this gap by developing formally verified decision procedures. Using proof assistants, sophisticated software tools that enable humans and computers to collaborate on creating mathematical proofs, we verify the logic of algorithms before they are deployed.

Intersection of AI with Core Research Plans

Digital and AI methods form the foundation of the research program of multiple research groups at Krea. These research groups typically employ a wide range of AI methods, including ML algorithms, deep learning, and graph neural networks (GNNs), as well as robotics and computational neuroscience models, to represent and analyse relationships among biological entities and model and understand manufacturing processes. These approaches enable researchers to integrate multiple public datasets and capture complex interactions at the system and network levels that are difficult to model using traditional statistical techniques. Principles of responsible AI, particularly explainability, bias mitigation, and robustness, are embedded throughout the analysis pipeline. Furthermore, the research also encompasses the use of proof assistants to ensure principles of robustness, reliability, and transparency in digital public infrastructure and AI systems.

Key Research Themes

The research program at Krea spans the following themes, as elucidated below:

- Graph-based modelling of biological systems, using public microbiome and neurological datasets.
- Phenotype and comorbidity prediction in TBI and epilepsy using ML and GNN frameworks.
- Mechanistic insight and interpretation, combining explainable AI with computational neuroscience to study pathological processes and identify potential therapeutic targets, including candidate drug combinations in neurological conditions.
- Application of ML and DL frameworks to understand manufacturing processes and systems with the overall aim of improving their efficiency.
- Data-driven digital twins that monitor the health of cutting tools in precision machining processes.
- Investigations of supervised and unsupervised learning systems suitable for industrial manufacturing environments.
- Investigation of how algorithmic systems reshape labor relations, expertise, and precarity, integrating critical theory with empirical studies of sociotechnical infrastructures that underpin platformized and surveillance-oriented forms of work.
- Application of formal methods to ensure principles of responsible AI in digital public infrastructure and AI systems.

To address these questions, the following methods are employed:

- Graph-theoretic representations of biological entities and phenotypes
- GNN and ML pipelines for prediction, clustering, and representation learning
- Explainable AI (XAI) techniques to explain model predictions to the stakeholders
- Foundational AI models, ML, and DL to represent and understand manufacturing processes
- Bias-and fairness-aware methods, including class-imbalance methods, to improve generalisability
- Public data repositories as a scalable and reproducible digital infrastructure.
- Grounded theoretical analysis at the intersection of algorithmic systems, governance, and labor:
    - Utilization of interactive proof assistants (such as Lean 4 and Rocq) and SMT solvers to bridge the gap between abstract policy goals and the underlying code, ensuring that digital tools are fundamentally robust, transparent, and reliable.

Inclusion Lens

The work contributes to inclusion implicitly by incorporating responsible AI principles into the research methods. By utilizing public datasets, openly available methodologies, and interpretable models, the research reduces barriers to access and reuse across institutions and stakeholders. Addressing bias and class imbalance helps address essential issues arising from underrepresented phenotypes, conditions, and entities. Improvements in transparency, robustness, and reliability thus translate

into more inclusive and equitable research outcomes for the stakeholders involved.

Insights, Findings, and Early Outcomes

Key early outcomes include:

1. Identification of the most common post-TBI comorbidities using graph theory and clustering across large public datasets (Sudhakar et al, 2024; Mehta & Sudhakar, 2025)
2. Tool wear and remaining useful life estimation in precision machining using an interacting multiple model (Yang et al, 2024)
3. Gaussian Mixture Model for tool condition monitoring (Mishra et al, 2024)
4. A hybrid digital twin for monitoring and controlling weld quality in friction stir welding, International Journal of Computer Integrated Manufacturing (Nayak et al, 2024)
5. Precarity and Platformization in Civilian Drone Labor (Issar et al 2025, Society for Social Studies of Science (4S) Annual Conference)
6. Bullshit Security: Precarious Civilian Labor in India's Surveillance Apparatus (Issar et al 2025, Eastern Sociological Society Annual Conference)
7. Initial findings showing systematic variation across GNN explainability methods, highlighting the need for rigorous evaluation (Sudhakar et al, work in progress)
8. Ongoing development of a benchmark framework for comparing explainable AI methods on microbiome and neurological datasets (Sudhakar et al, work in progress)
9. Article on governance, labor, and algorithmic power (Issar et al, work in progress)

Implications and Opportunities

The research has direct implications for AI governance in health, particularly emphasizing the need for transparency, explainability, and fairness in biological and clinical AI systems. By developing reusable ML and DL frameworks, as well as explainability benchmarks, this work addresses current gaps in the field related to evaluation standards and trust in translational applications. The approach is scalable, domain-agnostic, and well-suited for collaboration with other research groups worldwide, public health systems, and policy stakeholders working on long-term care, multimorbidity, and preventive health. Furthermore, proof assistants can support the formal verification of AI systems against explicitly defined ethical, legal, and fairness constraints, enhancing robustness to logical failures and enabling collaboration with state agencies to model and evaluate fairness principles in digital public infrastructure and social protection systems.

Student Innovations in Academic AI Systems

Student Group (SIAS): Rohan, Ishaan, Raghav, Tejas

Data Science students Rohan, Ishaan, Raghav, and Tejas have developed an AI-powered chatbot to answer student queries related to the Data Science program, including courses, prerequisites, pathways, and administrative workflows. The system demonstrates how natural language interfaces can improve accessibility and reduce informational friction in academic settings. Building on this, Rohan is independently developing an agentic AI framework for automated timetabling that integrates course offerings, student registrations, and faculty availability while respecting institutional constraints. Together, these projects showcase the practical application of AI to solve real, institution-scale coordination and decision-making problems in higher education.

ABLE: A Digital Platform for Parents of Children Requiring Special Support

Student Group (SIAS): Kush Verma, Ishaan Agarwal, Aadya, Ratul Prabhu

ABLE is a digital platform designed to coordinate care for Indian families with children requiring special support in learning, speech, attention, or development—an underserved group facing stigma, fragmented services, and unreliable guidance that delays interventions. It addresses parental challenges like unclear next steps, repetitive explanations, and unverified providers by integrating verified specialists, structured child profiles, secure IEP sharing, and community resources into a unified system. Leveraging AI, ABLE provides scalable impact through intelligent analysis of intakes and reports for actionable insights, precise therapist matching based on diagnosis, goals, language, location, and budget, and progress tracking to identify gaps and enhance coordination. By offering localized guidance in regional languages and learning from anonymized data, it reduces stigma, accelerates access to care, and delivers personalized support, empowering families with clarity and confidence.

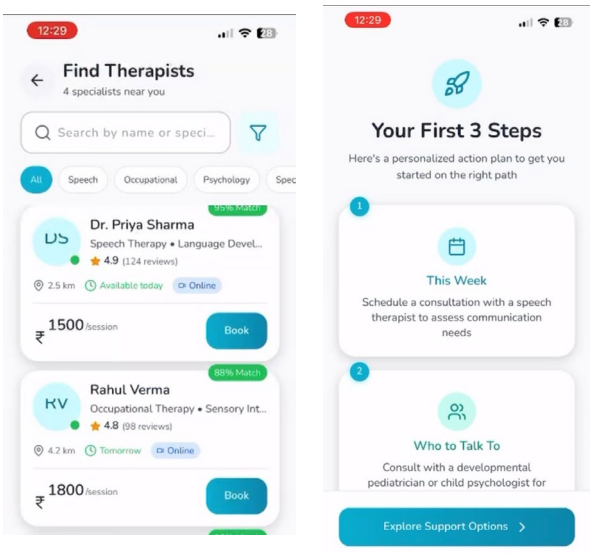


Image Credit: Krea University/Official Archive

AASPAAS: Digital Safety Platform

Student Group (SIAS): Anirudh Sondhi, Divy Khetan, Arushi Sridhar, Sagar Garg, Savir Bhaduri

Current navigation platforms are optimized for speed, often at the expense of safety, frequently routing users through poorly lit, isolated, or high-risk areas. That's where we at AASPAAS come in. We bridge this gap by prioritizing safety over speed. Using relevant local safety parameters such as lighting infrastructure, crowd density, and historical risk patterns, etc, AASPAAS calculates and delivers the safest possible route to your destination, ensuring peace of mind for every journey. However, the true potential lies in its evolution. As our user base will grow and real-time usage data begins to run our ecosystem, we are integrating AI not just as a feature, but as our central learning engine. This AI driven future means AASPAAS will move beyond static safety scores to become context aware and adaptive. By continuously analyzing live user movement, changing environmental conditions, and community feedback, our models will refine the definition of "safety" for every neighborhood in real time. Moreover, this gives each neighborhood a unique weighted safety score which relies on stored data. The result is a navigation experience that gets smarter with every trip, designed to ensure users feel secure, confident, and protected in every journey.

Image Credit: Krea University/Official Archive

CHAPTER 2

Atal Incubation Centre
Inclusive Tech For The Last Mile

Scaling Impact Tech Through Entrepreneurship and Innovation: Catalyst Atal Incubation Centre

Image Credit: Paula Bronstein/Getty Images/Images of Empowerment

Centre Overview

Catalyst is an impact-focused startup accelerator established in 2016 by IFMR, initially in partnership with USAID and subsequently with NITI Aayog's Atal Innovation Mission and other leading funders. Catalyst works closely with entrepreneurs building scalable, sustainable, and disruptive technology ventures grounded in impact-first business models. While initially set up with a 'FinTech' focus, Catalyst's thesis has broadened further to support technology startups in the Crafts, Culture, Sustainability and Climate change domains, with technology being the primary enabler in the business models. The accelerator supports founders through a combination of market access, strategic growth mentorship, early-stage capital (via an in-house seed fund) and syndicated investments. To date, Catalyst has supported over 60 startups and invested in nearly 20 companies across such emerging impact sectors.

Digital and AI Portfolio

Catalyst's primary thesis of supporting impact-ventures focuses on the use of technology to scale product-specific solutions for underserved communities. Be it crafts, fin-tech, culture or climate change, our core focus is to support startups which are making technology truly inclusive – by increasing digital adoption within last mile communities and using the same to increase incomes and livelihood opportunities. We support such initiatives through two distinct approaches:

- **Startup - centric support:**

Through a rigorous selection process, Catalyst selects 8-10 impact-tech ventures every year, providing them with critical support in terms of capital, strategic guidance and market connects.

  - Several of our startups have implemented AI solutions within their supply chain networks to increase efficiency and reduce costs.

- **Community - centric support:**

With support from leading global organisations, Catalyst also provides direct community support through entrepreneurial skilling and seed grants, to community champions who are using technology to uplift livelihoods.

  - One such recent example is our 'Project DIGITAL', wherein artisan communities in Rajasthan have been given extensive business and technology training to help them increase their enterprise revenues.

  - These communities have, for the first time, used AI – more specifically generative prompts – to ease supply chain bottlenecks.

    » For eg., communities have combined ChatGPT, Pinterest and their existing products, to create future product mockups, upload them on social media platforms to gauge demand and then manufacture samples basis this demand.

    » This has helped them reduce their working capital costs by nearly 15%, since they do not need to produce samples beforehand, without any demand knowledge.

Key Wins

- A Fintech portfolio company, supported during India's rapid digitalisation years of 2016-17, leverages machine learning to build alternative credit assessment models, enabling responsible lending to thin-file and underserved borrowers without reinforcing systemic bias.
- Several of our startups in the crafts & culture space extensively use AI and data-driven intelligence to tailor products, reduce supply chain bottlenecks and gauge demand that has led to a direct increase in artisanal incomes. For eg. Studio Moora uses AI to drive its performance marketing strategies, that has resulted in higher revenue per dollar in marketing spend.
- P-TAL, one of our portfolio companies, has extensively used AI to gauge demand in export markets, and prepare their supply chain extensively based on data insights derived from their AI experimentation.
- Rudhvaay, another portfolio company which runs an offline and online marketplace, has used AI to ease technology development of their marketplace backend, reducing costs to bare minimum, while helping them spent the saved capital towards product-based R&D.

Implications and Opportunities

- Impact-tech space is still an evolving landscape in India, and one wherein the thought process for most organisations is still 'sympathy-driven' rather than truly 'impact-driven'. However, in our work with nearly 60 impact-first businesses that support nearly 5000+ last mile livelihoods, there has emerged, a clear business case of 'sustainable' impact with the use of technology and clear business models.
- Our work, especially with the artisan communities, has a clear roadmap that can be replicated and implemented across several states across India, wherein artisans are losing ground to cheaper, imported alternatives due to lack of exposure to AI and technology that can help them scale.
- Project DIGITAL, our initiative that directly addresses this lacuna by working with Artisans, is an easy-to-replicate model in other states. We are keen to take this up across states, with the support of relevant government partners.

Image Credit: Bhavesh Jain/Pexels

CHAPTER 3

Building Digital Platforms and Data Systems for Last-Mile Delivery: Centre for Digital Financial Inclusion (CDFI)

Image Credit: Paula Bronstein/Getty Images/Images of Empowerment

Centre Overview

The Centre for Digital Financial Inclusion (CDFI) is a non-profit social enterprise established in 2014 and anchored at IFMR. CDFI's core mandate is to design and deploy data-driven systems that strengthen state capability, improve programme implementation, and enable inclusive outcomes at scale. At the heart of its work is the creation of robust digital platforms and data architectures that digitise information at source, generate granular, real-time insights, and support continuous monitoring and decision-making.

Building on this data-centric foundation, CDFI works with governments and ecosystem partners to operationalise digital public goods and programme platforms across domains such as health and nutrition, direct benefit transfers (DBT), rural livelihoods, adolescent wellbeing, financial inclusion, and outcome-oriented governance. The Centre emphasises practical, field-tested solutions that translate high-quality data into better service delivery, accountability, and inclusion for underserved populations.

Mandate and Domain

Digital and AI Intersection with Core Mission

CDFI leverages digital platforms, data systems, and applied analytics to bridge gaps between policy intent and last-mile delivery. Its work focuses on digitising government-to-people payment flows, enabling transparent and accountable program implementation, and supporting beneficiaries to meaningfully use digital services. Through integrated platforms, real-time dashboards, and decision-support systems, CDFI strengthens state capacity and inclusion outcomes. These digital foundations also create pathways for future AI-enabled risk identification, targeting, and optimisation across health, nutrition, and social protection systems.

Digital and AI Work Portfolio

Key Initiatives and Platforms

1. **MOTHER (Measurable Outcomes in Transforming Health sector through a holistic approach with focus on women's EmpoweRment):** A mobile and web-based platform supporting proactive maternal and child healthcare in Meghalaya. MOTHER enables early registration of pregnant women, longitudinal tracking through pregnancy and postnatal periods, and capture of clinical data to identify risk factors and danger signs. The platform supports frontline workers in planning follow-ups and enables administrators to monitor maternal and child health outcomes in real time.
2. **ASHAFIRST – Payment system for ASHA workers:** ASHAFIRST digitises the end-to-end incentive payment process for ASHA workers, replacing paper-based claims with transparent, time-bound digital workflows. The platform enables claim submission, verification, approvals, and direct bank transfers, significantly reducing payment delays while improving accountability and workforce motivation.
3. **Meghealth – Integrated Public Health Data Portal:** Meghealth is a public-facing, real-time health data portal that consolidates information from multiple health programmes. It provides dashboards and analytics for citizens, administrators, and health staff, enabling transparency, performance monitoring, and data-driven planning across the health system.

4. **MHSSP–IPS (Internal Performance Agreement Process System):** Developed under the Meghalaya Health Systems Strengthening Project, the IPS platform manages results-based financing for health facilities in the state. It links facility performance assessments with action planning, approvals, and expenditure tracking, strengthening accountability and evidence-based budgeting in health facilities.

Together, these initiatives create an integrated digital health ecosystem spanning beneficiary identification, service delivery, workforce incentives, transparency, and performance-based financing, while remaining adaptable to other social sector projects.

In addition, CDFI has also designed and developed National Rural Livelihood Mission's LokOS platform enabling end-to-end computerization of SHG network to capture the financial transactions, livelihoods and convergence led initiatives. LokOS enables integration at programme implementation unit level (village/gram panchayat/block/district/state/national level) and has a provision for cashless transactions including Aadhaar enabled payments.

Problem Statement/System Gaps Addressed

- High Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR), particularly in underserved and remote regions.
- Fragmented, paper-based data collection limiting continuity of care, cross-programme visibility, and early risk identification.
- Limited availability of granular, source-level data on beneficiaries, activities, and expenditures across projects.
- Delays and lack of transparency in incentive payments to frontline health workers (ASHAs)
- Limited real-time visibility for administrators to monitor both physical and financial progress and plan timely interventions.
- Weak accountability mechanisms in facility and project level performance funding.

Digital/AI Levers and Approaches Used

- Digitisation of data at source through mobile and web-based data capture by frontline workers and programme teams.
- Configurable MIS and programme platforms enabling beneficiary, activity and facility-level data across sectors.
- Digital beneficiary registration and longitudinal tracking of pregnant women, adolescents, and livelihood beneficiaries.
- Integrated data systems consolidating information across health, livelihoods, agriculture, and social welfare programmes.
- Workflow digitisation for incentive claims, approvals, fund releases, and expenditure reporting.
- Rule-based analytics and validation check to flag medical risks, implementation delays, and data quality issues.
- Public dashboards and internal monitoring views for real-time programme oversight.
- Digitised results-based financing systems linking performance assessment, planning, and expenditure tracking.

Inclusion Lens

Explicit Inclusion

- Primary focus on pregnant women, newborns, adolescents, and rural households, especially in high-burden and remote districts.
- Strengthening support for ASHAs and frontline workers, who are predominantly women and central to last-mile delivery of health services.

Implicit Inclusion

- Digitisation and MIS-enabled programme management reduce information asymmetries that often exclude marginalised beneficiaries.
- Granular data enables targeted outreach, follow-ups, and convergence across health, nutrition, livelihoods, and social protection schemes.
- Real-time visibility into physical and financial progress improves

responsiveness in remote and resource-constrained areas.

- Performance-linked financing and transparent reporting strengthen service quality in underserved geographies.

System-level improvements translate into more equitable access to care and services, earlier risk identification, and better outcomes for underserved populations.

Insights, Findings, and Early Outcomes

- **Maternal Mortality Reduction:** MMR reduced by nearly 50%, from 243 per 100,000 live births (2020-21) to 107 by January 2024.
- **Child Health Outcomes:** Under-five mortality declined by 34% over the same period.
- **Scale of Coverage:** Over 400,000 mothers registered; ~30,000 tracked at any given time through MOTHER.
- **Frontline Worker Payments:** ASHAFIRST reduced incentive payment timelines from 100-120 days to 7-8 days.
- **Financial Transparency:** ₹80.05 crore in ASHA incentives processed digitally between March 2022 and December 2025.

These outcomes demonstrate the role of integrated digital systems in improving both service delivery and workforce motivation.

Platform Snapshots

Across programmes, CDFI's digital platforms are supported by an MIS capability that allows rapid configuration for different sectors, capturing beneficiary and activity level data while enabling financial and physical progress tracking. This approach supports consistent monitoring while allowing programme-specific customisation.

MOTHER

- Digital registration and tracking of health parameters of pregnant women and newborns.
- Medical data capture enabling early detection of danger signs.
- Supports proactive follow-ups and field planning by health workers.

ASHAFIRST

» End-to-end digitisation of ASHA incentive claims, approvals, and payments.

» Single state-level account with automated accounting by health program.

» Real-time claim tracking with bank integration.

Meghealth (www.meghealth.in)

» Public-facing, real-time health data portal.

» Hosts data from MOTHER, ASHAFIRST, RBSK, TB screening, VHC and sector meetings.

» Used by citizens, administrators, and health staff for monitoring and planning.

MHSSP-IPS

» Digitised Internal Performance Agreement system.

» Links facility performance assessment, action planning, approvals, and expenditure tracking.

» Enhances accountability and evidence-based budgeting.

Implications and Opportunities

» Demonstrates how programme-focused digital platforms, supported by adaptable MIS capabilities, can strengthen implementation without creating rigid, one-size-fits-all systems.

» Offers a scalable model for granular data-driven monitoring across health, livelihoods, agriculture, and adolescent wellbeing programmes.

» Strengthens state capacity by linking beneficiary data, financial flows, and physical progress in near real time.

» Enables convergence across departments by providing a shared data backbone while respecting programme-specific needs.

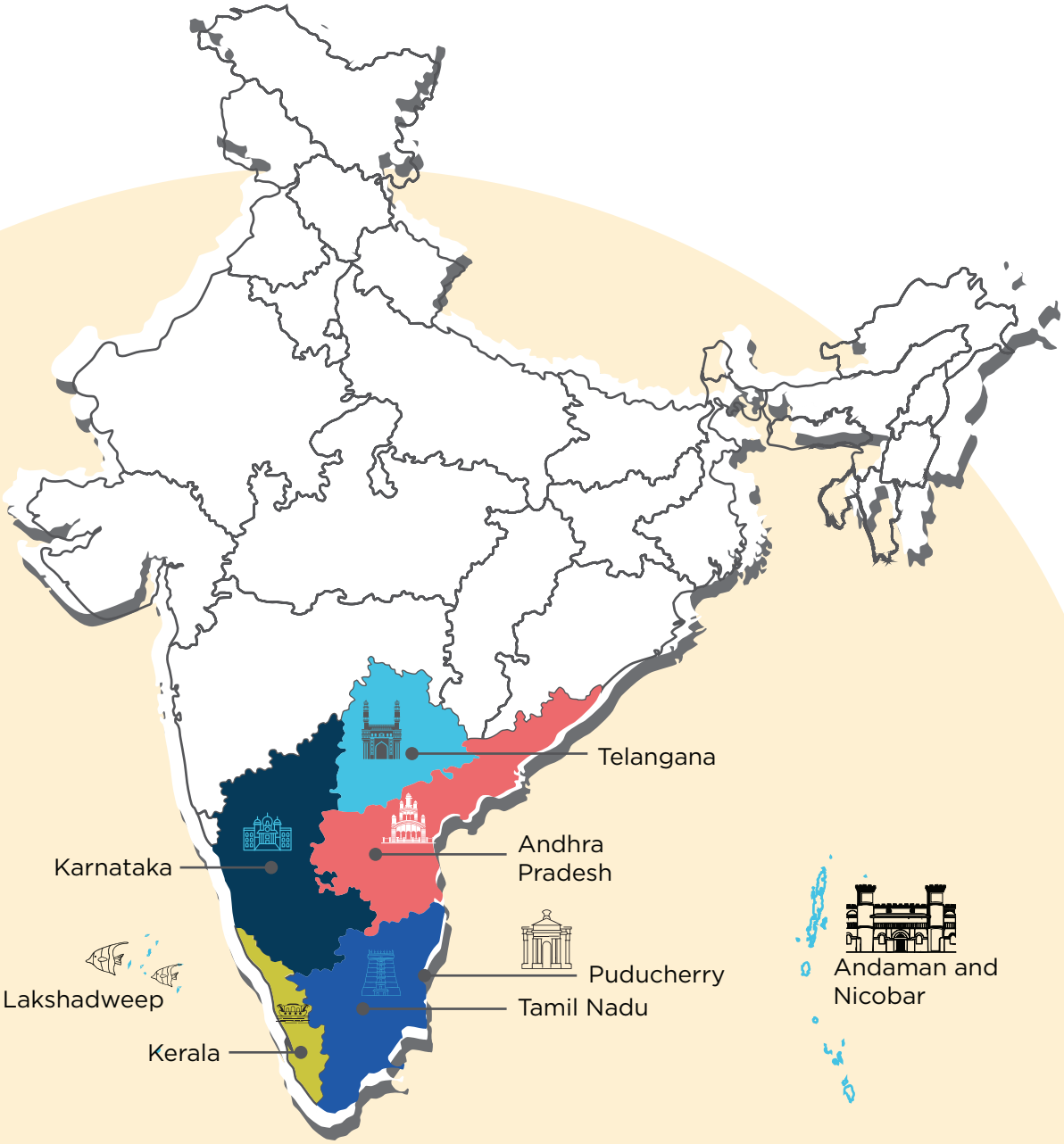
» Creates readiness for AI-enabled risk prediction, decision support, and resource optimisation as data maturity improves.

» Relevant for policy discussions on Digital Public Infrastructure (DPI), state capability, and inclusive service delivery.

CHAPTER 4

DECCAN CENTRE
For International Relations

Deccan Centre for International Relations



Centre Overview

The Deccan Centre for International Relations (Deccan Centre) is an independent think tank under IFMR and the first one dedicated exclusively to the study of international relations.

Based in Chennai, the Deccan Centre focusses on international relations of five South Indian states – Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, and Telangana, and three Union Territories – Andaman and Nicobar Islands, Lakshadweep, and Puducherry. These South Indian states/UTs have been, in many ways, the drivers of India's development and growth, and have had historical, cultural, maritime, business, tech hubs and other links with specific regions of the world. By focusing on the unique strengths of southern India, Deccan Centre will enhance international engagement of India's five South Indian States under the broader rubric of India's foreign policy.

The Deccan Centre has three broad verticals:

1. **Geopolitics**: opportunities and challenges, both regional and global, in strategic, security and development space impacting South India.
2. **Technology:** emerging and disruptive technologies, AI, digital transformation, biotechnology, and others.
3. **Business:** business link of South India with global markets.

Deccan Centre will work closely with the stakeholders to bring value added to their work. It proposes to do this through collaboration with institutions and organisations, undertake joint projects, publish policy briefs, and research papers, have strong online presence, put out dedicated podcasts, connect businesses and collaborate with academic and policy institutions in India and abroad. The Centre will be launched on January 30, 2026 in Chennai.

In the context of AI, southern India has emerged as the epicentre of India's digital and technological transformation. With its massive information technology workforce, thriving research community, and growing technology ecosystem, India's southern states hold a significant stake in the development of AI.

The centre proposes to work with partners in the AI space. To begin with, the Centre proposes to take up, inter alia, the mapping of AI ecosystem in the Deccan region along with interested partners and stakeholders. This project will be mapping ecosystems, assessing sectoral potentials, and identifying gaps. This structured analysis will foster collaborative growth corridors, inform policy recommendations, and align with the India AI Mission's vision for inclusive development. Such mapping will also amplify southern India's contributions to India's digital economy.

The project will focus on South India in five or six key categories of indicators pertinent to AI development namely: talent, research, patents, companies and investments, GCCs and compute.

CHAPTER 5

From AI-Enabled Insights to Policy Action: Inclusion Economics India Centre (IEIC)

Image Credit: Inclusion Economics India Centre/Official Archive

Centre Overview

The Inclusion Economics India Centre at IFMR is a policy-engaged research initiative that strives to inform and encourage evidence-backed dialogue on economic and social inclusion. Our work in India includes research engagements across multiple states and focuses on some of India's most challenging development issues, from supporting effective governance, to improving climate and environmental policy, to understanding opportunities to increase women's economic engagement.

IEIC combines innovative data collection with close stakeholder engagement to address development challenges across three pillars: Governance, Gender, and Environmental Justice. In governance, IEIC leverages data-driven tools to strengthen state capacity, notably designing systems to improve the delivery of large-scale social protection programs like MGNREGS. Its gender portfolio investigates policy mechanisms to bridge economic gaps, generating evidence on how to enhance women's agency and access to resources. On the climate front, the centre focuses on environmental justice, deploying technology-enabled early warning systems and innovative ecosystem payment models to protect vulnerable communities from extreme weather events. Evaluating how digital and AI innovations can effectively support economic and social inclusion is core to our mission.

Digital and AI Work Portfolio

Governance: We aim to build and evaluate digital tools that can improve performance of rural livelihood

- Digital payments and benefit transfers can be an important lifeline for vulnerable households in India, but administrative delays can blunt the impacts of these approaches, especially when overtaxed local officials are juggling multiple priorities and complex approval processes. In Madhya Pradesh and Jharkhand, IEIC researchers developed a digital application, "PayDash," that helped local officials identify bottlenecks that cause payment delays in the largest social protection scheme for the rural poor in India. This application visualized key indicators based on each officials' responsibilities and workload, and was available offline. Making existing information easier for officials to access was key to reducing processing times and ensuring that rural households could count on vital government payments.

Gender: Given digital gender gaps, restrictive norms, and increasing adoption of digital tools in social inclusion programs, what mechanisms and institutional structures can increase women's economic empowerment and labour market participation?

- MGNREGS, which guarantees up to 100 days of rural employment, pays wages exclusively via Aadhaar-linked digital direct deposits. Yet linking a woman's biometric ID, bank account, and MGNREGS record requires navigating complex banking and local-bureaucracy, tasks that can be challenging for women with limited mobility and confidence in engaging with officials. In Madhya Pradesh, IEIC researchers, in collaboration with PRADAN, state and central government, are evaluating at scale the effects of a group-based, video-enabled training that builds women's

capacity to link their accounts and demand work, layered onto a government-led Aadhaar payment linking drive. This design leverages India's DFS infrastructure to examine whether secure, direct digital wage access enhances women's labor force participation and has spillover effects on the local economy.

- Digital, flexible, work-from-home jobs are more attractive to many women in low-female labour force participation settings like India. But when these job opportunities open up for households, who gets the job in the household? IEIC researchers partnered with a digital work provider to offer mobile app-based gig work to rural households in Bihar and assess impact of gender reservation on job take-up, norms, productivity. They quantified how wage level affects norms, interacts with reservation policies.

Climate: We aim to understand how AI tools can build disaster resilience to natural disasters and target policies to prevent deforestation.

- In Bihar, one of India's most flood-prone states, many households do not have consistent access to accurate, actionable flood alerts that could help them take steps to protect their homes and families before floods arrive. IEIC researchers partnered with the Google Flood Forecasting Initiative and local community organizations to evaluate the low-term impacts of access to community-disseminated AI-powered flood early warning alerts. These AI alerts provided actionable, accurate alerts even in areas with limited river gauge data, thanks to advanced machine-learning hydrological models. But trained, incentivized volunteers were the key to getting these alerts to communities and ensuring that they were trusted and acted upon, even for households that were not literate or lacked smartphone access.

- In Meghalaya, state policymakers seek to combat rapid destruction of biodiverse subtropical forests through an innovative payment for ecosystem services program. IEIC researchers developed an AI-powered deforestation risk prediction tool to effectively target enrollment of small landowners. They are currently partnering with the government to test the social, economic, and environmental impacts of this tool in a large-scale rollout of the program. Results could inform other initiatives in India to build nature-based solutions that mitigate climate change while supporting local livelihoods.

Inclusion Lens

- In our governance portfolio, we focus on incorporating data and evidence usage into rural livelihoods programs that impact millions of vulnerable households, through a long-standing institutional partnership with the Ministry for Rural Development.

- In our gender portfolio, we focus on generating evidence on the role norms play in women's participation in the labour force and what mechanisms in public policies and programs enable rural women empowerment.

- In our climate portfolio, we seek to develop AI and digital tools that can support households that are vulnerable to disasters, and to ensure that smallholders in predominantly tribal areas can receive benefits for maintaining forests on their land.

Insights, Findings, or Early Outcomes

In our governance portfolio, our digital application, "PayDash," improved payment processing times by 17%, while increasing household usage of the social protection program (especially in the agricultural lean season). In the study states, the application generated estimated annual benefits of ~$1.4 million in interest costs avoided due to faster payment delivery, and nearly $31 million in additional wages due to greater workfare activity. The benefits exceeded costs in the first year of deployment by more than 170 times (working paper available here). Based on these results, we are currently collaborating with the Ministry of Rural Development and the National Informatics Centre to incorporate features from the "PayDash" application into a nationwide

launch of a new mobile application that has the potential to improve payment outcomes for millions of households across India.

In our gender portfolio, preliminary results show that reserving digital, home-based, flexible work for women doubled women's take up of job but when job is open for both men and women, women are 5 percentage point less likely to take-up job offers when wages are high, since those are taken by men. The work in Madhya Pradesh is ongoing.

In our climate portfolio, results show that community-disseminated AI-powered flood early warning systems are cost-effective, increasing adaptative behavior and lowering economic and health losses for households in severely flooded areas. For every $1 spent, the intervention generates $12-$273 in health benefits (policy brief available here). The AI tool, Google Flood Hub, is currently active in 150 countries, and the research evaluation is active in 12 flood-prone districts of Bihar, impacting a population of 3.6 million people. This scalable model demonstrates the power of combining AI tools with community engagement to create trust in flood early warning systems and to protect vulnerable populations

Implications and Opportunities

Our approach to ensuring the impact of our AI and digital research portfolio is to build long-term, institutionalized relationships with government organizations, non-profit organizations, and firms to understand currency evidence gaps, and to provide targeted technical assistance to utilize existing data pipelines to deploy public-sector AI solutions aimed at solving last-mile challenges.

We conduct impact evaluations of the social, economic, and environmental impacts of digital and AI tools in large-scale real-word settings in India, in order to generate evidence on cost-effectiveness that can be used by Indian policymakers.

We communicate results, through peer-reviewed academic research, events, and policy briefs, to key stakeholders inside and outside of India in order to gain support for the adoption of effective, inclusive AI and digital tools.

Image Credit: Anil/Pexels

IWWAGE
Institute for What Works to Advance Gender Equality

CHAPTER 6

From Digital Access to Economic Agency for Women: Institute for What Works to Advance Gender Equality (IWWAGE)

Image Credit: Rakibul Alam Khan/Pexels

Centre Overview

The Institute for What Works to Advance Gender Equality (IWWAGE) was established in 2018 as an initiative under IFMR and is hosted by LEAD at Krea University. IWWAGE's mission is to emerge as a Centre of Excellence on Gender Equality by driving gender-transformative change through rigorous evidence generation, policy engagement, capacity building, and community leadership development, with a sustained focus on women and girls. Its core mandate has been to strengthen the evidence base on "what works" to advance women's economic empowerment and to inform strategies that address persistently low female labour force participation in India.

A central pillar of IWWAGE's work lies in advancing the Care Economy. The centre has gained global recognition, including being acknowledged as an Asia Pacific Care Champion, for its leadership in strengthening care systems and advocating for the recognition and valuation of unpaid care work. Alongside this, IWWAGE plays a critical role in labour market intelligence by improving how women's economic participation, work conditions, and constraints are measured and understood within official statistics and policy frameworks.

Digital and AI Work Portfolio

Technology has consistently emerged as a key enabler within IWWAGE's research and policy agenda. Access to digital infrastructure coupled with adequate skilling can help unlock women's economic potential through gainful employment and entrepreneurship. The digital transformation of labour markets and the consequent reorganization of work has led to rapidly changing employer-employee relations, workers' rights and their overall wellbeing. With the advent of AI, these interactions have only become more complex. As more and more women are entering tech-enabled work, particularly Platform Work, IWWAGE has been studying and analyzing women workers' experiences in order to inform gender-responsive policy formulation, platform development, algorithm design and AI-modeling. IWWAGE collaborates extensively with government partners to drive systemic scale. Through strategic alliances with the Ministry of Rural Development (MoRD) and urban ministries, it supports large-scale national missions to combat gender-based violence, strengthen women's collectives and prioritize sustainable childcare infrastructure.

IWWAGE has consistently explored the gender dynamics of the digital & platform economy, particularly how digital platforms and gig/platform work affect women's employment, income, and economic empowerment.

- **Platform Economy Research:**
  - **India's Emerging Gig Economy:** The Future of Work for Women Workers, 2020
  - **Changing World of Women's Work:** Navigating the Possibilities and Precarities Within Platform Work, 2025
  - Understanding of Access to Grievance-handling and Labour Dispute Resolution Mechanisms for Platform Workers (To be published)
- **Policy Dialogue:**
  - **National Consultation on 'Platform Work as an Enabler for Women's Economic Empowerment'** | September 3, 2025 | New Delhi
  - **Future of Work Roundtable:** AI and Women's Work in collaboration with the GxD hub

Inclusion Lens

Our recent studies on platform work[1] examine women's interactions with technology, AI, and digitalisation in urban labour markets. Together, they capture differentiated experiences across economic backgrounds and occupations, including domestic and care work, beauty services, and women's entry into male-dominated sectors such as ride-sharing and delivery services.

- **Explicit Inclusion:** Both studies explicitly foreground women's work, with particular attention to informal, platform-based, and low-paid segments. They locate women across both traditionally male-dominated occupations and technologically mediated forms of historically gendered work, examining how occupational segregation persists and transforms under digitalisation. This enables comparison across sectors requiring distinct skill pathways, ranging from household-based skills to peer networks and NGO-supported training.
- **Implicit Inclusion via Analysis:** By examining how digital technologies reorganise labour markets and employment relations, the studies implicitly address exclusion. Analysing algorithmic management, access to digital infrastructure, and regulatory gaps reveal how platform systems interact with sector-specific skill requirements, shaping uneven entry, participation, and retention for women from different socio-economic backgrounds.
- **Translating Evidence into Inclusive Insights:** Through rigorous review of legal and policy elements, sectoral analysis and firsthand worker insights, we assess whether efficiency gains from AI and digitalisation translate into improved work quality. By comparing outcomes across occupations with distinct labour histories, the studies highlight uneven distributional effects, wherein technological change mitigates or reproduces gendered labour inequalities.

IWWAGE received an invitation from the Government of Karnataka to join the Working Group on Karnataka Gig & Platform Workers' Bill, where we had the opportunity to share some of these insights.

Insights and Early Findings

1. Digital and AI-Mediated Management in Platform Work: Findings from the Study titled 'Understanding of Access to Grievance-handling and Labour Dispute Resolution Mechanisms for Platform Workers' for the ILO (Report submitted; yet to be published)

- The study finds that digital and AI-enabled systems sit at the core of platform operations, shaping how work is allocated, monitored, and evaluated across ride-sharing, delivery, and home-based services.
- Platforms report that algorithmic task allocation and time management tools are central to ensuring scale and efficiency, yet workers experience these systems as opaque and unpredictable.
- Variations in work allocation, incentive eligibility, and performance assessment are rarely explained, reducing trust in the system and limiting workers' ability to plan their time and earnings.
- While technology is presented as an objective decision-maker, workers' accounts highlight that algorithmic rules reflect platform priorities and managerial choices rather than neutral automation.
- Grievance redressal has similarly been embedded within digital infrastructures, with chat-based and AI-assisted systems forming the primary interface for raising concerns. These systems enable platforms to standardise grievance response and manage large volumes efficiently.

[1] Mondal, B., Sharma, P., Chowdhury, A. & S, A. (2025) Changing World of Women's Work: Navigating the Possibilities and Precarities Within Platform Work. IWWAGE.

Mondal, B., Sharma, P., S, A. & Singh, V. (Forthcoming). Understanding of Access to Grievance-handling and Labour Dispute Resolution Mechanisms for Platform Workers. IWWAGE.

- However, workers report that predefined categories and automated workflows often fail to capture the complexity of their experiences, particularly in cases involving customer behaviour, rating disputes, or income loss due to factors beyond their control. Access to human support is typically layered above these systems and activated only after meeting system-defined thresholds, shaping when and how workers can exercise voice.
- In this context, digital grievance systems do not optimally serve the purpose of redressal and resolution.
- Across sectors, performance metrics and rating systems further illustrate how digital tools mediate power and risk. Ratings are closely tied to task allocation, incentives, and continued access to work, yet workers have limited visibility into how scores are calculated or contested.
- These systems prioritise standardisation and customer satisfaction, often shifting operational risks onto workers.
- Creating robust processes where platform workers can have easy access to platform managers/ supervisors without having to negotiate digital/AI based grievance resolution thresholds is critical to build trust and make platform work more aspirational.

2. **Digital Design and Organisational Structures:** Findings from the study titled 'The Changing World of Women's Work: Navigating the Possibilities and Precarities within Platform Work' funded by the MacArthur Foundation.

- Findings from the women in platform work study validate the findings of the aforementioned study and underscore that digital and AI systems do not operate in isolation but interact closely with organisational design, hierarchy, and support structures.
- Women workers repeatedly emphasise the importance of immediate supervisors, field staff, or human points of contact in navigating platform systems. Where such roles are absent or weak, digital interfaces become the sole channel for communication, limiting opportunities for collective voice and informal problem-solving.
- Rating systems and algorithmic performance thresholds have particular implications for women, especially in sectors such as beauty and care services. Women report that maintaining high ratings is critical for continued work allocation and access to platform-linked benefits, including health-related support.
- At the same time, ratings are often influenced by subjective customer expectations rather than service quality, reinforcing vulnerability within digitally mediated systems. The lack of gender-reponsiveness in algorithmic work allocation is also reflected when it fails to account for the special constraints women face such as domestic responsibilities, safety concerns etc.
- When women decline gigs for these reasons, the system often interprets it as lower reliability and limits their access to future opportunities, challenging the notion of flexibility attached to platform work.
- These experiences highlight that lack of gender responsive design, leads to technology becoming a conduit through which existing social norms, power relations, and organisational choices are reproduced.

Technology as a Mediating Tool

Across studies, a central insight is that digital and AI systems function as mediums through which platforms pursue efficiency, scale, and control, rather than as autonomous or neutral actors. The design of algorithms, grievance systems, and performance metrics reflects human decisions about risk distribution, accountability, and worker engagement. Outcomes for workers, therefore, are shaped not only by technology itself, but also by the institutional arrangements, policy choices,

and frameworks laid down by platforms within which these systems are embedded.

Strengthening transparency, human oversight, and avenues for voice within digital systems emerges as critical to aligning platform operations more closely with equitable and sustainable work outcomes.

Implications, opportunities and ecosystem contribution

The studies reflect that the digital mediation of work, facilitated by algorithms and AI, establish new governance mechanisms shaping the risk distribution, workers' agency, their earnings, and other labour market outcomes. The implications extend beyond individual platforms to critical questions of policy, inclusive design, and the future of digitally mediated work. Possible measures to close these gaps:

- **Transparent disclosure of algorithmic rules:** The systemic governance gap, arising from the lack of transparency in algorithmic work management, can be addressed through regulatory frameworks. The platforms should be required to disclose the key algorithmic practices determining work allocation, ratings, earnings, deactivation of accounts etc.
- **Institutionalize human oversight:** The evidence underscores the critical need for mandatory human oversight in algorithm and AI-driven platform work as a response to the limitations of fully-automated systems. The oversight is essential for correcting the algorithmic biases, provide empathetic resolution beyond the AI-led grievance redressal mechanisms and establish clear accountability for platform governance.
- **Gender-responsive design standards:** The algorithmic designs need to be gender-responsive and account for constraints like domestic responsibilities, safety concerns in work allocations, influence on ratings and future work opportunities.
- **Grievance framework to redress algorithmic biases:** The evidence suggests that the operational definition of grievances should be expanded to include systemic issues like algorithmic bias, unfair risk transfer to the workers, and the psychological strain of metrics surveillance in these algorithm-controlled work.
- **Strengthening state capacity:** The labour departments and social security regulatory bodies should be equipped with the required technical literacy and tools to audit platform algorithms and oversee the AI-led grievance redressal process, since effective regulation would necessitate understanding of the technological mediation process both in work allocation and labour disputes.
- **Tripartite plus engagements:** Structured deliberations between platform companies, workers' collectives, policymakers, industry experts/researchers and technologists should be promoted in order to co-design worker-sensitive and gender-inclusive algorithms.
- **Piloting the worker-sensitive algorithms:** In collaborations with the platform companies, the worker-sensitive algorithmic adjustments in various aspects of digitally-driven work should be piloted to see the effectiveness and scalability of these changes.

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J-PAL
ABDUL LATIF JAMEEL POVERTY ACTION LAB
SOUTH ASIA AT IFMR

CHAPTER 7

An Evidence First Approach to AI and Digital Innovation in Practice: J-PAL South Asia

Image Credit: Paula Bronstein/Getty Images/Images of Empowerment

Centre Overview

J-PAL South Asia at IFMR leads J-PAL's mission to advance evidence-informed policymaking across the region. Since its founding in 2007, the centre has grown from a small group of development economists into a team of more than 200 specialists driving the evidence-based policymaking movement in India. Through rigorous randomized evaluations, strategic partnerships, and the scaling of effective programs, J-PAL South Asia helps governments design better policies that improve lives. Over the years, J-PAL South Asia has reached more than 360 million people in India through policies informed by its evidence. Its capacity-building efforts have engaged over 60,000 government officials, monitoring and evaluation practitioners, funders, and academics, while partnerships across 20 states have been built on trust and a shared commitment to evidence-based governance. The centre has completed more than 250 evaluations across 11 sectors, tackling urgent policy challenges and helping to reshape conventional wisdom in policymaking circles.

How digital or AI intersects with J-PAL South Asia's core mission

As part of its mandate to rigorously evaluate emerging solutions, J-PAL South Asia is at the forefront of exploring the use of artificial intelligence (AI) for social good. AI is a powerful general-purpose technology—accessible at low marginal cost, embedded in everyday tools, and constantly improving—that has the potential to transform lives across sectors. Yet causal evidence on where and how AI can drive social impact remains scarce, with pressing questions that remain about the effects on outcomes in the real world. J-PAL South Asia is committed to filling this gap by conducting randomized evaluations of AI applications, adapting methods to account for the unique challenges posed by these technologies, and ensuring that their deployment enhances rather than undermines human well-being. The questions J-PAL seeks to answer are - who it benefits, under what conditions - with careful attention to inclusion and unintended harms, particularly for vulnerable groups, especially when deployed at scale in complex public systems.

J-PAL's initiative to this end, titled Project for AI Evidence (PAIE), spans multiple dimensions: determining key innovations where AI can deliver maximum social benefit; supporting organizations to adopt AI for social good; funding rigorous research to measure impact in priority areas; scaling effective solutions based on evidence; creating practical guides on evaluating AI to inform the wider research ecosystem; and building the capacity of researchers, governments, social enterprises, and NGOs to incorporate and evaluate AI responsibly. This initiative represents the latest chapter in J-PAL's long-standing research on digital solutions, building on earlier studies of technology use. Insights from these prior efforts, as well as emerging insights from studies on AI/ML are summarized in the next section.

Digital and AI Work Portfolio

Below we summarise studies undertaken by J-PAL affiliated researchers in partnership with several state governments and NGOs in India, which leveraged digital/AI/ML tools to address a policy priority. These examples illustrate how technology can help improve the well-being of people experiencing poverty- or sometimes, not live up to its promise. Given the speed, scale, and reach of current AI applications, the insights from these examples provide a useful lens to understand the real-world impacts (positive and negative) from these technologies that may arise in India.

Improving program targeting for vulnerable populations

1. **Utilising AI-enabled Early Warning Flood Systems with community volunteers for better preparedness and health outcomes** - Researchers evaluated a flood early warning system in Bihar that paired advanced forecasting with community-based dissemination.
    - **Insights:** The study found that treatment communities received more accurate alerts, reported greater trust in warnings, took more preparedness actions, and saw a 30 percent reduction in medical costs compared to control households (Jagnani and Pande, 2024).

Increasing access to relevant, personalized information to advance equity and inclusion

1. Delivering customized agricultural advice through digital and video-based tools for better farming practices - In 2014, researchers partnered with Digital Green and the Government of Bihar to evaluate the impact of incorporating short "how-to" videos into group extension sessions run by the government's network of self-help groups. Researchers found that the video increased farmers' agricultural productivity and profits. After one year, farmers who were offered the videos increased yields by 12-18 percent and estimated profits by 9-24 percent, relative to farmers who received conventional extension, with smaller effects after two years (Baul et al, 2024). In another example, evidence from the Avaaj Otalo mobile service in Gujarat shows that technologies such as IVR-based phone systems significantly increased farmers' adoption of recommended inputs and practices, though impacts on yields and profits were not observed in the short run (Cole & Fernando, 2020).

- **Insights:** Digital extension tools can effectively change farmer behavior and adoption patterns, in contexts where traditional extension services cannot reach all farmers.

2. Using ambassadors, incentives, and tailored SMS reminders to improve child immunization coverage - Immunization is a highly cost-effective way of improving child survival, yet immunization coverage remains low in many developing countries. Researchers partnered with the Government of Haryana to test local immunization ambassadors, small non-financial incentives, and tailored SMS reminders to caregivers, with reminders providing timely, personalized notifications about upcoming vaccinations.

- **Insights:** Combining all three interventions increased measles vaccination by approximately 55 percent, while using only ambassadors and reminders was more cost-effective per child than the standard program (Banerjee et al., 2019; Banerjee et al., 2024).

3. Offering digital gig work to expand women's employment opportunities - Prevailing gender norms and household responsibilities restrict women's participation in the labor market. Evidence from a study in West Bengal shows that online gig-based data entry jobs allowed women to work from home, choose their hours, and combine paid work with childcare.

- **Insights:** While initial productivity was lower, digital gig work built skills, confidence, and experience in a low-risk setting, substantially increasing women's job take-up and their likelihood of transitioning to future non-digital, outside-the-home employment (Ho et al, 2024).

Maximizing the effectiveness of frontline service providers to improve social outcomes

1. Raising learning outcomes through personalized digital learning in schools - Many students in public schools lag behind grade-level standards. Evidence from evaluations of Mindspark, a computer-assisted learning (CAL) software, shows that personalized digital instruction—tailored to students' actual learning levels—can substantially improve learning outcomes.

- **Insights:** In after-school settings in Delhi, personalized CAL generated large test score gains within a short period, exceeding the productivity of regular classroom instruction (Muralidharan et al., 2019). Subsequent large-scale classroom integration

in government schools in Rajasthan demonstrated sustained improvements in math and language achievement even when digital instruction replaced a significant share of traditional teaching time (Muralidharan & Singh, 2025). Gains depended on adequate adult supervision, showing digital learning tools are most effective with strong implementation support.

2. Limits of biometric monitoring to improve provider attendance - Increasing healthcare worker attendance is a critical challenge in improving healthcare delivery. In partnership with the government of Karnataka, researchers studied the impact of rolling out a biometric attendance system on the attendance of healthcare providers in the public health system.

- **Insights: Researchers found that the biometric attendance system improved attendance among** nurses, lab technicians, and pharmacists–but not doctors, due to uneven enforcement of penalties (Dhaliwal and Hanna, 2016). The results of the randomized evaluation informed the government's decision to end the attendance monitoring program, saving taxpayers money and avoiding an added burden and wasted time on the part of the government.

3. Ensuring farmer payment delivery through cell phone-based monitoring - Improving last-mile service delivery is a widespread challenge across social programmes. Researchers conducted a large-scale randomized evaluation to test the impact of a cell phone-based monitoring system on the delivery of government payments for 5.7 million farmers in Telangana.

- **Insights:** The intervention increased timely payment delivery and overall receipt at a cost of just 3.6 cents per additional US dollar delivered—suggesting that phone-based monitoring can be a cheap, simple, and flexible tool for improving last-mile service delivery at a large scale (Muralidharan et al, 2021).

Improving organizational efficiency to strengthen equitable systems and trust in public service delivery

1. PayDash digital platform to improve payments and worksite allocation in MNREGA: Researchers collaborated with the governments of Madhya Pradesh and Jharkhand to evaluate PayDash, a digital platform for real-time tracking of payments under the national rural workfare program.

- **Insights:** Access to PayDash sped up payment processing by 17%, increased available worksites by 23% and household workdays by 10%, and reduced manager transfers by 24% when used by principals, with larger gains during the agricultural lean season. PayDash strengthened state capacity at a considerably lower cost than hiring staff, while benefiting rural populations by more than 170 times the cost (Dodge et al, 2025).

2. Reducing air pollution through digital emissions trading - In partnership with the Gujarat Pollution Control Board, researchers evaluated the impact of the first-ever emissions trading scheme for particulate air pollution on air quality and compliance costs for industrial plants.

- **Insights:** Compliance with the emissions trading scheme was high, and participating firms substantially reduced their particulate matter emissions without large increases in abatement costs, suggesting that markets for air pollution can be a cost-effective pollution reduction strategy (Greenstone et al., 2025).

3. Detecting crop residue burning with machine learning - Crop residue burning is a major contributor to seasonal air pollution. Researchers used satellite imagery and machine learning to detect crop residue burning.

- **Insights:** A model trained on ground-verified data achieved 82 percent accuracy, showing the potential of AI tools to cost-effectively monitor burning and inform policies to reduce air pollution (Walker et al., 2022).

Boosting government resource mobilization

1. Detecting non-existent firms with machine learning - Indian governments currently utilise time and resource-intensive processes to identify bogus firms and improve tax collection. Researchers partnered with an Indian state government and tested a machine learning model to detect non-existent firms.

- **Insights:** The model was able to accurately flag bogus firms, with inspections confirming that many of those identified were indeed non-existent. However, this did not translate into stronger enforcement. The problem lay not in detection but in implementation: inspectors focused only on the firms flagged by the model - leaving many other suspicious firms untouched. Even when non-existent registrants were found, administrative frictions such as slow cancellation procedures, poor coordination across jurisdictions, and unclear processes for dealing with beneficiary firms meant that enforcement outcomes did not improve (Barwahwala et al, 2024).

Implications and Opportunities

Little is known about how AI is actually affecting people's lives—especially in low- and middle-income countries, where the stakes are high, and the data is scarce. Technologies often fail when treated as silver bullets rather than integrated into existing systems. AI programs must build on decades of research on technology adoption and human behaviour to identify where they can most effectively reduce poverty.

Evidence can help funders and regulators distinguish between promising AI innovations and unproven or risky applications, and help practitioners allocate scarce resources to the solutions that will drive the largest impacts. Rigorous evaluation is therefore essential for understanding how AI solutions operate when they are deployed in the real world.

J-PAL South Asia is working to fill some of those gaps with rigorous evidence—through randomized evaluations and other tools that help us understand not just what AI can do, but what it actually achieves in practice. A few ongoing partnerships include:

- **Optimising tested pedagogical approaches to improve learning:** J-PAL affiliated researchers are undertaking coordinated pilots to shed light on the potential for AI to deliver two highly cost-effective education interventions by reducing the burden on teachers in resource-constrained environments, and lay the groundwork for a randomized evaluation of one or both AI tools.
- **AI-assisted diagnosis of silent heart attacks:** This project evaluates a machine learning AI referral tool that uses handheld ECGs to predict silent heart attack risk in Tamil Nadu. In partnership with the Government of Tamil Nadu, a randomized evaluation within a government door-to-door health program will compare the tool to standard risk scores, measuring impacts on diagnosis rates, follow-up behavior, cost-effectiveness, and fairness.

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LEAD LEVERAGING EVIDENCE FOR ACCESS AND DEVELOPMENT
KREA UNIVERSITY

CHAPTER 8

Harnessing Data and Insights to Fuel Opportunities and Inclusive Growth: LEAD at Krea University

Image Credit: Saman Films/Pexels

Centre Overview

LEAD is an action-oriented research centre at IFMR dedicated to harnessing data and insights to fuel opportunity, resilience, and inclusive growth for underserved communities. LEAD's work spans a set of interlinked thematic priorities that include financial well-being and social protection, small and growing businesses and employment, health systems and quality of life, role of institutions, as well as data capture, analytics and innovation. Operating at the intersection of research and policy, the centre's full-stack insights engine generates scalable, data-driven solutions to critical development challenges. Within this portfolio, initiatives such as the Gender x Digital hub operate alongside programmes and Solutions for Transformative Rural Enterprises and Empowerment (STREE) under DAY-NRLM which provide technical advisory and strategic support to policy bodies, as part of its collaborations with the Ministry of Rural Development (MoRD) to jointly advance research supporting rural women entrepreneurs and partnerships with institutions such as NIELIT under MeitY to inform policy research and solution design for digital empowerment.

Digital and AI Work Portfolio

LEAD's digital and artificial intelligence (AI) portfolio focuses on improving how digital systems function in real-world public and market contexts through an inclusion-led innovation lens. Grounded in rigorous evidence, this work strengthens the speed, depth, and accuracy with which complex development challenges are understood and addressed, from diagnostics and measurement to piloting and testing innovations. Across domains such as entrepreneurship, gender, inclusive finance, meaningful digital inclusion, environment and climate change, and health, our focus is on enabling responsive decision-making and expanding opportunities for underserved groups.

Enabling Meaningful Digital Connectivity for Women and Girls

GxD hub
Digital Equity. Connectivity. Insights.

LEAD's Gender x Digital hub (GxD) undertakes research and technical advisory focused on how women participate in, are affected by, and their labour is measured within digital and data-driven economies and systems, strengthening the foundations on which AI systems rest. This includes examining women's access to devices and connectivity, their ability to use digital tools with confidence, and the learning pathways available to them across livelihoods, finance, health, and care systems, with particular attention to intermediaries within public systems, such as Self-Help Group members and community health workers, whose digital capacity shapes community outcomes.

- **Reimagining Women's Work in the Digital Economy:** A research and action initiative that examines how women participate in, and can benefit from, emerging forms of digital work in India's rapidly expanding digital economy. It was designed in response to the rapid expansion of India's digital economy, driven by platforms, AI services, and India Stack, which is creating new forms of digitally mediated work, particularly within data value chains such as data collection, annotation, moderation, and curation. While these emerging models offer significant employment potential, persistent gender gaps in access, digital literacy, safety, and socio-cultural norms have left many women on the margins of these opportunities. The initiative

aims to build a deeper, evidence-based understanding of how women can meaningfully participate in digital work and to identify pathways that combine skills development, autonomy, economic agency, and safety for women across diverse contexts. The initiative's research agenda focuses on three core areas: mapping how digital work is defined and structured and who participates; examining how AI-enabled and tech-mediated models reshape opportunities; and identifying strategic levers, across policy, design, and programs that can unlock and scale women's participation in the digital economy. Its approach includes landscape analysis of data value chains and inclusive work models, identification of barriers and enablers to participation, review of policy and skilling ecosystems, and development of a skill framework to categorise digital roles, with insights translated into pilot interventions and collaborative action with ecosystem partners.

- **In partnership with Yugantar and Society for Elimination of Rural Poverty (SERP)**, Government of Telangana, we are testing how the use of platforms such as UPI app and IVR technology can support SHG members in making their monthly loan repayments digitally, as a way to reduce financial burden on SHG women by making transactions more secure, and increase trust and transparency in the system. These learnings will inform the program's implementation strategy in the scale-up phase in Telangana.

- **Socio-economic context shapes gendered digital inclusion:** State-level work in Meghalaya shows that digital access and use vary significantly by education, income, and household dynamics and deprivation levels, with gender differences in barriers and enablers that must inform contextual policy responses. The study highlights that patterns of digital access and usage are shaped as much by intra-household autonomy, gendered control over devices, and perceptions of risk as by infrastructure availability. For AI-enabled public systems, this suggests that reliance on surface-level usage data alone may obscure underlying exclusions, particularly for women and highly deprived households. The study also demonstrates the analytical value of user typologies that combine socio-economic status with digital capability. Such persona-based frameworks offer a basis for designing AI-enabled interventions that are more context-sensitive, allowing systems across health, finance, and governance to respond to differentiated needs rather than uniform assumptions of access or proficiency

Inclusive Finance Models in the era of Digital Public Infrastructure

Despite improvements in access to digital public infrastructure in India, financial wellbeing outcomes remain uneven, particularly for women, informal workers, and low-income households. Through collaborations with public and private sector financial service providers, our work focuses on deepening digital inclusion both at the systems and end user level.

- Innovative approaches for the Bank Sakhi model for financial inclusion: LEAD and MicroSave Consulting have partnered to strengthen agent- based models for financial inclusion, with a specific focus on BC Sakhi programs and SHG-based enterprises. The intervention focuses on developing a digital platform for the Sakhis (women community resource persons) that will digitise processes from agent onboarding to performance monitoring, integrate payment systems, transaction tracking, and commission management, ensure user-friendly interfaces suitable for women agents with varying digital literacy level, develop curated mobile applications for BC Sakhis/agents and Web portals for program management and monitoring. The application will use AI to develop assisted grievance redressal and strengthen handholding support for new and existing Sakhis. LEAD is actively engaging to generate learnings and evidence form this pilot exercise for scale in the next phase of the project

- Expanding pathways to financial wellbeing through community-anchored digital livelihoods: LEAD partnered with the State Rural Livelihoods Mission and Haqdarshak Empowerment Solutions

Private Limited to address gaps in women's access to paid work and welfare information in rural Chhattisgarh. The initiative trained 5,000 SHG members to use a mobile application that supports community members in identifying and enrolling in government welfare schemes, creating a fee-based, community service livelihood that links income generation with social protection outreach. The study also highlights how normative constraints, household dynamics, and local demand conditions shape participation, offering actionable insights for designing inclusive, scalable digital livelihood pathways that strengthen women's financial agency alongside service delivery outcomes.

Entrepreneurship and Enterprise Resilience in Digital Markets

LEAD's work on Small, Growing Businesses and Employment (SGBE) in the digital space focuses on enabling inclusive, technology-enabled enterprise growth, particularly for women-led and micro enterprises. The emphasis is not on digitisation for its own sake, but on using digital tools and data to unlock productivity, market access, resilience, and upward mobility.

- A longitudinal study by LEAD in collaboration with the Dell Foundation examined how digitally delivered formal credit affects nano-enterprise performance and household well-being. Leveraging administrative and survey data, we analysed how credit accessed through increasingly digitised financial systems and alternative credit scoring models translates into enterprise investment, income stability, and shock absorption. The study underscores the need for data-informed credit design and monitoring systems, including better use of transaction data and enterprise diagnostics, to ensure that digital finance supports sustained resilience rather than short-term access alone.
- Under its Solutions for Transformative Rural Enterprises and Empowerment (STREE) technical assistance programme to DAY-NRLM (MoRD), a capacity building on-the-go pilot was developed as a phone-based interactive course in a Massive Online Open Course (MOOC) on record-keeping, intended for both the entrepreneurs and the business development service providers under NRETP. The project is a step towards enhancing digital financial literacy among rural women entrepreneurs. LEAD also piloted digital ledger–based financial management tools (Khatabook and myBillBook) with 504 women entrepreneurs under DAY-NRLM across Ratnagiri (Maharashtra), Erode (Tamil Nadu), and Tumkur (Karnataka) between November 2022 and August 2023. The intervention combined hands-on app training for entrepreneurs with capacity building of Block BDS Providers to integrate digital financial management into regular enterprise support visits. For rural women entrepreneurs, this knowledge enhances business efficiency and facilitates market access, among other benefits.
- Drawing on a scoping study of rural women entrepreneurs' readiness for and dependency on e-commerce marketplaces, and a complementary study conducted with the NASSCOM Foundation under our Udyogini initiative on women entrepreneurs' enterprise attributes, financial readiness, and digital platform use, LEAD's work underscores the need for AI-enabled diagnostics to better understand women's actual engagement with digital markets. Together, the studies reveal significant heterogeneity in capabilities, platform reliance, and growth pathways, alongside persistent frictions related to skills, logistics, trust, and control over transactions. These insights highlight how AI can be used to analyse diverse enterprise data at scale, enabling more targeted skilling, platform design, and policy interventions that respond to women entrepreneurs' differentiated needs rather than assuming uniform digital readiness.

Innovative AI-assisted Tools for Qualitative Research

Qualitative research methods such as in-depth interviews, focus group discussions, and key informant interviews are central to LEAD's work in data collection, impact assessment, and policy-oriented research. These methods are particularly important

in studies conducted in tribal, rural, and remote geographies, where understanding lived experiences, local implementation realities, and community perspectives is essential for inclusive and effective policy design. However, transcription of qualitative interviews presents persistent challenges such as distinctive speech patterns, accents, dialectal variations, code-switching between languages, and often leads to low accuracy when using standard, off-the-shelf transcription tools. To address these challenges, LEAD has developed an in-house, AI-enabled voice-to-text transcription tool to support faster, more inclusive qualitative research in complex field settings. Built using open-source technologies, the tool is designed to be adaptable, privacy-preserving, and transparent, while keeping researchers firmly in the loop. Piloted on qualitative data collected in Odia, the tool achieves an average transcription accuracy of approximately 80 percent, sufficient for generating high-quality draft transcripts that are subsequently reviewed and refined to ensure contextual accuracy and cultural sensitivity. The tool holds promise for scaling qualitative research across large and multi-state studies, shortening the time from fieldwork to insight, and lowering the cost of integrating lived experiences into policy and programme design.

Implications and Emerging Opportunities

Across applications ranging from nano-enterprise credit and skilling to digital bookkeeping and platform participation, LEAD's studies highlight opportunities for AI-driven diagnostics and targeted program design. More broadly, LEAD's portfolio points to the potential for AI to advance inclusion across livelihoods, financial and health systems, digital access, and gender equity by improving the analysis of large, fragmented datasets, surfacing early signals of exclusion or distress, and enabling programmes to adapt in closer to real time. Potential applications include strengthening grievance redressal and helpline systems, improving targeting and outreach in social programmes, supporting multilingual communication, and making monitoring and evaluation more responsive to frontline and community feedback. There is also growing scope for AI to complement digital public infrastructure by translating administrative data into actionable insights, while ensuring that those most affected by policy decisions remain visible in data systems. Critically, LEAD's experience underscores that inclusion-focused AI must be designed with strong ethical safeguards, human oversight, gender-intentionality, and contextual grounding to avoid reinforcing existing biases or exclusion. Another critical focus of LEAD's learning agenda is understanding how AI is reshaping the nature of work, opening new opportunities, risks, and forms of often-invisible digital labour for women within global data value chains, with important implications for skills and employment pathways. Looking ahead, we see opportunities to embed responsible AI more deeply within learning systems for governance, linking data, evidence, and decision-making in ways that support equity, accountability, and more inclusive development outcomes.

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WELL LABS
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CHAPTER 9

From Landscape Intelligence to Local Action: Water, Environment, Land and Livelihoods (WELL) Labs

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Centre Overview

WELL Labs is a water systems research and innovation centre at IFMR that focuses on solving complex water challenges by addressing their underlying links with land use, livelihoods and environmental change. The centre operates on the principle that durable water solutions must be tested in real-world settings and embedded within local institutions rather than treated as isolated technical fixes. Its work spans both rural and urban contexts, utilizing scientific expertise to test approaches, identify drivers of impact, and inform policy and programme design.

The centre has conducted rigorous evaluations of groundwater management, conservation structures and recharge pits in partnership with organisations like the Environmental Defense Fund and Foundation for Ecological Security. WELL Labs also works on systems-level transformation through flagship initiatives. The Rural Futures programme operates across five levers, including infrastructure, community capacity, and market access. The Urban Water programme designs pathways for water-secure cities, creating frameworks for lake restoration and wastewater circularity.

AI Applications for Water Problems

AI has a role to play as a force multiplier, especially when it comes to tedious tasks that can consume several man-hours to complete. It can also ease certain tasks that may not be worth the time it would consume if done manually. At the heart of it, AI requires field data to perform well and currently this is a huge bottleneck. It is trained on data, and it performs its task on data.

WELL labs is currently engaged in several collaborative projects that involve field data collection to train AI/ML algorithms.

Satellite Data

Satellite data provides us with some of the best large-scale mapping of the water scapes across the planet. This allows us to understand the moment of this resource, diagnose and solve problems in both urban and rural areas.

Data Downscaling

One huge issue with all satellite data is the resolution problem. Most of the free resources available do not provide very granular data. Satellite data are sometimes not useful enough on a farm scale. AI can be used to overcome this problem by training models to build more resolution and more accuracy into the images.

There are diverse typologies that need to be identified in the landscape. This can include types of crops, forests, streamflows, etc., which can be discerned from satellite images using AI. Some examples are:

- **Soil moisture** data tend to be at a 1 sq km scale. They need to be downscaled to the plot-scale to be useful for farm advisories. WELL Labs is currently engaged in a project with Stanford University to collect farm level data that can be used to train AI algorithms.
- **Land use mapping** – Land use maps have been long generated using Google Earth Engine, but they need ground data on cropping patterns and crop calendars. WELL Labs has been working with IIT Delhi to improve land use maps (and irrigated area maps in particular) using ground truth data.
- **Water body mapping** – Detection of small water bodies like farm ponds are extremely useful to understand farmer resilience in the dry season. But often water bodies are not easily distinguishable

because they are dry during most of the cloud-free post-monsoon season. WELL Labs is currently engaged in a project with University of Western Australia, to create training datasets.

Drone/Robotic Boat Data

Compared to satellites, drones can provide much more granular data. They provide a more accurate and detailed view of the landscape. Additionally, there is also the possibility of using infrared and multispectral sensors, to look beyond what the eye can see.

- **Evapotranspiration (ET):** Using infrared images from a drone and AI, we can deduce soil moisture, and water stress in plants even before they become visible. This requires a variety of sensors – both better input data into evapotranspiration algorithms (such as land surface temperature) and better ground measurement of ET. WELL labs is exploring a collaboration with IIT Bombay to do this.
- **Lake Bathymetry**: Using echo sensors and AI in combination, it is possible to undertake bathymetry of a lake using drones without anyone having to get into the lake physically. There is increasing use of autonomous boats to do this. WELL Labs is collaborating with Fluxgen Technologies on one such project.

Citizen Science Data

AI models can play a role in the interpretation of the data being collected by citizens.

- **Flood mapping**: AI can be used on top of drone data to arrive at high-quality flood models for urban landscapes as well. At a time when many of the cities across the world are prone to flooding due to heavy rainfall, such modelling can then provide the basis for flood alerts and help save lives. The problem is flooding is a hyperlocal problem and granular data are simply unavailable. Also floods coincide with clouds and therefore satellite imagery tends to be not useful. What we are testing in Bengaluru is the potential to use AI to interpret citizen-reported flood photographs to create more hyperlocal flood maps.
- **Water level detection:** A recent CAG report in Bengaluru showed that the vast majority of sensors, costing crores of rupees, installed in the city's drains were stolen or vandalised. This is a huge problem because water management systems require continuous monitoring of streams and lakes. One way to overcome this is by using manual or CC TV camera generated photographs of a staff gage that is painted on the wall of a drain or canal or water body outlet. The image stream is then visually interpreted to create a time-series dataset of water levels. We have partnered with Aga Khan Rural Support Programme and Aga Khan Foundation to collect community generated datasets on water levels in check-dams and farm-ponds, which we will be testing using AI.
- **Groundwater fracture mapping:** Hard-rock aquifers are extremely difficult to map. Often the density of fractures is a good proxy for recharge zones and storage potential but again such data are hyper-local. Many farmers have borewell camera scans of their wells, which visually show the depth and size of fractures.
    - One-time scans identify depth and density of fractures, active versus inactive inflow zones
    - Continuous scans during pumping enable direct observation of fracture inflows, water movement, changing contributions as pumping progresses. This determines the depth range over which fractures remain hydraulically connected and sustain yield during sustained pumping.

WELL Labs has been collaborating with Fluxgen technologies to see if these camera scans can be interpreted to generate useful datasets.

Sensor Data

The other source of data that has a significant role to play in the water sector is the data from various sensors.

Internet of Things (IoT) - There are a number of IoT solutions that are available for tracking assets performance in the field. This includes volumes of water pumped, tracking duration of pumping as well as field parameters such as soil moisture.

The broad array of sensors also can estimate the electricity being used, the depth of the well and discharge from the well.

This data can form the basis for modelling more efficient irrigation practices and also for undertaking protective irrigation for crops. The AI can be used for the purposes of automation of irrigation on the field as well as making it based on soil conditions rather than running it at specific time slots which can be wasteful.

Sensor Innovation - Startups are also working on a host of sensor technologies that can detect water flows in pipes in a non-invasive manner. This uses a layer of AI to arrive at the estimation. These technologies can play a critical role in estimating leaks in the system and to reduce the wastage by addressing them at the right location.

In the urban landscapes sensors are being used to make sure that the water being treated in STPs and ETPs meet safe standards before they are released into the sewage. Sensors are used for measuring pH level of water, Biological process status, flow rates and state of the system.

AI can be used for anomaly detection, diagnosis of the problem, and also predictive analysis.

Generative AI

There are also a number of areas where the generative AI tools are used in the appropriate manner to speed up work.

Prompt engineering done properly can allow you to seek out data from specific sources and compile them in a particular manner.

At WELL Labs, we have been using it to extract data from various reports such as the NAQUIM report and help construct an entire Detailed Project Report with a single prompt. Generative AI, is also being used to derive patterns in data and visualise the data such as well depth data collected over a period of time.

The limitation of Generative AI is that the output needs to be verified for hallucination, which remains a non-trivial activity.

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