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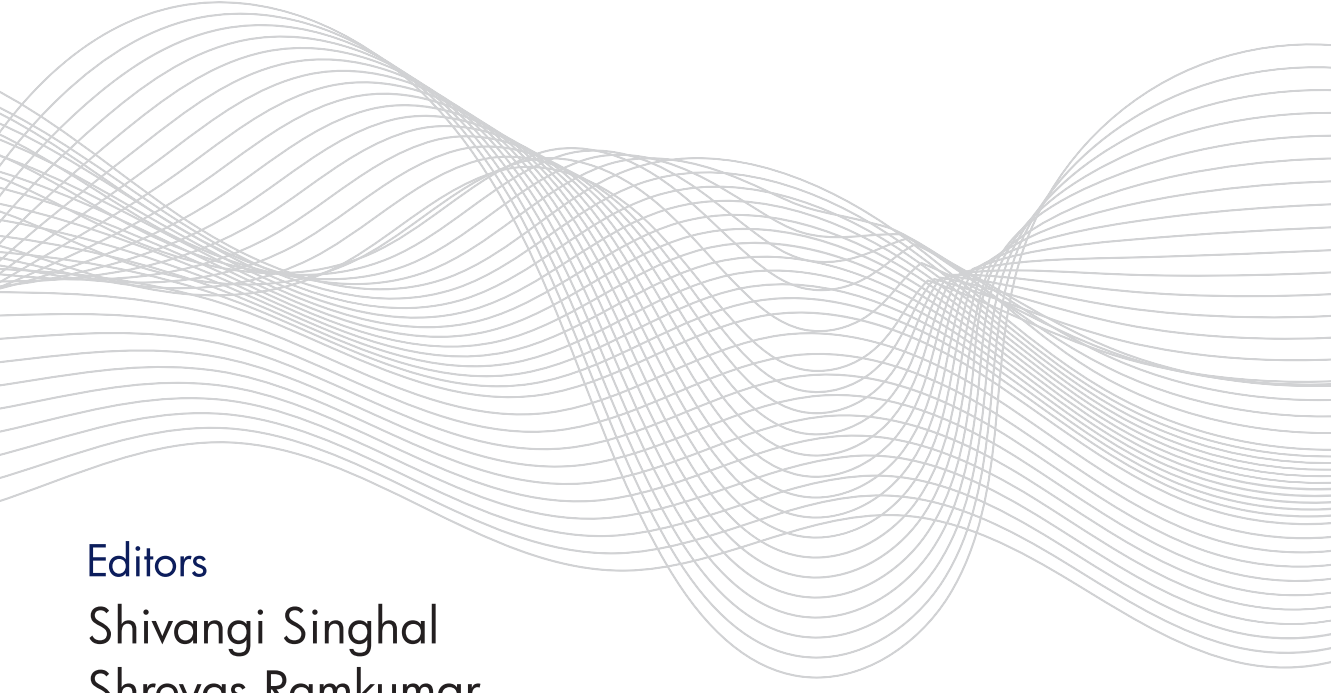
DigiNiti

Advancing Research and Collaboration



Editors
Shivangi Singhal
Shreyas Ramkumar
Parth Piyush Prasad

FLAME UNIVERSITY | EVERLASTING impact

DigiNiti Technology Policy Conclave

Post Conference Output

Editors

Shivangi Singhal

Shreyas Ramkumar

Parth Piyush Prasad

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INTRODUCTION

1. Introduction to DigiNiti

1.1. Why We Created DigiNiti

In most policy conferences we attended or read about, a pattern kept repeating itself - panels filled with academics, keynote speakers from elite institutions, and largely passive audiences. While intellectually rich, these gatherings left little space for early-stage researchers or students to contribute meaningfully. More importantly, there was a widening disconnect between the policy education we were receiving and the practical worlds we aspired to join. It began with a question we kept returning to: Why are most policy conferences so inaccessible to students? Time and again, we found conclaves dominated by panel discussions, where students were spectators - not participants. Rarely did we find space to present our own research, ask honest career questions, or engage with policy from a place of experimentation rather than deference.

DigiNiti was our response to this gap.

And so, was born - a name we coined by merging two worlds:

“Digi”, representing technology and digital transformation, and

“Niti” (नीति), the Sanskrit word for policy and governance.

Together, DigiNiti stands for the integration of technology and policy - the exact intersection we believe will define the next generation of public problem-solving in India.

We envisioned a conclave not just *about* students, but *by* students. A platform where youth voices were not tokenistic but central. A space where policy scholars could learn not only from professors but from practitioners - industry experts, think tank analysts, founders, bureaucrats - those shaping public policy on the ground.

We asked ourselves:

- Could we centre student research in a national policy conclave?
- Could we create space for questions students actually worry about - like whether to pursue a master’s degree right after undergrad?
- Could we host panels that don’t only describe change, but also *model* the career paths and dilemmas we’ll inherit?

DigiNiti became our answer.

1.2. What Set DigiNiti Apart

Over two days, DigiNiti brought together emerging voices and seasoned experts in a structure that broke traditional molds:

A. Student Research Was Central, Not Supplementary

We curated full-length student presentation sessions alongside each panel. These weren't side events - they were part of the main agenda. Research spanned topics like AI in governance, inclusive digital finance, e-governance reform, and sustainability tech - showcasing how undergraduate and postgraduate scholars across India are thinking about the future.

B. Panels With Practitioners, Not Just Professors

We deliberately brought voices from the field. Across five panels, industry professionals, think tank leads, legal experts, and policy entrepreneurs shared real-world experiences - whether it was regulating tech, deploying AI ethically, or crafting urban policy using IoT.

C. A Youth-for-Youth Career Panel

Our most candid and empowering session was *"Think Tanks, Industry, Government – What Else Does Public Policy Offer?"* It was imagined, designed, and delivered by young professionals close to our age - offering a no-filter conversation on job roles, fellowships, the value of a master's degree, and navigating the early policy career landscape.

D. Keynotes Rooted in Practice

From Dr. Shamika Ravi's deep dive into the timing and design of data-driven policymaking, to Prof. Rishikesha Krishnan's keynote on innovation policy ecosystems, our keynotes grounded theory in application - challenging us to think beyond abstraction.

1.3. A Reflection from the Organizers

Organizing DigiNiti was a leap of faith.

None of us had coordinated something at this scale before. Yet, every obstacle - from scheduling speakers to proofreading submissions - taught us something about leadership, compromise, and the value of trusting peers. We were not just designing a conclave; we were rehearsing the very skills that policy work demands - coordination across silos, learning from feedback, thinking structurally, and acting adaptively. Organizing DigiNiti wasn't a line item on our CVs - it was a transformative experience. We learnt what it means to build consensus, mediate feedback, negotiate with institutions, and still stay true to the vision.

At its heart, DigiNiti was an experiment.

Could three students reimagine a policy conclave that's equally academic and personal, structured and open?

Could we make research accessible without diluting its complexity?

The resounding feedback - both from attendees and panelists - was: yes.

We now know this: *students are not the future of policy - they are already shaping it.* All they need is a platform. DigiNiti was one such platform. We hope it's only the beginning.

Our greatest takeaway? **Young people can design serious policy conversations.** They just need a platform and the freedom to reimagine the format.

2. The Team Behind DigiNiti

Every student-led initiative is, in some way, an act of trust.

That DigiNiti came to life the way it did - ambitious in scope, rigorous in content, and seamless in execution - was only possible because that trust was extended to us by our institution, our mentors, and most meaningfully, our peers.

At the very top of this journey stood **Dr. Dishan Kamdar**, Vice Chancellor of FLAME University, who took what we now recognise as a leap of faith. He believed in our capacity to execute a national conclave-led entirely by students - and backed that belief with resources and support. That kind of institutional confidence is rare, and it gave us the license to dream boldly and deliver fully.

Our academic and structural backbone throughout this process was **Dr. Chaitanya Ravi**, Assistant Professor and Chair of Public Policy. From our first whiteboard discussiWon to the final student feedback form, he was the person we turned to - when we were unsure, when we needed feedback, and when we simply needed someone to tell us we could do this. Through every late-night idea draft, design crisis, or judgment call, he stayed by our side - quietly reinforcing our independence while offering steady mentorship.

We were deeply fortunate to have had the support of other FLAME faculty who helped shape both the quality and confidence of this event: **Dr. Yugank Goyal**, **Dr. Juhi Sidharth**, **Dr. Rishi Jha**, **Dr. Arun Kaushik**, and **Dr. Shivakumar Jolad**. From helping us refine research formats to grading student presentations, they gave their time, insight, and encouragement without hesitation.

2.1. The Organising Committee

DigiNiti was led by a trio who shared one belief: that students should not just attend policy conversations they should shape them.

1. **Shivangi Singhal** – Research Assistant, Centre for Economics and Public Policy
2. **Shreyas Ramkumar** – Undergraduate Student, FLAME University
3. **Parth Piyush Prasad** – Undergraduate Student, FLAME University

2.2. Design & Communications

Rudra Ajay

Undergraduate Student, FLAME University

2.3. Our Volunteers: The Soul of this Conference

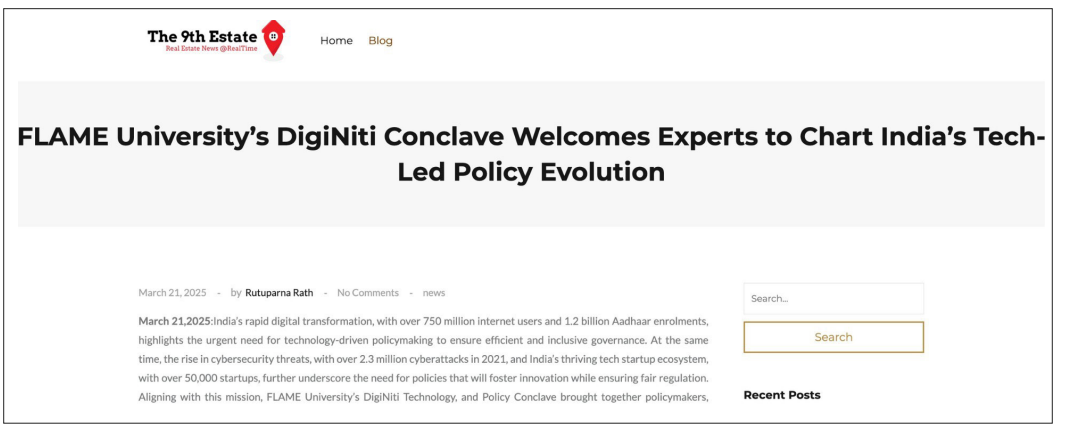
To our extended team of volunteers - your energy was our engine. You didn't just assist. You owned. And it showed.

Table 1

Volunteer Name		
Manasi Bijith	Saee Joshi	Siddharth Ramkumar
Kavish Kaul	Kriti Bhargava	Mrinangshu Sengupta Das
Samyukta Satish	Anmol Patil	Dhruv Yadav
Akshata Nippani	Ragini Ramachandran	Prasoon Joshi
Sanskruti Bapu Jadhav	Aastha Jain	Priyanshi Agrawal
Meenakshi SV	Harshitha Sree P	Krish Nagori
Charulatha Kumar	Sanyam Kanthaliya	Ragini Arora
Ram Varan	Lipika Gupta	Satya Teja Karri
Shreya Sharma	Neel Talaviya	Manasvi Sharma
Priyansha Arora	Ritvikka Sarathi	Shreenidhi Manigandann
Druthi Vutukuru	Advika Sahithi Udumula	Yaana Postwala
Prachi Mehndiratta	Lesha Raval	Stuti Agarwal
Ria Shah	Shahus Nridev	Suhani Mathur
Aadi Sardesai		

3. Glimpses from the Conference

3.1 Pictures of our Social Media/Media Representation



Shaping India's Policy Future: FLAME University's DigiNiti Conclave Explores Technology's Role in Governance

Pune: FLAME University recently hosted the DigiNiti Technology and Policy Conclave 2025 themed 'Tech in Policy: Technological Innovations and their Integration into Policymaking and Implementation.' The event brought policymakers, thought leaders, and young scholars together to explore the intersection of governance and technology. The conclave's main aim was to promote meaningful collaborations and interdisciplinary research among young minds and to upskill policymaking by integrating technological innovations while also ensuring the right balance between innovation and inclusivity. A leader in India-focused research, FLAME University has been instrumental in hosting a series of events to establish a platform for researchers to bridge the academia-policymaking gap and the academia-industry gap in India.

The conclave fostered discussions around the two-way causal relationship between technology and public policy, on how technology enables data-driven policymaking while also necessitating robust regulatory frameworks. The discussions covered system-disrupting and system-transforming technologies such as artificial intelligence (AI), cryptocurrency, and blockchain.

Bridging the gap between real-world policy application and academic research, the conclave featured youth forums, research presentations, panel discussions, and keynote lectures.

In her keynote speech on data-driven policymaking, Shamika Ravi, Member, Economic Advisory Council to the Prime Minister, said, "India is at the point where the baseline needs are met, and there is now a need to move towards precision policy. The data should now focus on state or district-level for precision policymaking."

In a panel on "How Much to Regulate Technology," prominent lawyer Apar Gupta spoke about the importance of striking the right balance between regulation of digital content and safeguarding citizen privacy and freedom of expression. In another panel on "Bridging Academia and Industry: Crafting Tomorrow's Policy Path," Prashant Girbane, the Director General of the Maharatta Chamber of Commerce, Industries, and Agriculture, spoke about the need for academia and industry to closely collaborate as part of a 'whole of society' effort to come up with technological innovations and policies conducive to economic growth and rapid job creation. Rishikesha Krishnan, Director of Indian Institute of Management, Bangalore (IIM-B), spoke at length in his keynote address on the key role of carefully designed public policies in accelerating the rise of India's innovation potential.

With in-depth discussions on technology's role in governance, the conclave received enthusiastic participation from research scholars, undergraduate, postgraduate, and doctoral students across India who presented their fresh perspectives on emerging themes such as the use of efficient IoT, artificial intelligence (AI) in public policy, the future of digital finance, fintech policies, smart cities, and blockchain for governance, among others. Best presentations were awarded across the undergraduate, postgraduate, and young researcher categories.

The conference will culminate in a post-conference proceedings document, consisting of key insights from panels and presentations that will be further developed into working papers. This publication will not only extend the impact of the condave beyond its duration but also serve as a catalyst for ongoing discourse, shaping the future of technology-driven policymaking in India.

Reflecting on the conclave's impact, Prof. M.A. Venkataramanan, Pro Vice-Chancellor, FLAME University, stated, "The DigiNiti Technology and Policy Conclave represents our commitment to promoting an environment where research meets real-world application. By engaging students in critical policy discussions, we empower them to contribute meaningfully to India's governance landscape through technology-driven solutions."

The success of DigiNiti 2025 reaffirms FLAME University's vision of promoting interdisciplinary research and thought leadership in the realm of technology and public policy. As the event concluded, it marked the beginning of a sustained effort to cultivate policy-driven technological research and inspire the next generation of scholars and policymakers.

Rishikesha Krishnan · Following
Director at Indian Institute of Management Bangalore
2mo ·

Thanks for inviting me Shivangi Singhal.

This was an extremely well organised event. Congratulations to you and your colleagues.

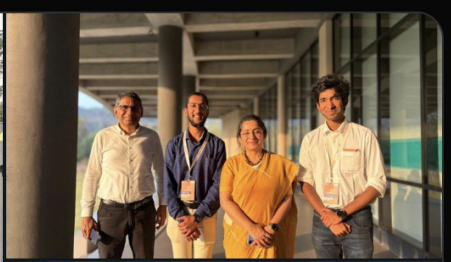
It was a real pleasure to interact with the bright and engaged students at FLAME University.

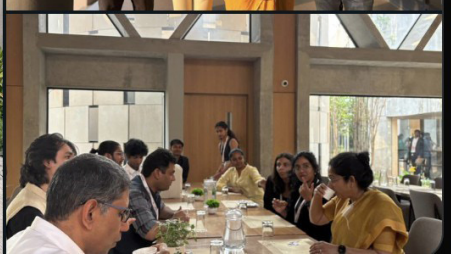
> **Shivangi Singhal** · You
> Research Assistant at the Centre for Economics and Public Policy
> 2mo ·
>
> Still not over what an unforgettable two days we just had at DigiNiti: Technology and Policy Conclave at FLAME University!
>
> As one of the Lead Organisers (along with Shreyas and Parth!), I've had the privilege of seeing this conference grow from a half-baked idea in an October brainstorm to a full-blown event with incredible speakers, packed halls, more chai-fueled coordination calls than I can count and some of the most inspiring minds in the room.
>
> We hosted stellar speakers – Shamika Ravi, Rishikesha Krishnan, Prashant Girbane, Parth Shah, Sachin Ravi, Chinmay Shaligram, Nikita Kwatra, and Tarun Arora, Ph.D. Arora – who brought sharp insights and generous energy to every session.
>
> A personal highlight? Prof. Rishikesha Krishnan citing my paper in his keynote address. That moment alone made six months of effort feel completely worth it.
>
> I also got the chance to moderate a panel close to my heart: "Think Tanks, Industry, Governments – What Else Does Public Policy Offer?" with the sharp and insightful Sidharth Rath, Reshu Natani, and Yash Agarwal – thank you for the thoughtful conversation and audience Qs mid-

---

Prof. Shamika Ravi @ShamikaRavi · Mar 17

'Data-driven Policymaking' my keynote address @FLAMEUniversity Pune's Technology & Policy Conclave #DigiNiti. Spent a memorable afternoon with faculty & students - all buzzing with energy and ideas! The campus is modern and architecturally v impressive and includes an undergraduate program in Public Policy. (Perhaps the only one among private universities?)





DigiNiti Technology Policy Conclave

CONFERENCE PROCEEDINGS

4. CONFERENCE PROCEEDINGS

4.1 Introduction to Keynote Speakerrs and Panels

The first edition of DigiNiti Technology and Policy Conclave was an incredible success, organising four panels and two keynote addresses over two days at FLAME University, Pune. The conclave hosted Dr. Shamika Ravi, member of the Economic Advisory Council to the Prime Minister, and Dr. Rishikesha Krishnan, Director of Indian Institute of Management (IIM), Bangalore as keynote speakers. Their inspiring and thought-provoking speeches capped off two packed days of panel discussions, student presentations and networking opportunities.

The first panel took a policy-first perspective on technology and policy, discussing and evaluating the regulation measures on technology in India. Moderated by Mr. Parth Piyush Prasad, the panel membership included Mr. Apar Gupta, Advocate and Founder Director, Internet Freedom Foundation, and Mr. Rohit Kumar, Founding Partner, The Quantum Hub. Their insights simplified complex legal and policy analysis into accessible thematic discussions as well as constructive critique of existing policy measures.

The second panel took a deeper look at the relationship between data and public policy, touching upon discussions related to data availability in India, existing (or the lack thereof) data collection and presentation methods of the government, best practices as well as the ethics of using publicly-available data. Moderated by Mr. Shreyas Ramkumar, the panel included Mr. Tarun Arora, Associate Dean at O.P Jindal Global University, Ms. Nikita Kwatra, Principal at Artha Global, and Mr. Chinmay Shaligram, Founder at Terra Helix. This panel was most illuminating for proponents of data-driven policymaking, and argued for more consistent data sharing mechanisms across all verticals of the government.

The third panel answered the deep-seated questions and fears of all public policy students and aspirants: what next? This youth-led panel discussed the immediate next steps for the largely-undergraduate audience to make their way into the field of tech-driven policymaking, and shed light on the hurdles and roadblocks through personal anecdotes. Moderated by Ms. Shivangi Singhal, the panel included Yash Agarwal, Founder, Public Policy India, Reshu Natani, Digital and Trade Policy Manager, AWS, and Sidharth Rath, Founder, Swasthya Plus Network. The panel was extremely beneficial for the students in attendance, leading them towards the path to a successful policy career and developing confidence in their career choices.

The final panel detailed the bridge between the classroom and the boardroom through the experiences of industry veterans and their outlook for the field of technology policy. The discussion detailed the “supply chain” of policy and thought, and denoted the roles and responsibilities of policymakers, academics and industry professionals. Moderated by Mr. Sidharth Rath, Founder, Swasthya Plus Network, the panel included Mr. Parth Shah, Dean and Co-Founder, Indian School of Public Policy (ISPP), and Mr. Prashant Girbane, Director General of the Mahratta Chamber of Commerce, Industry and Agriculture (MCCIA). The panel fleshed out the discussion around policy careers by delving into the existing industry insights in policy education, demand and lacking supply as well as cases of notable linkages between all stakeholders in the policymaking process.

This section details the takeaways from each keynote address, panel discussion and student presentations held during the conclave. The notes for these proceedings were meticulously curated by volunteers and the lead organisers of the conclave.

4.2 Keynote 1

Dr. Shamika Ravi, member of the Economic Advisory Council to the Prime Minister, delivered a keynote on the theme: "Data-Driven Policymaking: How and the When?", emphasizing data-driven policymaking, developmental economics, labor market dynamics, agricultural reforms, and the critical role of gender in economic outcomes.

Theme 1: India's Development Trajectory and the Democratic Trade-Off

Dr. Ravi opened by contrasting India's economic growth against China's trajectory, highlighting that although India is economically 22 years behind China - with China's per capita income five times larger - developmentally, India trails by just six-and-a-half years due to its democratic context. She emphasized democracy as a critical factor shaping development agendas. Since electoral politics require addressing development issues, democracy inherently focuses policy attention on human development goals.

She also discussed GDP per capita as a proxy for overall progress, aligning closely with human development indices (HDI). Economic growth and development targets such as poverty reduction, healthcare improvements, and education have moved hand-in-hand. For instance, despite global perceptions, India reduced poverty levels significantly, achieving below 5% poverty incidence according to the Rangarajan Poverty Index. Dr. Ravi highlighted India's notable progress in maternal and infant mortality rates, which are declining twice as fast as global averages due to targeted policies and resource allocation facilitated by economic growth.

Theme 2: Precision Policymaking and the Shift Toward Data-Driven Governance

Dr. Ravi emphasized the shift toward "precision policymaking", focusing resources and policies precisely where needed. She mentioned the saturation of basic amenities such as electricity and the extensive coverage achieved through digital initiatives like Aadhaar, bank accounts, and mobile connectivity (J.A.M trinity), now covering 98% of households. This connectivity is boosting startup ecosystems and accelerating growth in sectors like EdTech and HealthTech.

Precision policymaking requires granular data analysis, exemplified by district-level analyses in India (with an average district population size around 2 million people). She urged policymakers to utilize advanced data sources like satellite imagery (Global Human Settlement Layer dataset) and narrative analysis from sources like GDELT, ensuring policy precision and effectiveness.

Theme 3: Labor Market Dynamics, Skills, and Youth Employment

A significant portion of Dr. Ravi's keynote was dedicated to India's labor market, particularly addressing low Labor Force Participation Rates, unemployment, and the disconnect between

education and market skills. While China's LFPR exceeds 70%, India's was barely 50% just eight years ago, highlighting structural barriers in employment creation. She identified "skilled manpower" as the primary constraint for industries, due to a mismatch between the degrees offered by educational institutions and the skills industries require.

Youth employment, particularly voluntary unemployment among educated youth, remains problematic. Many educated individuals delay workforce entry until around age 30. She emphasized the importance of apprenticeships and internships, as promoted by the National Education Policy (NEP), to bridge the gap between theoretical knowledge and practical market skills. She critically questioned the prevailing educational assessment systems, asking rhetorically about the inherent value of exam-taking skills in relation to real-world employability.

Theme 4: Gender, Labor Force Participation, and Valuing Unpaid Work

Dr. Ravi addressed the gender dimension extensively, specifically complexities behind the low labor force participation among women despite increasing educational attainment. Women's participation has rebounded recently, more pronounced in rural areas, yet it remains constrained by deeply rooted social structures. Urban women's participation remains particularly low due to marriage, family responsibilities, and societal expectations around caregiving roles.

She Underlined the pandemic's Critical Lesson: the importance of recognizing and valuing unpaid labor disproportionately performed by women. Dr. Ravi stressed that traditional economic measures undervalue caregiving and household tasks, a shift towards a "care economy." Policies must be structured to reduce women's caregiving burdens, enabling greater economic participation. She called for promoting child- and elderly-friendly economic environments to lower the marginal costs borne by women, thereby enabling higher labor market engagement.

Theme 5: Agricultural Reforms, Diversification, and Manufacturing Growth

Dr. Ravi concluded her address by analyzing agricultural policy, industrialization, and their links to economic diversification. She used Punjab as a cautionary example: once India's richest state per capita, it has stagnated due to reliance on agriculture alone. Cross-subsidies benefiting agriculture at the cost of industries have led to significant industrial movement to neighboring states like Haryana and Himachal Pradesh, demonstrating policy-induced de-industrialization.

She argued the best approach to doubling farmers' incomes involves reducing the proportion of the population dependent on agriculture, advocating a substantial shift towards manufacturing under initiatives like the 'Make in India' programme. She stressed the limitations of relying solely on agricultural productivity gains, pointing to technology's limited ability to solve employment issues within agriculture. Diversification beyond cereals towards protein-rich sources like fisheries and fruits, is already evident. Better storage and logistics have reduced seasonal variations in food availability, contributing to improved nutrition outcomes such as reduced anemia prevalence.

Additionally, Dr. Ravi discussed fiscal policies around food distribution, specifically how free food grain distribution impacts consumer spending, driving expenditure towards diverse dietary choices, thereby amplifying nutritional benefits.

4.3. Keynote 2

Dr. Rishikesha T. Krishnan, Director of the Indian Institute of Management, Bangalore, delivered a thought-provoking keynote address on the theme "Building India's Innovation Sector through Better Public Policies", emphasising on the need of innovation to drive the Indian economy, and how more aware policymaking is key to stimulate the growing sector of innovation in India. His address, populated with case studies, theoretical insights as well as calls for action for the youth in attendance, was broken into five core themes.

Theme #1: Innovation as a Strategic Imperative

Dr. Krishnan noted innovation not just as an economic driver but as a geopolitical necessity. In a world where technological self-sufficiency dictates power, India's innovation capacity has become central to its sovereignty and strategic autonomy. Innovation enables countries to avoid technological dependence and mitigate risks of foreign control over critical sectors, illustrated in India's past struggles with mobile handset manufacturing where foreign companies like Micromax were displaced due to an inability to innovate. Strategic innovation is also vital in defence, exemplified by initiatives like INS Vikrant and iDEX (Innovations for Defence Excellence), and in public health, where low-cost indigenous solutions like Rotavac and the COVID-19 vaccine campaign illustrated how innovation can serve national needs efficiently.

Moreover, Dr. Krishnan linked innovation to global leadership, noting India's strength in sectors like generic pharmaceuticals (e.g., Cipla, Dr. Reddy's Labs) where frugal innovation has provided both market access and global relevance. He called for moving beyond raw material export towards value chain integration, echoing Taiwan's example with TSMC in microchip manufacturing. The argument is fundamentally about escaping the "middle innovation trap," where a country is able to adopt but not originate technologies. Thus, innovation becomes a strategic lever, not merely for competitiveness, but for asserting national agency and shaping global outcomes.

Theme #2: Structural Gaps in India's Innovation Ecosystem

The core argument of Dr. Krishnan's address was the persistent structural weaknesses that limit India's innovation potential. The most glaring of these is low R&D spending, hovering around 0.6%–0.7% of GDP, compared to countries like China or the U.S., where private sector investments are significant drivers of innovation. In India, government remains the dominant source of R&D funding, which distorts the incentive structure and slows the commercialization of innovation. This has consequences for the volume and quality of high-tech exports and the global competitiveness of Indian firms.

Dr. Krishnan also highlighted institutional bottlenecks, especially in higher education. Unlike China, which has rapidly scaled globally ranked universities, India's academic sector

struggles with fragmented research capabilities and limited industrial linkage. Regulatory rigidity further complicates innovation in highly regulated sectors like pharmaceuticals and telecommunications, where approval cycles often lag behind technological progress.

The absence of an integrated value chain from ideation to commercialization was another concern. While startups and public institutions like BIRAC offer some end-to-end support in sectors like biotechnology, systemic fragmentation prevents scalable, sustainable innovation. Even when innovations emerge (e.g., Mangalyaan, Aadhar, UPI), they are often not embedded into broader ecosystems capable of iterative development and global dissemination. Without a cohesive framework connecting government policy, academia, startups, and established firms, India risks remaining an assembler of foreign technologies rather than an originator.

Theme #3: Building an End-to-End Innovation Ecosystem

Dr. Krishnan argued that India's success stories in innovation, such as UPI, Mangalyaan, and COVID-19 test kits, emerged not from isolated ingenuity but from ecosystems where policy, institutions, and markets aligned. To replicate such success, India needs to institutionalize a value-chain approach to innovation that spans ideation, incubation, prototyping, production, and market integration.

This Means Focusing on Four Pillars: academia, startups, established firms, and public policy. Academia must transition from being knowledge repositories to innovation enablers. Dr. Krishnan cited IIT Madras Research Park as an exemplar, its integration of academic research, industry collaboration, and startup incubation has yielded real-world applications, from green tech to AI tools.

Startups, he stressed, are central to solving local problems at scale. Companies like Niramai and Vigyanlabs embody the type of deep-tech, purpose-driven innovation India needs. Collaboration with larger firms enables startups to scale while large companies access disruptive agility.

For established firms, he pointed to those with step-by-step innovation capability or integration platforms as vital nodes in India's innovation ecosystem. Government must facilitate these efforts through structured programs like BIRAC, and strengthen institutions like ANRF with sustained funding and regulatory coordination. Without end-to-end alignment across actors, innovation risks remaining episodic and unsustained.

Theme #4: Policy and Regulatory Reforms for Innovation

Effective innovation ecosystems require not just funding and talent, but regulatory and policy agility. Dr. Krishnan emphasized that rigid or outdated regulations can stifle innovation, particularly in deep-tech or highly regulated domains such as defense, biotech, or AI. He called for "dynamic regulatory bodies" that evolve alongside technology, enabling risk-managed experimentation while safeguarding public interest.

A key reform initiative discussed was the Advanced National Research Foundation (ANRF), intended to transform public universities into research hubs. This is a long-overdue move to decentralize research beyond premier institutes and to integrate innovation into India's

wider academic system. The Rs. 50,000 crore investment over five years is a promising start, but must be matched by accountability frameworks and global talent engagement policies, including diaspora return programs and international partnerships.

Defense innovation through iDEX is another policy success Dr. Krishnan spotlighted, an example of policy-driven self-reliance via startup collaboration and targeted procurement. He urged a similar approach in AI and semiconductor sectors, calling for foundational institutions like IndiaStack or UPI, but tailored to emerging technologies.

Finally, he highlighted the role of public procurement in shaping innovation, referencing the COVID-19 vaccine rollout as a successful model. Public policy, he concluded, must not only create incentives but also reduce bureaucratic friction and build institutional memory for innovation governance.

Theme #5: Solving the Right Problems with Frugal and Scalable Innovation

Dr. Krishnan repeatedly stressed that innovation should not be driven by novelty alone, but by relevance and scalability, what he called "solving the right problems." This philosophy is at the heart of India's most impactful innovations, be it UPI, designed to be bank-agnostic and scalable across demographics, or the Aspirational Districts Program, which used data and competition to improve local governance.

Frugal innovation, or doing more with less, emerged as a key framework. Examples like Rotavac, MyLab, and Mangalyaan show how India has leveraged constraints to develop low-cost, high-impact solutions.

This approach contrasts with the capital-heavy innovation of the West and is better suited to India's socio-economic landscape.

Moreover, Dr. Krishnan emphasized that innovation must be inclusive. Digital platforms like Aadhar or GeM are valuable not only for their technological robustness but for democratizing access, whether to identification, welfare schemes, or procurement opportunities. Such innovations transform governance and create "public digital infrastructure" that others can build upon.

He warned against techno-fetishism, urging policymakers and innovators to focus on value creation, not vanity metrics. Managing trade-offs, between scale and quality, speed and safety, regulation and freedom, is the essence of successful innovation. The Bajaj DTSi engine, a case in point, succeeded because it balanced cost, performance, and technological differentiation. Innovation, he concluded, must be problem-first, ecosystem-enabled, and socially rooted.

4.4 Panel 1

17th March, 2025 - 10:30AM to 11:30AM

How (Much) To Regulate Technology?

Moderator: Mr. Parth Piyush Prasad, Lead Organiser, DigiNiti Technology and Policy Conclave

Panellists: Mr. Apar Gupta, Advocate and Founder Director, Internet Freedom Foundation, and Mr. Rohit Kumar, Founding Partner, The Quantum Hub

Overview

This panel explored the fine balance between fostering innovation and ensuring accountability in the digital age. As technology continues to permeate every aspect of governance, commerce, and personal freedoms, regulatory frameworks must evolve to address concerns surrounding technological proliferation. This panel examined existing regulatory frameworks such as the Digital Personal Data Protection Act (2023), IT Rules (2021), and Competition Commission of India's actions against Big Tech, alongside global precedents like GDPR and China's Cyberspace Administration policies.

The discussion is necessary because unregulated technological advancements can lead to privacy violations, while overregulation may stifle innovation and restrict economic growth. With India emerging as a global technology hub, the need for nuanced and adaptive policy mechanisms has never been greater. This panel assessed India's regulatory trajectory and its implications for civic engagement, business environments, and state control over digital infrastructures.

Key Thematic Discussions

AI Regulation: Timing, Harms, and Systemic Risks

The regulation of Artificial Intelligence (AI) in India was presented as a domain ripe for urgent yet calibrated rule-making. Mr. Apar Gupta and Mr. Rohit Kumar outlined a wide range of systemic, ethical, and temporal concerns that inform the current discourse on AI regulation. Mr. Gupta argued that regulation must not be treated as an optional postscript to innovation, particularly when AI systems interact with public infrastructures and shape access to economic opportunities. He cited ranking algorithms used in gig work platforms as a stark example of how technology can adversely impact marginalized workers by entrenching precarious conditions and amplifying discrimination.

A key concern raised by Mr. Gupta was the concentration of executive power in the absence of meaningful delegation to independent regulatory bodies. In his view, India's centralization of policymaking, often in the hands of a few bureaucrats and ministers, has led to what he described as "techno-feudalism" in a country already shaped by historical inequities. Gupta emphasized that the government should resist the temptation to interfere in pre-existing, functioning digital connectivity policies, which often provide vital infrastructure to underserved populations. Abrupt changes, he warned, risk dislocating public services and eroding trust in governance.

Mr. Rohit Kumar brought attention to the problem of regulatory timing. While premature regulation may stifle innovation, delayed action risks locking society into harmful technological trajectories. Drawing a parallel with the regulation of social media, Mr. Kumar emphasized that AI systems, once deeply embedded, are difficult to rein in. Thus, while India

seeks to foster a vibrant startup ecosystem, it cannot afford to ignore the emerging harms of unregulated AI. These include non-consensual data scraping, algorithmic bias, and the spread of misinformation. He advocated for forward-looking planning through government-issued vision documents, such as three-year, five-year, and six-month plans that transparently list goals, progress, and failures.

Both speakers agreed that AI regulation must be anchored in constitutional values rather than merely emulating international frameworks such as those from the OECD. India's regulatory ambitions must be people-centric, transparent, and locally contextualized, especially when the AI landscape includes threats such as deepfakes, discrimination in decision-making, and unaccountable data use. Current government actions, such as the amendment of Section 8(1)(j) of the RTI Act, suggest a weakening of transparency norms at a time when the stakes are highest. Therefore, AI regulation in India requires a robust architecture that can address harms after deployment, audit algorithmic decisions, and ensure that data used to train AI models is not only lawfully sourced but ethically governed.

Youth Engagement: Opportunity, Responsibility, and Democratic Renewal

Another strong theme that emerged from the discussion was the essential role of youth in engaging with and shaping technology regulation. Both speakers recognized that youth, by virtue of their digital literacy, demographic weight, and proximity to technological change, are uniquely placed to intervene in emerging regulatory conversations. Mr. Apar Gupta pointed out that technology opens up both opportunities and avenues of harm. Therefore, the youth must be equipped not just as consumers or workers in a tech-driven economy, but as critical agents capable of shaping policy.

The rise of technological platforms in areas such as agriculture, logistics, education, and public service delivery has already created an ecosystem where the youth are central actors. As Mr. Rohit Kumar illustrated, youth-led innovations in agriculture are gaining traction because young people have the advantage of entering the sector early with tech-forward thinking, even as older generations lag behind. This creates a moment of potential disruption, where youth can use AI and digital tools to solve long standing developmental challenges.

However, meaningful youth engagement requires more than enthusiasm. It demands institutional support. Policy frameworks must actively involve young people in consultative processes, participatory governance, and innovation ecosystems. With rapid technological advancement, regulatory frameworks must evolve in tandem. As AI and algorithmic decision-making systems become more sophisticated, so too must our expectations from the youth, not only to build these systems but also to question, reshape, and regulate them in the public interest.

Moreover, youth engagement with technology regulation is not merely a matter of innovation or employment. It is deeply political. Engagement in tech policy can help youth break through entrenched caste, class, and regional barriers. A robust, inclusive approach to policy participation can create a more democratic digital future. But that will only be possible if avenues for civic expression and policy engagement remain open, accessible, and legitimate.

Government and Civil Society: Transparency, Accountability, and the Role of Independent Regulators

The session also delved deeply into the structural problems in India's existing regulatory apparatus. Mr. Apar Gupta highlighted how many current laws, particularly the Digital Personal Data Protection Act, grant wide powers to bureaucrats and ministers without requiring the establishment of independent regulators. The central government has not only concentrated power but has also often exempted itself from regulatory oversight. This creates significant asymmetry between public accountability and executive authority.

This lack of institutional independence was flagged as a core challenge to effective regulation. For instance, Mr. Gupta noted that some advisory functions in regulatory frameworks now amount to direct decision-making power, bypassing the regulatory bodies that are supposed to mediate between government policy and public interest. Mr. Rohit Kumar added that while politicians and bureaucrats are increasingly aware of the role of technology and its implications, as seen in Lok Sabha records concerning cybersecurity and AI, the absence of regulatory transparency undermines public trust.

The weakening of the RTI regime, particularly with the amendment of Section 8(1)(j), reflects a troubling trend. Despite global norms emphasizing transparency and public participation, India's regulatory structure is moving in the opposite direction. This makes the role of civil society even more crucial. Civil society actors must not only scrutinize government action but also keep a close watch on corporate excesses. With AI systems being trained on vast swathes of publicly available data, often without consent or compensation, there is a growing need for independent monitoring, algorithmic audits, and stress testing mechanisms.

The speakers called for the establishment of a National Knowledge Commission or equivalent body to promote digital literacy, civic education, and informed debate on technology policy. A culture of self-assessment by the government, in the form of periodic report cards or vision documents, was also suggested. These documents should articulate specific achievements, failures, and future strategies, thereby institutionalizing accountability.

Salient Points

- **AI Regulation in India is at a Critical Juncture:** While premature regulation may hinder innovation, delays can entrench systemic harm. The challenge is to strike a balance that allows innovation while safeguarding public interest.
- **The Concentration of Executive Power in India's Regulatory Landscape:** Limits effective policymaking and increases the risk of regulatory capture due to the absence of independent regulators.
- **Youth Engagement with Technology Policy is Essential for Solving Future Challenges and Ensuring a more Democratic Digital Ecosystem:** Youth-led innovation must be backed by inclusive, responsive, and transparent regulatory systems.

- **AI Misinformation Poses a Growing Threat To Democratic Processes, Especially During Elections:** The government must create mechanisms to slow down harmful content without censoring dissent.
- **Civil Society must Act as a Watchdog:** To ensure both governmental and corporate accountability in the rapidly evolving tech sector. Transparency, periodic reporting, and independent oversight are necessary to restore public trust.

4.5. Panel 2

17th March, 2025 - 11:30 AM to 12:30 PM

The Data Revolution: Ethics, Impact, and Innovation in Policy

Moderator: Mr. Shreyas Ramkumar, Lead Organiser, DigiNiti Technology and Policy Conclave

Panellists: Mr. Tarun Arora, Associate Dean at O.P Jindal Global University, Ms. Nikita Kwatra, Principal at Artha Global, and Mr. Chinmay Shaligram, Founder at Terra Helix

An Overview of the Panel

This panel discussed how data is reshaping public policy in India, covering ethical issues, real-world impacts, and opportunities for innovation. Panelists critically examined whether governments genuinely use data-driven methods or if data is merely a checkbox exercise. The session delved into practical barriers like government reluctance to share or effectively use data, privacy breaches, restrictions around geospatial data, and issues arising from the agendas of stakeholders funding data-driven research. The discussion also highlighted the crucial roles played by universities, private organizations, media, and young citizens in driving policy innovation through better use of data.

Key Thematic Discussions

Government Use of Data in Decision-Making

Tarun Arora addressed the uneven application of data in policy-making, emphasizing both successes and challenges. He highlighted India's struggle with complexity, such as having over 700 scattered housing indicators available on international platforms like the UK's RIC website, which are rarely effectively used. He noted that governments often fail to act on data unless presented in simpler, actionable formats. For instance, Pune's municipal corporation improved revenue collection through GIS-based property tax analysis because the data was provided in an easy-to-use format, demonstrating the need for clarity and simplicity to foster governmental data adoption.

Geospatial Data: Opportunities and Regulatory Challenges

Chinmay Shaligram discussed the growing availability and use of geospatial data following recent regulatory relaxations in India. Satellite companies and organizations like ISRO now collaborate more, enhancing data availability and practical use. However, he criticized

ongoing government restrictions, stating that public institutions continue to overly guard data ownership due to outdated security concerns.

He argued that most geospatial data should be openly accessible, challenging fears of national security risks by pointing out that global satellite imagery is widely available. Shaligram emphasized that restrictive mandates are limiting innovation despite geospatial data becoming mainstream.

Privacy, Ethical Issues, and Data Protection Frameworks

Nikita Kwatra highlighted significant problems in India's current approach to data privacy and protection. She described widespread governmental paranoia about data security, emphasizing that privacy breaches are mostly due to poor data management practices at state and local government levels, not central government or private firms. Kwatra illustrated this with an incident where a local government official mistakenly shared exhaustive personal Aadhaar data via WhatsApp. She urged shifting the policy focus toward addressing such governmental mishandling rather than targeting private sector companies excessively. She also underscored emerging concerns about corporate misuse of data for manipulative advertising through dark patterns and stressed the need for clear rules on data portability and corporate accountability.

Stakeholders Influencing Data-Driven Policy

The panel extensively debated the role of various stakeholders—government bodies, private foundations, universities, and media—in driving data-focused research. Tarun Arora pointed out that governments rarely finance independent data collection for policy decisions, putting the burden on universities and private institutes. However, private funders like Ford Foundation and others sometimes subtly push their own agendas, potentially influencing the neutrality of policy research. Arora advised researchers to proactively propose solutions, not just criticism, if they want governments to listen. Nikita Kwatra echoed this view, noting governments become particularly sensitive about data if researchers publish findings publicly, whereas they are more open to private solution-oriented dialogues.

Public Access, Transparency, and Youth Participation

The panel recognized a significant gap in transparency and public access to data. Arora shared personal experiences where granular data, although available at ward-level, was withheld by authorities citing fears of inciting social unrest. Kwatra stated that releasing data publicly is essential for effective citizenship, but added that simply making information available without ensuring proper implementation is ineffective. She advocated for stronger media involvement to independently ensure transparency.

Additionally, Chinmay Shaligram cautioned against mistaking louder outreach or advocacy as always correct or beneficial.

Panelists also emphasized the vital role youth must play in policy innovation. Shaligram encouraged treating geospatial data simply as another dataset, suggesting policymakers

and young researchers incorporate broader socio-economic layers, such as finance and demographics, to generate more meaningful insights. He highlighted that critical thinking and skillful model-building are key future opportunities in data analytics and policy-making.

Global Data Integration and Digital Ecosystem Challenges

Discussing India's global position, Nikita Kwatra explained that India's new data regulations positively emphasize data ownership, but also noted challenges around international data flows, especially given that most data centers serving India remain abroad. She stressed the importance of adopting a balanced, risk-based approach for data localization, especially for sensitive sectors like defense. Kwatra highlighted the pressing need for India to negotiate bilateral data-flow agreements to accommodate multinational companies, thereby creating a more robust and globally integrated digital ecosystem.

Tarun Arora provided an example of the practical difficulties governments face with data management, recalling when the Swachh Bharat Mission collected massive amounts of data to rank cities. The government ultimately overwhelmed research teams by sending truckloads of data physically because neither government nor universities had adequate data storage infrastructure.

Salient Points

- Effective data use in policy-making depends heavily on simplifying data presentation. Complex or poorly formatted data discourages governmental action.
- Geospatial data has become widely available due to regulatory relaxations, but outdated government restrictions still hinder innovation.
- India's data privacy breaches are primarily due to poor local government data handling, not private sector misuse, highlighting urgent gaps in data governance and training.
- Government funding shortages force researchers to rely on private donors, risking biased policy outcomes due to donor-driven agendas.
- Enhanced transparency, public data accessibility, and meaningful youth involvement are essential to realizing the potential of data-driven policy-making in India.
- India faces critical challenges balancing national interests and international data-flow demands, requiring strategic regulatory reforms and global partnerships.

4.6. Panel 3

17th March, 2025 - 3:30PM to 4:30PM

Panel 3: Think Tanks, Industry, Governments – What Else Does Public Policy Offer?

Moderator: Shivangi Singhal, Lead Organiser, DigiNiti Technology and Policy Conclave

Panelists: Yash Agarwal (Founder, Public Policy India), Reshu Natani (Digital and Trade Policy Manager, AWS), Sidharth Rath (Founder, Swasthya Plus Network)

Overview

Panel 3 at the DigiNiti Conclave addressed a central question many public policy students face: *What lies beyond the conventional domains of government and think tanks?* With a dynamic mix of speakers from the startup ecosystem, corporate sector, and independent initiatives, the session explored the expansive and evolving landscape of public policy careers. Moderated by Shivangi Singhal, the panel highlighted how policy work is increasingly situated at the intersection of technology, social impact, and entrepreneurship - bringing forth new modes of influence, opportunity, and responsibility.

Each panelist brought a distinct perspective grounded in personal experience - Yash Agarwal through building a policy-focused platform for professionals, Reshu Natani from her corporate policy work in global digital trade, and Sidharth Rath through health-tech advocacy for underserved populations.

Together, they challenged traditional assumptions about policy careers and offered tangible insights into what it takes to build meaningful work in the field.

Key Thematic Discussions

Rethinking the Public Policy Ecosystem: Beyond the Traditional Career Map

A core theme that ran through the discussion was the widening scope of public policy as a profession. Yash Agarwal challenged the narrow perception that policy work is confined to roles like "PM, CM, DM" or to academic think tanks. Drawing from his own experience building Public Policy India (PPI), he emphasized the growing number of grassroots organizations, consulting firms, and independent platforms shaping the policy discourse in India. He pointed to the increasing availability of policy-related jobs - shared in real time across PPI's city-based chapters - and stressed the need for students to engage with the sector early on.

Sidharth Rath further illustrated this expansion by describing policy as inherently multi-stakeholder. His organization, Swasthya Plus Network, was born out of a glaring gap in the health policy ecosystem - where government and market actors failed to provide accessible, unbiased health information to regional language speakers. The organization creates videos in multiple Indian languages, countering information asymmetry and pushing back against the over-medicalization of online health content. He described this kind of entrepreneurship as essential in responding to market failure, where traditional systems fall short.

Reshu Natani added that public policy is a deeply cross-sectoral domain. Drawing on her role at AWS, she emphasized that today's policymaking requires an understanding of how regulation, corporate interests, and social objectives intersect. For example, policy changes like the inclusion of gaming revenue under GST can have significant, unintended ripple effects across sectors. Her point underscored the increasing need for public policy professionals who can work across silos—with an appreciation for both public outcomes and private sector realities.

The panel collectively emphasized that policy work is no longer confined to regulation or advocacy—it now influences startups, healthcare delivery, digital infrastructure, and trade strategy. This makes public policy less of a predefined pathway and more of an evolving ecosystem of actors, roles, and impact areas.

Careers, Credibility, and the Role of Education

One of the most engaging parts of the conversation centered around the question: Do you really need a master's degree to build a career in public policy? The panel's consensus was nuanced. Yash laid out three conditions under which a policy master's makes sense: (1) if you want to work on specific academic themes; (2) if you are targeting government roles; or (3) if you are looking to transition from a completely different career. However, he cautioned against viewing the degree as a necessary next step post-undergrad, especially without clarity on one's long-term goals.

Reshu offered a complementary perspective: public policy is more about application than credentials. Her academic training in economics helped her think through behavioral incentives and unintended consequences, which she now brings into corporate policymaking. Yet, she emphasized that what matters most in interviews and jobs is the value and clarity you bring to the table - not just your qualifications.

Sidharth encouraged students to pursue a period of fieldwork before considering graduate studies. He described liberal education as "education in life," and spoke of the importance of understanding different sectors - not just to become better policy thinkers, but also to undergo a self-reflective process about where one can contribute most meaningfully.

The discussion also tackled how students without credentials can still build strong public policy careers. Yash spoke candidly about India being a low-trust society, where credibility is either earned over time or borrowed from institutions. To stand out, he urged students to demonstrate their knowledge and impact through their work - not just claim it on a résumé. Sidharth added that students should "think like designers" - go out, observe, critique, and show their problem-solving ability through public contributions. Reshu reiterated that curiosity and confidence matter: striking up a conversation with someone in the field could be the most effective form of learning.

Filling Gaps: When Policy is the Response to Failure

Several discussions during the panel revolved around the idea that public policy often arises in response to failure - whether of the market, the state, or automatic systems. As Sidharth explained, policy is necessary when "automatic processes do not solve problems." For instance, in healthcare, the asymmetry of information between providers and patients requires targeted policy responses to empower individuals. His nonprofit emerged precisely because no one else - neither government agencies nor profit-driven actors - were addressing this communication gap.

The panelists agreed that being able to identify a gap, map the stakeholders, and seek multidisciplinary solutions is a key public policy skill. Whether it's the collective action problems around natural resources, or the regulatory ambiguity in emerging sectors like digital trade, professionals must learn to navigate complexity. In fact, as Reshu noted, many of today's policy challenges have no clear sectoral ownership - solutions will come from cross-pollination and collaboration.

This portion of the discussion resonated especially with students aspiring to social impact roles. Panelists stressed that public policy entrepreneurship - whether nonprofit or private - is not about heroic transformation, but about solving practical, structural problems. Yash reminded the audience that not all policy work is life-changing - but even incremental improvements can be deeply meaningful when done well.

Future-Proofing Policy Careers: Skills, Strategy, and Sustainability

The final part of the panel focused on how students can prepare for careers that are still being shaped by technological, political, and social change. When asked what they would specialize in if they were starting today, Reshu said she would still choose technology policy, given its wide applicability. Sidharth offered a cautionary note: public policy careers often work in preventive or systemic ways, rather than delivering direct, visible impact. He urged students to seek alignment between their domain interest and their personal values - what he described as finding one's ikigai.

A critical takeaway was that young professionals should prioritize building sustainable careers rather than jumping from one low-paid project to another. Yash advised against getting stuck in short-term, ad hoc policy roles without growth or fair compensation. Instead, he urged students to build a portfolio that demonstrates clarity, relevance, and expertise. "Show that you know the work you want to do," he said, "don't just list it on your résumé."

The session ended with actionable advice from each panelist. Yash encouraged students to be conscious of how their time and skills are valued. Reshu highlighted the importance of spontaneous learning—"strike up conversations," she said, because public policy careers often grow in non-linear, unpredictable ways.

Sidharth emphasized mindset: policy professionals must learn to navigate ambiguity, take initiative, and reflect deeply on the systems they seek to change.

Salient Points

- Public policy careers have expanded beyond government and think tanks to include startups, corporate teams, nonprofits, and independent ventures, as seen in initiatives like Public Policy India and Swasthya Plus Network.
- Policy interventions are essential for addressing governance and market failures, particularly in underserved areas such as health information access for non-English-speaking populations.
- A Master's in Public Policy is most valuable for those seeking government roles, academic research, or a career shift, but should be pursued after gaining practical experience.
- In low-trust environments, professionals must earn credibility through demonstrable work, problem-solving, and leveraging institutional affiliations rather than relying solely on formal degrees.

- Long-term, sustainable policy careers require clarity of purpose and a focus on roles that offer institutional affiliation and consistent engagement, rather than short-term gigs.
- Future policy professionals must combine domain expertise with cross-sectoral skills like stakeholder management, data literacy, and systems thinking to navigate an evolving landscape.
- The panelists advised young professionals to value their time, seek non-linear growth through proactive learning, and align their careers with systems-level impact and purpose.

4.7. Panel 4

18th March, 2025 - 10:00AM to 11:00AM

Bridging Academia and Industry: Crafting Tomorrow's Policy

Moderator: Mr. Sidharth Rath, Founder, Swasthya Plus Network

Panellists: Dr. Parth Shah, Dean and Co-Founder of the Indian School of Public Policy (ISPP), and Mr. Prashant Girbane, Director General of the Mahratta Chamber of Commerce, Industry and Agriculture (MCCIA)

Overview

This panel explored the dynamic relationship between policy, industry, and academia, especially in the context of innovation, growth, and social good. Panelists reflected on how government and business priorities can both align and diverge, and how good policy must strike a balance by fostering fair competition, enabling ecosystems, and accelerating inclusive development. Academia and civil society were described as vital "alchemists" in this process, generating research, evidence, and educational initiatives that shape more responsive and equitable policy. The discussion also emphasized the growing relevance of policy education, especially in the age of AI and rapid transformation, and questioned whether current academic structures align with the needs of industry and society. Panelists debated whether the private sector's policy function is evolving beyond compliance toward proactive engagement and if small businesses are being left behind in policy conversations. The session offered valuable insights into how students and young professionals can navigate diverse careers across policy, academia, and industry. Panelists called for deeper collaboration between academia and industry to foster innovation and highlighted the importance of ensuring every stakeholder, especially youth, has a meaningful role in shaping the policy landscape of the future.

Key Thematic Discussions

Defining Industry and the Industry-Academia Dynamics in Public Policy

The relationship between industry and academia in the policymaking process is complex and layered, as is the definition of industry and academia. Prashant Girbane described "industry"

to have a nebulous meaning due to the vast size of the fields it covers and the geographical differences within and outside of India. However, the conversation focused more towards the relationship between large companies,

MSMEs, research institutions and the government. As Parth Shah and Prashant Girbane outlined, large corporations such as Tata and Bajaj collaborate meaningfully with research institutions like IIT Bombay and IISER Pune. However, these collaborations are often instrumental, as academia is used to legitimize predetermined industrial positions rather than co-create policy. MSMEs, which comprise the bulk of India's economic actors, are largely absent from this dialogue. Prashant Girbane emphasized that MSMEs, burdened with compliance and payment delays, rarely have the bandwidth or representation to engage with academia or influence public policy meaningfully. Global MNCs like Amazon and Netflix, meanwhile, maintain public policy arms that push globally framed agendas without necessarily aligning with India's specific needs. This asymmetric engagement illustrates how industry utilizes academic research selectively, reflecting broader structural disparities.

Inclusion and Representation of MSMEs in Policy Frameworks

Prashant Girbane consistently underscored the urgent need to bring MSMEs into policy conversations. While policies for MSMEs exist, they are often inaccessible due to compliance burdens, delayed payments, and low bureaucratic responsiveness. For instance, Prashant Girbane cited the challenge of 366 licenses required for a factory with 150 employees. MSMEs are disadvantaged not only by administrative red tape but also by a lack of systemic support. The introduction of technologies like RBI's Trade Receivables Discounting System (TReDS) offers promise, yet adoption remains uneven. Parth Shah both pointed to opportunities for academia and public institutions to fill this gap through simple language policy guides, directories, and institutional trust-building platforms. Democratizing policy space for MSMEs is not just a regulatory task; it is about embedding autonomy and ensuring equity in who gets to shape industrial policy.

Public Policy as a Negotiation between Samaaj, Sarkar and Bazaar

Both speakers highlighted the unique role of public policy in harmonizing interests across society (Samaaj), government (Sarkar), and markets (Bazaar). Parth Shah emphasized that policy professionals must develop the skills to balance power differentials, especially in disruptive sectors like AI, electric vehicles, and the gig economy. Prashant Girbane spoke of the 'embedded autonomy' model, wherein policy actors are independent yet deeply networked with stakeholders. This tri-sectoral negotiation is increasingly critical as new industries reshape traditional norms. The License Raj, once a symbol of bureaucratic overreach, benefited select industrialists rather than the entire industry. Today, policies must foster inclusion, flexibility, and innovation while maintaining accountability. Public policy, in this framing, is about enabling long-term cooperation, echoing Harari's argument on human dominance through large-scale collaboration.

Evolving Landscape of Policy Education and the Future

A recurring theme was the positioning of public policy education, particularly the Master of Public Policy (MPP), relative to traditional management programs like MBAs. Parth Shah argued that MPPs offer holistic training to understand and navigate intersecting institutional landscapes, equipping graduates with skills in negotiation, systems thinking, and stakeholder engagement. Prashant Girbane added that public policy is a field that demands both patience and competence, using GST as an example of long-term policy gestation. As India's economy matures, the scope for competent policy professionals is expanding. However, the value proposition of public policy education must be better articulated to align with emerging career paths, especially those involving technology integration, regulatory design, and development governance. In this way, the MPP is positioned not as an alternative to the MBA but as a distinct tool for shaping tomorrow's India.

Salient Points

- **Industry-academia collaborations in India often serve elite corporate interests** rather than fostering co-created, inclusive policy solutions. MSMEs are notably absent from these relationships, despite constituting the bulk of India's economy.
- **MSMEs face systemic exclusion from the policymaking process** due to bureaucratic hurdles, limited representation, and lack of institutional support. Bridging this gap requires simplifying policy language, building trust-based platforms, and ensuring timely redressal mechanisms.
- **Public policy must be viewed as a tri-sectoral negotiation** between Samaaj (society), Sarkar (government), and Bazaar (markets), where power asymmetries are acknowledged and addressed through embedded autonomy and multi stakeholder engagement.
- The current policy ecosystem **disproportionately amplifies the voices of global corporations and legacy industrialists**, sidelining grassroots entrepreneurs and community-led innovations that often lack lobbying power or policy literacy.
- India's evolving policy landscape **demands professionals who are both politically aware and technically competent**. As regulatory challenges intensify across AI, gig work, and sustainability, there is a growing need for adaptive, interdisciplinary policy education.

4.8. Student Paper Presentations (UG)

Theme #1: Technology for Enhancing Governance

"Kya Aapke Democracy Mein Reel Hai?"

Presented by Mr. Aadi Sardesai, Undergraduate Student, FLAME University, Pune.

Ms. Yaana Postwala, Undergraduate Student, FLAME University, Pune.

Ms. Stuti Agarwal, Undergraduate Student, FLAME University, Pune.

This presentation critically analysed the social media behaviours of leading politicians in India in an attempt to understand the political rationale and motivating factors behind the content posted online by politicians in India. Taking a primary approach, this presentation demonstrated that politicians often use social media to push partisan narratives as well as garner political momentum in their regions through the 'vernacularisation' framework.

This presentation was awarded as the **Best Presentation for Theme #1**, and the authors were felicitated by Ms. Shamika Ravi, EAC-PM.

This paper was selected for publication in this issue, please refer to Page 115 for the full paper.

"Implementation of Artificial Intelligence for Judicial Efficacy in India"

Presented by Mr. Siddharth Ramkumar, Undergraduate Student, FLAME University, Pune.

Mr. Anmol Patil, Undergraduate Student, FLAME University, Pune.

Ms. Samyukta Satish, Undergraduate Student, FLAME University, Pune.

This presentation took a novel approach to the ever-growing problem of judicial backlog and efficacy in the Indian judicial system, and weighing the benefits and drawbacks of using AI-based solutions to enhance efficiency. Taking a mixed-methods approach to the question, this presentation critiques existing efforts, notably the Supreme Court Portal for Assistance in Court Efficiency (SUPACE), and argues for curating diverse datasets and the integration of Explainable AI techniques to enhance transparency and.

This paper was selected for publication in this issue, please refer to Page 101 for the full paper.

"The Digital Divide in Indian Agriculture- The Struggles of Small Landholders"

Presented by Ms. Manasvi Ghosh, Undergraduate Student, FLAME University, Pune.

This presentation questioned the structural inequities which cause small landholding farmers to be unable to benefit from the technological initiatives pushed by the government in India. Taking a close look at secondary sources, specifically on empirical research-driven papers and articles, this presentation argued that the lack of inclusivity in technological initiatives targeted towards farmers can be derived from a lack of empathetic implementation, and is a problem faced by most developing states beyond India, taking cases from Philippines, Bangladesh and other developing states.

This paper was selected for publication in this issue, please refer to Page 43 for the full paper.

"Smart Cities in the Era of Climate Change: Leveraging IoT for Resilient Urban Governance"

Presented by Ms. Ridhima Sharma, Undergraduate Student, FLAME University, Pune.

Ms. Radha Ghormade, Undergraduate Student, FLAME University, Pune.

This presentation, through the cases of Chennai and Guwahati, explored the possibility of 'smart city' solutions to urban governance and urban development-driven environmental

crises, and integrating the Internet of Things (IoT) frameworks for resolution. The presentation demonstrated the practical application of IoT-based solutions in Chennai and Guwahati, and presented actionable pathways to integrate generalisable IoT-based solutions into urban governance frameworks.

Theme #2: Policy for Innovation and Sustainability

"Green Public Policies and Corporate Reporting: A Case Study on the Private Sector "

Presented by Mr. Soomrit Chattopadhyay, Senior Research Associate, Center for Sustainable Development, Gokhale Institute of Politics and Economics, Pune.

Mr. Yakabal Shekhamaheboob, Management Trainee, Ernest & Young (E&Y).

Mr. Utkarsh Singh, Research Fellow, Center for Sustainable Development, Gokhale Institute of Politics and Economics, Pune.

This presentation brought light to the carbon credit and green credit policies in India and the propensity for greenwashing they offer through clever accounting and financial maneuvers. The presentation argued that existing measures fail to effectively define 'carbon credits' and the quiet dilutions in environmental protection policies in India does not bode well for environmental sustaianability in the country.

Furthermore, the presentation argued for a complete overhaul of the existing methods of technological reporting through regulatory mechanisms.

This presentation was awarded as the **Best Presentation for Theme #2**, and the authors were felicitated by Ms. Shamika Ravi, EAC-PM.

This paper was selected for publication in this issue, please refer to Page 80 for the full paper.

"Co-Designing Ethical AI for Inclusive Governance: A Framework for Sustainable Transformation"

Presented by Mr. Rahul Kumar, Policy and Development Advisory Group (PDAG).

This presentation took a broader perspective on India's policies and past efforts to integrate AI-based solutions into policy frameworks. The presentation argued for an ethics-first approach to AI-design in the Indian context, and assessed the possibility of using AI-based solutions to target critical social and economic issues in the country, keeping policies in line with the Sustainable Development Goals (SDGs).

"Decentralized Finance in India: Navigating Regulatory Frameworks for Scalable Innovation"

Presented by Mr. Rishi M. Trivedi, Gunfire Holdings Limited.

This presentation dissected the transformative shift caused by the adoption of decentralised finance (DeFi) methods in the financial system of India. By examining the RBI Digital Rupee pilot and the usage of blockchain technology by the Securities and Exchange Board of India

(SEBI), this presentation critically examined the existing field of decentralized finance. The presentation demonstrated three key challenges with the existing measures: ensuring cybersecurity in smart contracts, addressing concerns about anti-money laundering (AML) compliance, and promoting interoperability between traditional and decentralized systems.

Theme #3: Technology for Inclusive Development

"AI & Democracies: How Does Dis/misinformation Play a Role?"

Presented by Mr. Anand Rajagopal, Postgraduate Student, IIT Madras, Chennai.

This presentation scrutinised the role of the rapidly-advancing and readily accessible AI tools and mechanisms in democratic electoral processes. Taking a case study-based approach, this presentation demonstrated that, in the existing cases of misinformation in India, AI has served the dual purpose of generating content and strategies for the misinformation campaigns as well as identifying and countering such campaigns. This presentation further explored the deepening relationship between AI and democracy, and argued for a comprehensive and locally-driven framework for mitigating the adverse effects of AI-based misinformation, grounding the framework in responsible AI principles.

This presentation was awarded as the **Best Presentation for Theme #3**, and the author was felicitated by Mr. Rishikesha Krishnan, Director, IIM Bangalore.

"The Frost Index: Leveraging Bayesian Statistics & Big Data To Vote Better"

Presented by Mr. Dhruva Vorkady, Research Assistant, Azim Premji University, Bangalore.

This presentation took an econometric approach to redefine social choice in electoral contexts by attempting to objectively quantify a politician's alignment with societal well-being. Through the use of the Hierarchical and Bayesian Inferred Trust (HABIT) model, this presentation demonstrated the quantified link between politician behaviour and their motivation to work for societal well-being, accounting for intra sensitivity in human choice mechanisms and variability in intrinsic factors.

"Measuring Digital Financial Inclusion in India: A TOPSIS Methodology Approach"

Presented by Mr. Parth Basankar, Postgraduate Diploma Student, FLAME University, Pune.

This presentation critiqued the existing Financial Inclusion Index (FII), developed through the UNDP system of linear weighted averaging. Through the novel usage of the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methodology, this presentation argues for the creation of a more inclusive and representative development index measuring Digital Financial Inclusion in India.

This paper was selected for publication in this issue, please refer to Page 65 for the full paper.

"Integration of AI in Primary Healthcare Centres of Rural India"

Presented by Mr. Suraj S. Sugandhi, Contributor, India Chronicle.in

Ms. Medha Manoj Panikkasseri, Postgraduate Student, Vellore Institute of Technology, Chennai

This presentation investigated the feasibility of AI-based technological solutions for Primary Healthcare Centres (PHCs) in India, and the transformative potential these solutions would hold. The presentation argued for the creation of a comprehensive and strategic approach to tackling these issues of fit, establishing the need for region-specific, multi-lingual and scalable AI solutions.

This paper was selected for publication in this issue, please refer to Page 54 for the full paper.

DigiNiti Technology Policy Conclave

KEY TAKEAWAYS

5. KEY TAKEAWAYS

This section summarises key insights from the aforementioned panels and keynote addresses, highlighting the urgent need for balanced technology regulations, inclusive governance, data-driven decision-making, and reimagined public policy careers.

Balancing Innovation and Regulation: India needs a balanced AI regulation approach. Early rules stifle innovation; delayed action risks systemic harm. A calibrated approach is essential, fostering innovation while protecting public interest, especially against misinformation and electoral manipulation.

Democratic Deficits in the Regulatory Landscape: Executive power in regulation limits effectiveness, risks capture. Independent, transparent, responsive bodies are vital for accountability and preventing elite overreach.

Youth & Civil Society as Catalysts: Youth engagement shapes a democratic digital future. Inclusive policies empower young innovators; civil society ensures accountability. Transparency, regular reporting build public trust.

Data Governance and Evidence-Based Policymaking: Effective policy relies on accessible, well-formatted data. Poor data presentation, lack of technical training hinder government actors. Decentralized data governance reform and training needed.

Inclusion and Equitable Policy Design: MSMEs are excluded from policy due to barriers. Simplifying language, building trust, creating grievance mechanisms ensure inclusive governance.

Reconstructing the Policy Ecosystem: India's policy discourse must acknowledge power asymmetries (society, state, market). Current ecosystem over-represents corporations, under-represents grassroots actors. Multistakeholder frameworks needed for equitable outcomes.

Reimagining Public Policy Careers and Education: Public policy careers now extend beyond government. Practical experience is key before advanced degrees. Building credibility requires demonstrable contributions, strategic networking, domain expertise.

The Future of Public Policy Practice: Policy professionals need political awareness and technical skills. Interdisciplinary skills (data, regulation, stakeholder management) crucial. Policymakers must be agile, collaborative, navigating AI, labor, sustainability.

DigiNiti Technology Policy Conclave

STUDENT PAPERS

The Digital Divide in Indian Agriculture: Struggles of Small Landholders

5.1

Manasvi Ghosh

Undergraduate Student, FLAME University

ABSTRACT

The State has introduced technological innovations intended to benefit farmers in realizing their deserved profits yet it does not trickle down to the grassroots. This paper hypothesizes how the hurried push of technological advancements with the lack of support by the government marginalizes farmers with small land holdings further. The lack of understanding of the Indian context especially in the addressing of labour influx, informal and generational relationships among farmers and middlemen and skepticism towards technology before the introduction of such policies creates a new barrier along with the pre-existing lack of monetary, land, social mobility and natural resources. It was found that wealthier, larger land holding and higher education holding farmers are benefiting more from technological advancements. Efficiency is not significantly achieved by schemes that aim to democratize data in the absence of an empathetic implementation by the Government. This paper looks at how likely farmers are to adopt technological advancements. Even after robust data which is present from the last census and NSSO (National Sample Survey Office), the government is unable to provide technological advancements that are efficient to all Indian farmers in an inclusive manner. Bringing perspective to agriculturing policy making, this paper aims to synthesize all problems and their solutions given by various academicians that get left scattered in isolation. This will help bridge digital divide in a time where technology is so deeply ingrained in agriculture, it becomes necessary to democratize it. This paper hopes to bring a more inclusive lens to policy making by catering to local needs.

Keywords: Small Landholding, Technology Policy, Information and Communication Technology (ICT), Marginal Farmers, Democratize Data

INTRODUCTION

India is an economy hugely driven by the agrarian sector which is unequally divided as are most sectors but increased technological initiatives are deepening this divide. In 1970, India had about 71 million operational landholdings and 70 percent of them were small and marginal (Agriculture Census). By 2015-16, these numbers increased to about 146 million and 86 percent respectively (Saini & Chowdhury, 2023). The Digital Agriculture division of the

government highlights their Mission as an "aim to establish a comprehensive farmer-centric digital and space-tech ecosystem to enhance transparency and efficiency in the execution of government programs while providing crucial support for evidence-based policy making for farmers' welfare." (India, 2025). Fragmented lands and a wave of technology now has stopped small farmers from reaping the benefits as estimated by the government when introducing schemes and hence are counterproductive.

RESEARCH QUESTION AND OBJECTIVES

This paper brings together individual studies of policy academicians to show that even with the willingness shown by farmers towards acceptance of technology, marginal farmers are unable to benefit entirely due to low education levels, lack of adequate land holdings and awareness. This paper suggests that Governments must form policies that cater to this demographic specifically to see the most productive agrarian sector. Looking at Information and Communication Technology (ICT) and e-Agriculture policies through a systematic review of the literature on specific interventions in Bihar and South Indian states, finding commonalities in failures and successes to understand what policies may be suitable for marginalized farmers. Attempts to digitize agriculture will be understood from the lens of accessibility. Existing literature data will be reviewed through the help of drawing parallels along with generalizations where possible. This paper at the end looks to answer whether development agencies and providers are sufficiently knowledgeable about their target audiences. As a researcher, it is understood that to cater to such a large population is difficult and one size does not fit all. Having said that, it is in such cases even more necessary to cater to the grassroots and organically it shall travel upwards.

What's the Approach?

As mentioned previously, 86 percent farmers are small and marginal. A resource-poor farm family (RPF) is essentially a household that struggles to access the basic agricultural resources it needs like land, water, labor, and capital to secure a decent livelihood (Biggs *et al*., 2004). In India, this often includes families with very small landholdings, typically those with less than 2 hectares. A recent government survey revealed that four out of ten farmers in the country aren't too fond of farming and would jump at the chance to pursue a different career if they could. Even though the government has rolled out several reforms in the agricultural sector, like e-Nam and the Farm Mechanisation Scheme, it seems that the perks of these initiatives have primarily favored the larger farmers (Bhogal, 2023).

The transfer-of-technology (TOT) (Biggs *et al*., 2004) model has had a significant impact on how knowledge is shared across various fields around the globe. This model is based on a centralized view of knowledge creation, highlighting the authority and prestige of scientific and technical "centers" that produce innovations meant for less developed or peripheral areas. In this setup, highly skilled professionals like civil, mechanical, and agricultural engineers, medical scientists, and agronomists create technologies in controlled environments such as labs, workshops, or research stations, expecting that these innovations will be embraced by the end-users.

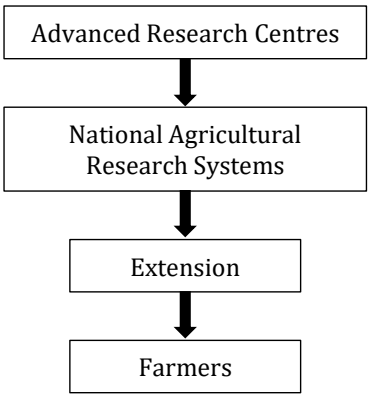


Fig. 1: (Douthwaite *et al*., 2000)

While the TOT model has seen notable success in industrial and agricultural sectors, among resource-rich farmers (RRFs), its effectiveness has been inconsistent. For example, advancements in mechanization, like tractors, threshers, and combine harvesters, along with the development of high-yield crop varieties through scientific breeding, have led to significant boosts in productivity and profitability for RRFs.

However, this same model has faced considerable challenges when it comes to resource-poor farmers (RPFs).

Until recently, the TOT model was the prevailing approach in agricultural research communities worldwide, including in India. In reality, though, applying this model to RPFs often ran into ongoing difficulties. Back in the 1960s, early assumptions, especially those behind large-scale social science studies on the "diffusion of innovations" suggested that the technologies were inherently beneficial and could be applied universally. When RPFs didn't adopt these technologies, the common explanation was that they simply lacked knowledge or awareness. As a result, the proposed solution was to improve extension services, a concept that became ingrained in the structure and goals of Extension Directorates within Indian Agricultural Universities.

What is the Demographic?

The insights gathered from the Agricultural Technology Information Centre (ATIC)—which serves as a one-stop shop for farmers and other stakeholders seeking information, advice, and access to agricultural technologies really shine a light on both the potential and the challenges of current agricultural efforts. While these initiatives are designed to boost farmers' technical know-how and introduce them to new innovations, they often focus more on spreading technology rather than tackling the bigger systemic and structural issues at play. This tech-focused mindset can miss out on crucial elements that greatly influence how well agricultural practices are adopted and sustained, such as land availability, economic feasibility, social infrastructure, and community support systems. Because of this, the overall impact of these interventions tends to be limited. Even though the agricultural technology sector is projected

to reach a market value of around USD 24 billion by 2025, it currently represents less than 1% of that figure. This gap highlights the urgent need for a more comprehensive approach to agricultural development, one that combines technical solutions with necessary structural changes and support systems that are relevant to local communities (Singh *et al.*, 2024).

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S. No.	Age (Years)	frequency	Percentage
1.	Young (Below 24)	49	16.33
2.	Middle Age (24 – 53)	186	62.00
3.	Old Age (Above 53)	65	21.66
Gender			
1.	Male	250	83.3
2.	Female	50	16.7
Caste			
1.	General Caste	169	56.3
2.	Other Backward Caste	70	23.3
3.	Scheduled Caste	21	7.0
4.	Scheduled Tribe Caste	40	13.3
Religion			
1.	Hindu	224	74.7
2.	Muslim	35	11.7
3.	Christian	24	8.0
4.	Sikh	17	5.7
Type of family			
1.	Nuclear Family	233	77.7
2.	Joint Family	67	22.3
Size of family			
1.	Up to 5 members	213	71.0
2.	6-8 members	21	7.0
3.	Above 8 members	66	22.0
Type of house			
1.	Kuchcha House	75	25.0
2.	Mixed House	93	31.0
3.	Pucca House	132	44.0
Material possession			
1.	Low (below 15.1821)	28	9.33
2.	Medium (15.821 – 18.4839)	160	53.33
3.	High (above 18.4839)	112	37.33

Fig 2: Distribution of the ATIC Beneficiary's Profile (Singh *et al.*, 2024)

It seems that ATIC services are mainly being used by people from more privileged socio-economic backgrounds. The fact that most of the support goes to middle-aged, male, upper-caste individuals from nuclear families who often have better housing and material resources indicates that agricultural information isn't reaching those who need it most. Groups like landless farmers, women, younger and older individuals, and marginalized castes are

still largely left out of the picture. This imbalance in outreach points to a pressing need to rethink how we share information. If we don't make a conscious effort to include those who are underrepresented and lack resources, these initiatives might end up deepening existing inequalities instead of helping to solve them. To promote fair agricultural development, it's crucial to broaden access to ATIC resources through inclusive outreach, participatory methods, and focused support for marginalized communities.

Small and marginal farmers often struggle to get the technical advice and modern technology they need to boost their output and productivity in various agricultural activities. In India, public sector extension services are delivered through several methods, including the Training and Visit System and Krishi Vigyan Kendras (KVKs)—there are currently 645 KVKs across the country (Bhogal, 2023). The Agricultural Technology Management Agency was set up specifically for rural districts. Unfortunately, both public and private organizations in India have not been able to provide universal access to these essential services in the agriculture sector, mainly due to a shortage of manpower. For example, back in 2005, only 40 percent of agricultural households in India could access agricultural information from any available sources. When looking at the data by farm size, just 38.2 percent of small farmers had access to information, compared to 53.6 percent of large farmers. Small farmers tended to rely on other progressive farmers (16 percent), input dealers (12.6 percent), radio (12.4 percent), television (7.7 percent), newspapers (six percent), and extension workers (4.8 percent) for information. Extension workers play a crucial role in sharing information, especially with large farmers, as 12.4 percent of them received information through this channel. The significant differences in access to these services have only increased the vulnerability of subsistence farmers.

A study by D. Rengaraj and Dr. N.S. Shibu of Department of Management Studies, Bharathidasan University College, Tamil Nadu shows the realities of why adoption of information and communication technology (ICT), which is claimed to be the pillar of Indian agriculture technology transmission. The study involved a survey of farmers from four southern Indian states Tamil Nadu, Kerala, Karnataka, and Andhra Pradesh with a total of 115 respondents participating.

The results show that while most farmers are familiar with and use traditional information and communication technology (ICT) tools like television, radio, mobile phones, and print media, the uptake of more advanced ICTs such as video players, digital cameras, computers, and internet services remains quite limited in these rural farming communities.

One reason for this trend could be the demographic characteristics of the respondents. Only about a quarter of the farmers surveyed were considered young, and not all had access to higher education. This might lead to lower digital literacy levels and less exposure to modern tech tools.

It's noteworthy that even among those who do have access to traditional ICTs like television and mobile phones, these tools are seldom used to seek out agricultural information. This points to a gap that goes beyond just infrastructure; it also involves awareness and engagement. Farmers might not know about the agricultural content available on these platforms, or they

may not view them as trustworthy or relevant sources of information. These findings highlight the pressing need to raise awareness about the agricultural information services available through various ICT platforms and to enhance outreach and training efforts that are tailored to the specific needs and capabilities of local communities (Rengaraj & Shibu, 2020).

ICT	Ownership		Accessibility		Skills to operate		Usage in gathering agricultural information	
	YES	NO	YES	NO	YES	NO	YES	NO
Television	88	27	115	0	115	0	58	57
Radio	99	16	115	0	115	0	69	46
Mobile Phone	115	0	115	0	115	0	60	55
Newspaper, Magazine, Brochures, Pamphlets etc.	83	32	115	0	85	30	36	79
Video Player/ Video cassette/DVD	33	82	72	43	29	86	15	100
Digital Camera	15	100	35	80	44	71	10	105
Computer	13	102	60	55	13	102	09	106
Internet	50	65	78	37	43	72	30	85

Fig. 3: ICT Adoption Pattern (Ownership, Accessibility, Skills and and Usage in Gathering Agricultural Information (Rengaraj & Shibu, 2020)

Sl No.	Statement	Mean Score	RANK
1.	Insufficient financial resources	3.51	VII
2.	High cost of ICT tools	3.46	IX
3.	Inadequate power supply	3.80	II
4.	Inadequate availability of ICT services to rural farmers	3.59	VI
5.	Poor internet/phone connectivity	3.66	V
6.	Poor support from extension agents and other institutional agriculture service providers	3.36	X
7.	Lack of training on using ICT tools for improving agricultural practices	4.00	I
8.	Lack of formal education among farmers	3.31	XI
9.	Low levels of faith/trust on ICT tools; trust personal knowledge over modern methods	3.47	VIII
10.	ICT tools are complicated to use	3.66	IV
11.	Affiliation of the farmers in less important topics	3.76	III
12.	Social barriers of using the internet	2.67	XII

Fig. 4: Constraints to Adoption of ICT (Rengaraj & Shibu, 2020)

The general sentiment around ICT applications in agriculture is quite positive. However, there's a clear need for farmers to enhance their skills in using these technologies. While many farmers appreciate the potential benefits of ICT in their work, they haven't really seen a significant impact in the field just yet.

Another study that holds true to this result is by Surabhi Mittal & Mamta Mehar in "Socio-economic Factors Affecting Adoption of Modern Information and Communication Technology by Farmers in India: Analysis Using Multivariate Probit Model" (Mittal & Mehar, 2015). Farmers have shared that there isn't just one source that gives them all the information they need. Instead, they turn to various sources for different types of information, or even for similar information. While they do rely on multiple sources, they still place a strong emphasis on connecting with other farmers and having face-to-face conversations. The effective use of information as a resource for agricultural development really hinges on how accessible and adequate those information sources are.

Possible sources of information combination	Frequencies of farmers	% of farmers
Only 'Face-to-Face'	49	4.0
Only 'Other Farmers'	66	5.5
Only 'Traditional media'	0	–
Only 'Modern ICT'	0	–
'Face-to-Face' and 'Other Farmer'	213	17.8
'Face-to-Face' and 'Traditional media'	24	2.0
'Face-to-Face' and 'Modern ICT'	7	0.6
'Other Farmer' and 'Modern ICT'	25	2.1
'Other Farmer' and 'Traditional media'	80	6.7
'Modern ICT' and 'Traditional media'	9	0.8
'Face-to-Face', 'Other Farmer' and Traditional media	336	28.0
'Face-to-Face', 'Other Farmer' and Modern ICT	36	3.0
'Face-to-Face', 'Traditional media' and Modern ICT	13	1.1
'Other Farmer', 'Traditional media' and Modern ICT	81	6.7
All four	260	21.6
None of the four	1	0.1
Total	1200	100

Fig. 5: Proportion of Farmers using, Different Combinations of Information Sources (Mittal & Mehar, 2015)

Note: Four sources of information as categorized for the analysis are–face-to-face interaction, traditional media, modern ICT and other farmers.

System of Rice Intensification (SRI)

The introduction of the System of Rice Intensification (SRI) has shown varying levels of adoption among different socio-economic groups. While this method offers the potential for higher yields and reduced input costs, its reliance on intensive labor and the necessity for careful water and soil management can be tough for poorer farmers who often struggle with limited access to water or family labor. Additionally, in regions like Bihar and Odisha, where land fragmentation and tenancy issues are common, smallholders encounter further challenges, including insecure land tenure and a lack of access to extension services. On the flip side, wealthier farmers, who typically have better access to irrigation and institutional support, are more inclined to adopt and reap the benefits of SRI. This situation highlights the need for integrating institutional reforms—like securing land rights, promoting cooperative farming models, and providing tailored extension services—along with the introduction of new technologies.

Harley convincingly points out a great example that highlights the challenges of spreading agricultural technology—especially when it comes to measuring success can be seen in the System of Rice Intensification (SRI) in Bihar. Even though there are many claims about SRI's success in the state, there's a surprising lack of reliable data on how well it's actually being adopted. Observations from the field suggest that the official adoption numbers might not truly reflect what farmers are doing. It seems that government estimates often use the number of subsidy packages handed out as a stand-in for actual adoption, instead of looking at verified implementation on the ground. Conversations with staff from the agricultural department revealed that this way of measuring success is more about how the extension system and subsidy access work, rather than the real spread of the technology itself. With ongoing issues of corruption and mismanagement in subsidy distribution, it's hard to believe that all the resources meant for farmers actually make it to them. This raises further questions about the reliability of the reported adoption rates. Adding to these concerns, agronomists at Rajendra Agricultural University (RAU) in Bihar have voiced doubts about the government's figures, suggesting that the official adoption rates could be inflated by as much as 75%. This situation highlights a crucial point made by Harley: achieving technological success isn't just about having the latest innovations; it's also about having strong institutions, transparency, and systems that can fairly reach farmers who are struggling. When institutional mechanisms like extension services and subsidy programs don't work well or inclusively, even the best-designed technologies can end up being out of reach for those who need them the most.

Keeping aside these biases, In Bihar, "SRI" refers to the System of Rice Intensification, a cultivation method that aims to maximize rice yields by optimizing resource use. Despite perceptions of SRI's widespread success in Bihar, fueled both by the media and the government, a more detailed analysis of the data from the 11-village survey is less supportive of the government's narrative of SRI as a "pro-poor" technology. The results show that the majority of farmers who had used SRI were wealthier farmers in terms of both landholding and caste. 42% of large lange holders had used SRI at least once. In contrast, out of the 283 households of small land, only 13% had used SRI. In terms of caste, only 8% of SC/ST farmers had used SRI. However, the poorest farmers were more likely to report that SRI was "very beneficial". In contrast, 0% of UC farmers reported that SRI was very beneficial. This shows a clear wastage of governmental resources.

Category	Households Surveyed	% Used SRI
Land Ownership		
>1 hectare (2.5 acres)	55	42%
<1 hectare	283	13%

Caste Category	% Used SRI	% Found SRI "Very Beneficial" (Among Adopters)
UC (Upper Caste)	14%	0%
OBC (Other Backward Class)	24%	52%
SC/ST (Scheduled Castes/Scheduled Tribes)	8%	64%

What About Apps Made by the State?

There is a pressing need to reevaluate existing policies. The success of digital agriculture in India will depend on the technologies being cost-effective, access being simple, maintenance straightforward, and government-driving development. But we see that there is much focus on service delivery, that is, the supply chain and more customer-based apps as opposed to insurance, logistics, and even market linkage that may help farmers. The marketization of agriculture seems to be the priority for the government and related industries. The most concerning is that there are more implementation and monitoring apps for pesticides and governmental projects as opposed to soil health which is of most concern to farmers. This shows clear neglect. The core problem that makes the data less useful and hampers the development of innovative farm management software is the lack of consistency across different platforms and the piecemeal nature of various initiatives. The ongoing ignorance among the general public, coupled with a dearth of relevant research, has complicated our understanding of how digitalization can drive increases in revenue and crop yields. There needs to be a focused, research-driven effort towards establishing a centralized management system. We also need the deployment of technologies that specifically address local challenges, this includes everything from managing irrigation and invasive species, to ensuring soil and water health, enhancing crop resilience to climate change, overseeing post-harvest management, conducting crop quality assessments, creating market connections, ensuring financial security, and resolving land disputes (Balkrishna *et al*., 2023). All these efforts can significantly advance our agricultural goals.

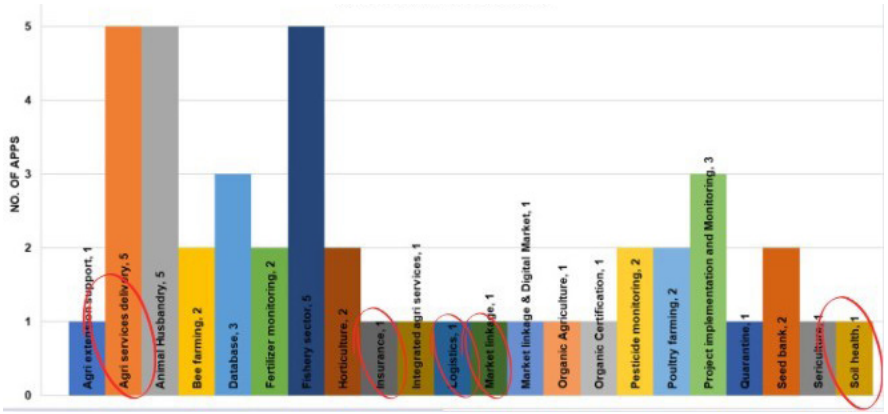

Fig. 6: State of Digital Penetration in Indian Agriculture through the lens of Key Initiatives (Balkrishna *et al*., 2023)

To promote development toward innovative agriculture, India has established one of the largest agricultural research systems in the world: the National Agricultural Research System (NARS). The article "Need of Open Access Repositories for NARS in India" by S. Gutam *et al*. highlights the necessity of Open Access Repositories (OARs) within (NARS). Its research output is not widely accessible due to factors like subscription-based journals and a lack of interoperable digital infrastructure (Gutam *et al*., 2010).

Solutions

Agricultural technologies often end up favoring wealthier farmers, even when policies and innovations are meant to help those who are struggling the most. This gap really shows us that we need a more thoughtful approach to agricultural innovation, one that makes sure the technology aligns with the specific conditions of the area and the systems in place. For the farmers who are the most marginalized and resource-poor, their ability to access and benefit from technology isn't just about whether it's technically suitable; it also hinges on how well it meshes with local socio-economic factors, like land ownership, access to credit, support services, and market opportunities.

To effectively address the needs of the marginalized, reorienting agricultural innovation systems involves more than simply providing technologies that fit the physical specifications but rather providing awareness and handheld support in light of the low literacy rates and stigma towards technology. It necessitates a comprehensive approach that aligns both the physical and institutional aspects of technology with local conditions, ensuring that these innovations truly serve the needs of the most vulnerable populations.

To truly help the poorest communities, we need to rethink how we approach agricultural innovation systems. It's not just about handing out the right tools or inputs; we need to take a more comprehensive approach. This means putting in the work at every stage of the innovation process—from designing and testing to sharing and implementing solutions. We have to blend both the physical resources and the institutional support in a way that tackles the unique challenges faced by rural poor farmers.

If we understand the likelihood of a farmer's choice of source of information then direction can be provided and policies can be developed to provide information through those sources in targeted regions with the most effective impact.

References

1. India, G. (2025, January 22). Digital Agriculture Mission Overview. Department of Agriculture & Farmers Welfare.
2. Saini, S., & Chowdhury, A. (2023, June 13). India's small and marginal farmer: Arcus Policy Research.
3. Harley, A.G. (2018, May). Why does technology fail to benefit the poorest farmers? A sociotechnical approach to the study of innovation and poverty. Digital Access to Scholarship at Harvard.
4. Biggs, S.D., Collinson, M., Hildebrand, P., Rhoades, R.E., Agrawal, B.D., Ashby, J.A., Brammer, H., Byerlee, D., Catling, H.D., Chambers, R., Chapman, G., Dutta, S.K.D., & Gilbert, E.H. (2004, December 16). Agricultural Research for Resource-poor farmers: The farmer-first-and-last model. Agricultural Administration.
5. Bhogal, P. (2023, December 4). Policy imperatives for India's small farmers.
6. Douthwaite, B., Keatinge, J.D.H., & Park, J.R. (2000, June 7). (PDF) why Promising Technologies Fail: The neglected role of user innovation during adoption. Research Policy.
7. Mittal, S., & Mehar, M. (2015). Socio-economic factors affecting adoption of modern information and communication technology by farmers in India: Analysis using multivariate probit model. The Journal of Agricultural Education and Extension, 22(2), 199–212.

8. Rengaraj, D., & Shibu, Dr. N.S. (2020). Use of Information and Communication Technology in Agriculture Among Farmers in the South Region of India. International Journal of Advanced Research in Engineering and Technology (IJARET), 11(11), 2419–2425.
9. Gutam, S., Mishra, A.K., Pandey, P.S., Chandrasekharan, H., & Aneeja , G. (2010). Need of open access repositories for NARS in India. CURRENT SCIENCE, 98(12), 1564–1566.
10. Singh, A., Singh, Dr. H., Tiwari, D., & Saini, P. (2024, September 4). Demographic and economic profiles of Agricultural Technology Information Centre beneficiaries. International Journal of Agriculture Extension and Social Development.
11. Balkrishna, A., Pathak, R., Kumar, S., Arya, V., & Singh, S.K. (2023). A comprehensive analysis of the advances in Indian Digital Agricultural Architecture. Smart Agricultural Technology, 5, 100318.

5.2 Integration of AI in Primary Healthcare Centres of Rural India

[1]Medha Manoj Panikkasseri and [2]Suraj Shailendra

[1]Vellore Institute of Technology, Chennai

2Sugandhi, Contributor, IndiaChronicle.in

ABSTRACT

The Indian healthcare system is one of the largest in the world. It relies heavily on the Primary Health Centre (PHC) to cater to its vast rural population, which constitutes over 65 percent of the country's total. The PHC is fundamental to delivering essential healthcare. services such as immunisations, maternal and child care, and the treatment of common illnesses. Nevertheless, the PHC faces significant challenges with respect to inadequate infrastructure, lack of availability of trained healthcare workers and region-specific, culturally tailored healthcare solutions (Okolo *et al*., 2021). These systemic issues limit the effectiveness of healthcare delivery in rural areas, perpetuating inequities and hampering progress in addressing the healthcare needs of marginalised communities.

Artificial Intelligence (AI) offers transformative potential to overcome these challenges by providing innovative tools to enhance healthcare delivery (Medida *et al*., 2024). AI must be leveraged to provide training programmes for the healthcare workers, in order to empower them with essential digital skills and literacy, equip them for the integration of advanced technologies into their flow of work. These training programmes can address skill gaps, enable real-time decision-making, and support the adoption of AI-powered tools in diagnostic and therapeutic processes. Through activities for building the capacity of the workforce, investing digital infrastructure is critical for the successful deployment of AI tools.

Reliable internet connectivity, uninterrupted power supply, and access to necessary devices are foundational to ensuring that the PHC can effectively utilise AI technologies. Without these infrastructural upgrades, the potential benefits of AI integration remain inaccessible to rural healthcare systems.

Another key consideration is the development of region-specific AI tools designed to cater to the cultural, linguistic, and socioeconomic diversity of rural populations. Many existing AI solutions fail to account for these unique needs, resulting in low adoption rates and limited impact. Culturally sensitive tools, such as those that offer multilingual support or address specific local healthcare challenges, can significantly improve the usability and acceptance of AI solutions among rural communities (Shinners *et al*., 2023). A comprehensive and strategic approach should be developed to address and overcome the potential challenges that arise. We

propose an approach that focuses on workforce capacity. building, infrastructure development, and region-specific AI solutions. The approach thus developed should transform the PHC into an efficient and impactful healthcare hub for the village, capable of delivering equitable and accessible care to rural populations. Further discussions and studies must be performed to understand the practical challenges of integrating AI into the PHC, especially in the post-implementation phase, and propose an actionable solution for overcoming systemic barriers. By focusing on sustainable and scalable strategies, the roadmap thus developed for leveraging AI should strengthen the PHC and reduce the healthcare disparities in rural India.

Keywords: Artificial intelligence (AI), primary health centres (PHC), stakeholder mapping and engagement, rural healthcare.

INTRODUCTION

Primary Health Centres (PHCs) serve as the foundational interface between rural communities and India's healthcare system, offering essential curative, preventive, and promotive services. As of March 31, 2022, there were 24,935 PHCs operating in rural areas, with notable expansions in states such as Jammu & Kashmir, Karnataka, Rajasthan, Gujarat, and Assam. Despite 91.1% of these centres functioning within government buildings, significant challenges persist, particularly the shortage of medical professionals.

There is a 3.1% shortfall of allopathic doctors at PHCs, especially in Odisha, Chhattisgarh, and Karnataka, and a 3.5% shortfall in female health workers (HW-F)/Auxiliary Nurse Midwives (ANMs) in states like Uttar Pradesh, Himachal Pradesh, and Gujarat.

Rural India faces multifaceted healthcare challenges that hinder effective medical service delivery. The doctor-to-population ratio stands at approximately 1:1,511, falling short of the World Health Organisation's recommended 1:1,000 ratio, with rural areas experiencing more pronounced shortages. Additionally, PHCs often lack essential diagnostic tools, leading to delays in disease detection and treatment initiation. Limited digital connectivity further impedes the adoption of telemedicine and other digital health solutions, while overburdened healthcare facilities result in extended wait times and compromised quality of care.

Artificial Intelligence (AI) presents a transformative opportunity to address these issues by enhancing accessibility, optimising resource allocation, and improving healthcare delivery. AI-powered tools can assist in interpreting medical images and laboratory results, reducing reliance on scarce specialist doctors. AI-driven chatbots and virtual assistants can provide preliminary medical advice and facilitate remote consultations, extending healthcare access to remote areas. Machine learning algorithms can analyse epidemiological data to forecast potential disease outbreaks, allowing for proactive public health interventions. Furthermore, AI can aid in managing hospital resources, such as staff scheduling and inventory management, enhancing operational efficiency.

However, implementing AI in rural healthcare is fraught with challenges, including ethical concerns related to data privacy, potential biases in AI algorithms, issues of accountability, and infrastructural limitations such as inconsistent electricity supply and internet connectivity. Unreliable internet and electricity supply in many rural areas are essential for operating AI systems and telemedicine platforms. The financial burden associated with procuring

and maintaining AI technologies can be prohibitive for underfunded rural health centres. Additionally, AI models trained on data unrepresentative of rural populations may yield biased results, compromising diagnostic accuracy and patient trust. Ensuring the confidentiality and security of patient data is critical, particularly in regions with limited regulatory oversight. The absence of comprehensive regulations governing AI applications in healthcare complicates the establishment of accountability and quality standards.

The successful integration of AI into rural healthcare is contingent upon the proficiency and acceptance of healthcare workers. Many rural healthcare providers possess limited experience with digital technologies, making the adoption of AI tools challenging. Comprehensive training programmes are essential to build confidence and competence in using AI-driven systems. There may also be scepticism or apprehension among healthcare workers regarding the reliability of AI tools. Demonstrating the efficacy and benefits of AI through pilot programmes and success stories can help mitigate resistance.

This study aims to explore the major gaps in rural healthcare, map key stakeholders, and present an implementation framework for AI-driven solutions in PHCs across India. By integrating AI into rural healthcare, the study seeks to strengthen primary care, improve efficiency, and ensure better health outcomes for underserved communities. Through a comprehensive analysis of existing challenges and potential AI applications, the research intends to provide strategic recommendations for policymakers, healthcare providers, and technology developers to facilitate the sustainable integration of AI into rural healthcare systems.

LITERATURE REVIEW

The integration of Artificial Intelligence (AI) in rural healthcare has gained increasing attention due to its potential to bridge the gap in medical services between urban and rural areas. The literature extensively explores AI-driven applications such as predictive analytics, telemedicine, and automated diagnostics, which can address key healthcare challenges in resource-limited settings. Various studies have emphasised AI's ability to enhance disease prediction, assist in medical imaging interpretation, and streamline patient data management, thereby improving overall healthcare accessibility and quality (Smith *et al*., 2020; Brown & Lee, 2021).

Several studies have highlighted the role of AI-powered diagnostic tools in early disease detection. Machine learning algorithms have been successfully deployed for detecting tuberculosis, pneumonia, and skin diseases with accuracy comparable to human experts (Jones *et al*., 2019; Patel *et al*., 2022). These AI models utilise deep learning techniques applied to radiographic images and dermatological scans to identify anomalies efficiently. Furthermore, AI-driven chatbots and virtual assistants are being developed to provide preliminary consultations and recommend healthcare measures, reducing the burden on rural healthcare workers (Garcia & Thompson, 2021).

The impact of AI on telemedicine services is another widely researched domain. Telehealth platforms powered by AI enable remote diagnosis and patient monitoring, which is particularly beneficial in rural areas where access to specialised medical professionals is limited (Williams

et al., 2020; Zhang *et al*., 2021). Studies indicate that AI-enhanced telemedicine services improve patient engagement, adherence to treatment plans, and overall healthcare outcomes. AI-integrated wearable devices also facilitate real-time health monitoring, allowing for proactive interventions in chronic disease management (Kumar & Singh, 2023).

AI's contributions to predictive analytics in rural healthcare have been profound. Research demonstrates that AI models analysing electronic health records (EHRs) and population health data can predict disease outbreaks, identify high-risk patients, and optimise resource allocation (Chen *et al*., 2022; White & Harris, 2023). Such predictive capabilities are crucial for mitigating the impact of communicable diseases and ensuring efficient distribution of medical supplies in underserved regions.

Despite these advancements, the literature acknowledges several challenges associated with AI deployment in rural healthcare. Key concerns include data privacy, ethical considerations, and the need for high-quality annotated datasets to train AI models effectively (Anderson *et al*., 2020; Miller & Roberts, 2021). Studies have also pointed out that AI-driven systems must be interpretable and explainable to gain trust among healthcare professionals and patients (Davis *et al*., 2022). Additionally, the digital divide and lack of infrastructure in rural areas present significant barriers to AI adoption, necessitating policy interventions and collaborative efforts to enhance AI literacy and accessibility (Nguyen *et al*., 2023).

In conclusion, the literature underscores the transformative potential of artificial intelligence in rural healthcare, particularly in improving diagnostic accuracy, expanding telemedicine services, and enhancing predictive analytics. Nevertheless, for AI solutions to be successfully implemented and scaled, addressing challenges related to ethical considerations, data security, and infrastructure development remains imperative (Clark *et al*., 2023). Future research should focus on developing AI models tailored to the unique needs of rural populations, ensuring equitable healthcare access for all.

Table 1

S. No.	Citation	Purpose of the Research	Summary	Implication
1	Lamem, M.F.H., Sahid, M.I., & Ahmed, A. (2025). Artificial Intelligence for Access to Primary Healthcare in Rural Settings. Journal of Medicine, Surgery, and Public Health, 5, 100173.	To explore the potential of AI in improving access to primary healthcare in rural settings, addressing systemic challenges such as infrastructure inadequacies, professional shortages, and preventive care gaps.	AI technologies hold immense potential to improve rural healthcare through better diagnostic accuracy, early detection, and resource management. However, challenges like data security, ethical concerns, and infrastructural barriers persist.	Encourages the development of AI-powered tools like mHealth and IoT technologies for remote monitoring and diagnostics in rural settings. Suggests extensive training of healthcare professionals to integrate AI.

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2	Kerketta, A., & Balasundaram, S. (2024). Leveraging AI Tools to Bridge the Healthcare Gap in Rural Areas in India. MedRxiv. https://doi.org/10.1101/2024.07.30.24311228	To explore how AI tools can address the healthcare gap in rural India by improving access, efficiency, and outcomes in underserved regions.	AI can significantly enhance healthcare delivery in rural India through applications like telemedicine, diagnostic tools, and patient monitoring. However, challenges like data privacy, infrastructure, and ethical concerns remain.	Encourages investment in digital infrastructure, collaborative efforts among stakeholders, and capacity-building initiatives for local healthcare workers.
3	Guo, J., & Li, B. (2018). The Application of Medical Artificial Intelligence Technology in Rural Areas of Developing Countries. Health Equity, 2(1), 174–181. DOI:10.1089/heq.2018.0037	To examine how medical AI technologies can address health care inequities in rural areas of developing countries by improving access, quality, and efficiency.	Medical AI can enhance rural healthcare through applications like diagnostics, decision support systems, and low-cost diagnostic tools. Proposed a multilevel medical AI service network to systematically address challenges.	Promotes the development of multilevel AI systems with a focus on affordability, infrastructure support, and ongoing training. Highlights the role of governments, organizations, and technology companies in scaling solutions.
4	Bhatt, A. (2024). Development of AI-Driven Healthcare Systems in Rural India. Asian Journal of Computing and Engineering Technology, 5(1), 21-30. DOI	To analyze the development of AI-driven healthcare systems in rural India, addressing traditional barriers like limited access to facilities and professionals.	AI systems like telemedicine, predictive analytics, and diagnostic tools improve access, accuracy, and treatment planning in rural healthcare. Challenges include infrastructure gaps and the need for culturally adapted AI solutions.	Advocates for comprehensive training for healthcare providers, investment in digital infrastructure, and culturally sensitive AI tools tailored to rural needs.
5	Rao, B.V.A.N.S.S., Kumar, K.S., & Sundeep, P. (2020). AI based E-Healthcare in Rural Areas. International Journal of Innovative Technology and Exploring Engineering, 9(3), 3098-3101. DOI: 10.35940/ijitee.C8946.019320.	The research aims to enhance healthcare services for individuals in rural areas who lack access to adequate medical facilities, utilizing Artificial Intelligence (AI) and Big Data technologies to improve healthcare delivery and decision-making processes.	The findings suggest that integrating AI and Big Data into rural healthcare can significantly improve service delivery, patient outcomes, and operational efficiency by enabling better data management and decision-making capabilities	The research implies that stakeholders in the healthcare sector should invest in AI technologies to bridge the gap in healthcare services for rural populations, potentially leading to improved health outcomes and reduced inequalities.

(...Contd. Table 1)

6	Pahune, S.A. (2024). How does AI help in rural development in the Healthcare Domain: A Short Survey. Preprint. DOI: 10.13140/ RG.2.2.16675.63525.	The research explores how Artificial Intelligence (AI) can transform healthcare delivery in rural areas by addressing challenges such as scarcity of healthcare resources, lack of professionals, and inadequate infrastructure.	The survey concludes that AI can significantly improve healthcare outcomes in rural areas through accurate diagnosis, enhanced access to services, remote patient monitoring, and informed decision-making for healthcare providers. However, challenges such as privacy risks, data quality issues, and regulatory barriers need to be addressed.	The findings suggest a need for comprehensive strategies that include training for healthcare providers, investment in digital infrastructure, and the development of culturally sensitive AI tools tailored for rural communities.
7	Devi, V.S., Ranjani, D., Komathi, M., Thulasi, P., & Shanmugam, S. (2024). AI-Based Virtual Clinic For Rural India. International Journal of Advanced Research in Computer and Communication Engineering, 13(4), 1232-1236.	The research introduces an AI-assisted telemedicine robotic kiosk aimed at improving healthcare delivery in rural India by addressing challenges such as remote locations, limited medical professionals, and inadequate infrastructure.	The implementation of AI-based virtual clinics has shown promising outcomes in enhancing healthcare accessibility and quality for rural populations. The project demonstrated high patient satisfaction due to reduced travel times, accurate diagnoses through AI algorithms, and streamlined medication delivery processes	The findings advocate for continued investment in technology and infrastructure to support AI-driven healthcare solutions in rural areas, emphasizing the importance of stakeholder engagement and ethical considerations in deployment
8	Guo, J., & Li, B. (2018). The Application of Medical Artificial Intelligence Technology in Rural Areas of Developing Countries. Health Equity, 2(1), 174–181.	To examine how medical AI technologies can address health care inequities in rural areas of developing countries by improving access, quality, and efficiency.	Medical AI can enhance rural healthcare through applications like diagnostics, decision support systems, and low-cost diagnostic tools. Proposed a multilevel medical AI service network to systematically address challenges.	Promotes the development of multilevel AI systems with a focus on affordability, infrastructure support, and ongoing training. Highlights the role of governments, organizations, and technology companies in scaling solutions.

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9	Nwankwo, E.I., Emeihe, E.V., Ajegbile, M.D., Olaboye, J.A., & Maha, C.C. (2024). Integrating Telemedicine and AI to Improve Healthcare Access in Rural Settings. International Journal of Life Science Research Archive, 7(1), 59–77.	To explore how telemedicine and AI integration can address healthcare disparities in rural areas by improving access, diagnostics, and treatment.	Telemedicine and AI integration significantly improves healthcare access, diagnostic accuracy, and treatment personalization in rural areas.	These technologies hold transformative potential for equitable healthcare delivery, but require infrastructure investment, training, and data security measures.
10	Chettri, S.K., Deka, R.D., & Saikia, M.J. (2025). Bridging the Gap in the Adoption of Trustworthy AI in Indian Healthcare: Challenges and Opportunities. AI, 6(1), 10.	To review the current state of AI development in Indian healthcare, assess its adherence to ethical and legal standards, and explore challenges and opportunities in adopting trustworthy AI.	Trustworthy AI can significantly improve healthcare outcomes in India, but challenges like data privacy, infrastructure gaps, and regulatory inconsistencies persist.	Highlights the need for robust regulatory frameworks, patient data privacy measures, and public awareness initiatives to ensure responsible AI adoption.
11	Pahune, S.A. (2024). A Brief Overview of How AI Enables Healthcare Sector Rural Development. Preprint.	To explore the role of AI in improving healthcare delivery in rural areas and identify challenges and ethical concerns in its deployment.	AI can improve healthcare delivery in rural areas through enhanced diagnosis, remote patient monitoring, telemedicine, and AI-powered education tools.	Suggests integrating AI for rural healthcare improvements, addressing gaps in access, affordability, and literacy, while ensuring privacy and ethical compliance.
12	Shah, D., Yadav, V., Singh, U. P., Sinha, A., Dumka, N., Banerjee, R., Shah, R., Unni, J., & Manneni, V.R. (2024). Prevalence of Non-Communicable Chronic Diseases in Rural India Amongst Peri- and Post-Menopausal Women: Can Artificial Intelligence Help in Early Identification? Maturitas, 186, 108029.	To assess the prevalence of non-communicable diseases (NCDs) in peri- and post-menopausal women in rural India and explore how AI can aid in early identification and diagnosis.	AI-based tools can improve early detection of NCDs by clustering symptoms for targeted screening, enabling timely referral and treatment.	Promotes integration of AI into rural healthcare for efficient screening and management of NCDs, highlighting the role of community health workers like ASHAs.

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13	Abisha, D., Thanusiya, M., Mahalakshmi, M., Punitha Sahaya Sherin, A., Pritiga, T., & Navedha Evanjalin, R. (2024). Revolutionizing Rural Healthcare in India: AI-Powered Chatbots for Affordable Symptom Analysis and Medical Guidance. Proceedings of the 7th International Conference on Inventive Computation Technologies (ICICT 2024).	To explore how AI-powered chatbots can improve access to healthcare in rural India through affordable and accurate symptom analysis and medical guidance.	AI-powered chatbots significantly enhance healthcare access by providing accurate, low-cost, and efficient symptom analysis and medical guidance.	AI-based chatbots are a viable solution for bridging healthcare gaps in rural areas by offering affordable and accessible medical assistance, especially for initial diagnosis and guidance.
14	Medida, J., Tandu, R., Tangudu, N., Kumar, K.P., Goud, B.P., & Padma, T.N.S. (2024). AI-Assisted Telemedicine Kiosk for Rural India. Proceedings of the International Conference on Computational Intelligence for Green and Sustainable Technologies (ICCIGST 2024).	To develop and assess the effectiveness of AI-assisted telemedicine kiosks in addressing healthcare disparities in rural India.	AI-assisted telemedicine kiosks significantly improve access to healthcare services in rural areas by enabling remote consultations, symptom analysis, and timely interventions.	Highlights the potential of AI in revolutionizing rural healthcare, promoting timely diagnosis and reducing travel burdens for patients. Calls for collaboration among technology providers, healthcare practitioners, and policymakers.

METHODOLOGY

This study employs a systematic literature review as the primary methodology to examine the integration of Artificial Intelligence (AI) in rural Indian healthcare. The research is guided by a central question: *"How can Artificial Intelligence enhance healthcare delivery in rural India, and what are the key challenges and opportunities in its implementation?"* To address this, an extensive search was conducted across academic databases, including PubMed for biomedical and public health literature, IEEE Xplore for technical perspectives on AI, and Google Scholar for interdisciplinary peer-reviewed articles, conference papers, and grey literature. The search strategy utilised carefully selected keywords such as *"Artificial Intelligence in rural healthcare", "AI applications in Indian healthcare",* and *"Machine learning for rural medical diagnosis",* refined with Boolean operators to ensure comprehensive coverage. Additionally, backward and forward citation tracking (snowballing) was employed to identify further relevant sources.

The selection process prioritised studies directly related to AI in rural healthcare, particularly in India or comparable low-resource settings, while excluding opinion pieces or research focused solely on urban applications. Each source underwent a critical appraisal to assess credibility, relevance, and methodological rigour, with an emphasis on peer-reviewed journal articles, reputable conference proceedings, and authoritative institutional reports. The literature was then analysed thematically, revealing key insights into AI applications such as diagnostic tools, predictive analytics for disease surveillance, and personalised treatment recommendations. Challenges such as infrastructural limitations, data privacy concerns, and healthcare worker training were identified, alongside opportunities for scaling AI solutions through public-private partnerships and cost-effective models.

The synthesis highlighted significant gaps in the literature, including a lack of long-term sustainability studies, limited research on patient trust and cultural acceptability, and the need for robust policy frameworks to guide ethical AI deployment. By systematically organising and evaluating existing knowledge, this review provides a comprehensive foundation for understanding AI's potential in rural Indian healthcare while identifying critical areas for future research and policy intervention. The methodological rigour ensures an unbiased, evidence-based analysis that supports actionable recommendations for improving healthcare outcomes in underserved regions.

FINDINGS AND RESULTS

The cases of implementation proposed demonstrate the wide range of applications through which artificial intelligence could be implemented in improving the standards of healthcare in rural India through the PHCs. Nevertheless, major gaps exist in the research. The PHCs largely do not possess the necessary equipment to perform the diagnostics for the patients. This is due to the absence of systems required to operate the mentioned platforms for diagnosis. The shortage of healthcare personnel, doctors and paramedical staff alike has complicated the implementation process of smart systems. Highly curated or personalised solutions are essential for maximising the usage of AI in rural healthcare. With the issue of limited internet connectivity still persistent in parts of rural India, the obstacle continues to exist.

DISCUSSION

The gaps identified in the proposition could be addressed by identifying the stakeholders and mapping them. Based on the roles, responsibilities and the impact thus caused, stakeholders for the proposition have been identified and mapped. The bodies of governance at the central, state and local levels have a very high level of impact due to their involvement in the formulation of the technological policies and the oversight of implementation. The central government, through its think tanks and authorities, proposes the policies and schemes for the digitalisation of healthcare policies. The department(s) of the state government for public health and welfare serve as the nodal agencies for the centrally proposed or implemented schemes. The rural governance bodies are responsible for ensuring the reach of the scheme. Being the frontline workers, the staff of the primary health centres as well as the rural populace to whom the services are administered have a high impact. By developing smart solutions, The

technological firms and entrepreneurs focused on the domain of AI play an important role by developing tailored solutions.

The non-profit and non-governmental organisations play a medium role by conducting awareness and outreach campaigns. The researchers and academics have a similar impact because they play a secondary role in assisting the techpreneurs and firms in developing the smart solutions. Providers of services such as internet, insurance, and pharmaceuticals, as well as the manufacturers of the equipment, play a medium role as well. The media houses play a lesser role, as their part is limited to displaying campaigns and influencing public opinion. The activities carried out under corporate social responsibility have less impact due to the reliance of the corporate firms or philanthropists on the governmental and non-governmental agencies for the implementation of projects.

CONCLUSION

Given the higher impact played by both government and the techpreneurs, a public-private partnership would help address the deficiencies prevailing in the health centres, with additional assistance provided from the philanthropists. A dedicated team must be established at the zonal or district level to train the staff as well as provide the technical support to the PHCs existing under the jurisdictions. The frontline workers must be trained on the operation of the platforms. The mass media and the nonprofit organisations must be involved in spreading awareness as well as ensuring accessibility. The regulatory authorities of the government must oversee the process in order to prevent potential irregularities.

References

1. Lamem, M.F.H., Sahid, M.I., & Ahmed, A. (2025). Artificial intelligence for access to primary healthcare in rural settings. *Journal of Medicine, Surgery, and Public Health*, 5, 100173.
2. Kerketta, A., & Balasundaram, S. (2024). Leveraging AI tools to bridge the healthcare gap in rural areas in India. *MedRxiv*.
3. Guo, J., & Li, B. (2018). The application of medical artificial intelligence technology in rural areas of developing countries. *Health Equity*, 2(1), 174–181.
4. Bhatt, A. (2024). Development of AI-driven healthcare systems in rural India. *Asian Journal of Computing and Engineering Technology*, 5(1), 21–30.
5. Rao, B.V.A.N.S.S., Kumar, K.S., & Sundeep, P. (2020). AI-based e-healthcare in rural areas. *International Journal of Innovative Technology and Exploring Engineering*, 9(3), 3098–3101.
6. Pahune, S.A. (2024). How does AI help in rural development in the healthcare domain: A short survey. *Preprint*.
7. Devi, V.S., Ranjani, D., Komathi, M., Thulasi, P., & Shanmugam, S. (2024). AI-based virtual clinic for rural India. *International Journal of Advanced Research in Computer and Communication Engineering*, 13(4), 1232–1236.
8. Nwankwo, E.I., Emeihe, E.V., Ajegbile, M.D., Olaboye, J.A., & Maha, C.C. (2024). Integrating telemedicine and AI to improve healthcare access in rural settings. *International Journal of Life Science Research Archive*, 7(1), 59–77.
9. Chettri, S.K., Deka, R.D., & Saikia, M.J. (2025). Bridging the gap in the adoption of trustworthy AI in Indian healthcare: Challenges and opportunities. *AI*, 6(1), 10.

10. Shah, D., Yadav, V., Singh, U.P., Sinha, A., Dumka, N., Banerjee, R., Shah, R., Unni, J., & Manneni, V. R. (2024). Prevalence of non-communicable chronic diseases in rural India amongst peri- and post-menopausal women: Can artificial intelligence help in early identification? *Maturitas*, 186, 108029.
11. Abisha, D., Thanusiya, M., Mahalakshmi, M., Punitha Sahaya Sherin, A., Pritiga, T., & Navedha Evanjalin, R. (2024). Revolutionizing rural healthcare in India: AI-powered chatbots for affordable symptom analysis and medical guidance. In *Proceedings of the 7th International Conference on Inventive Computation Technologies (ICICT 2024)*.
12. Medida, J., Tandu, R., Tangudu, N., Kumar, K.P., Goud, B.P., & Padma, T.N.S. (2024). AI-assisted telemedicine kiosk for rural India. In *Proceedings of the International Conference on Computational Intelligence for Green and Sustainable Technologies (ICCIGST 2024)*.

5.3 Measuring Digital Financial Inclusion in India: A TOPSIS Methodology Approach

Parth Basankar

Post Graduate Diploma Student, FLAME University

ABSTRACT

Digital Financial Inclusion (DFI) has recently become a point of focus with regards to financial policy. Efficacious DFI-relevant policy would be crucial to realise the range of socioeconomic benefits and second-order positive transformations it offers. However, the aetiology of policy is based on the comprehensive measure and analysis of the phenomenon itself. Accordingly, this study develops an Index of Digital Financial Inclusion using the Technique for Order Preference with Similarity to Ideal Solution (TOPSIS) from the family of Multi-Criteria Decision Making (MCDM) methods. Beyond the theoretical justification of the index construction methodology, this study also proves, through the NAMPUS axioms, that such an index surpasses indices created through the Linear Averaging system by the UNDP. Finally, the index is used to understand the condition of Digital Financial Inclusion in Indian states across a five year time period (2018–2022), evincing patterns and trends useful for understanding how appropriate policy and future research can be designed.

Keywords: Digital financial inclusion, TOPSIS, index construction methodology, Index of Digital Financial Inclusion, NAMPUS axioms

INTRODUCTION

Developing an Index of Digital Financial Inclusion

Digital Financial Inclusion (DFI) can be understood as the use of and the access to formal digital financial systems and services to all strata of the economy or society. Enhanced DFI conditions usually bring with it a range of socioeconomic benefits, especially in the form of diminished poverty rates, better social inclusion and overall economic empowerment along with a host of pecuniary advantages (Ozili, 2020).

The Indian government, recognising these advantages, has applied several important policies and programs, namely the Pradhan Mantri Jan Dhan Yojana (PMJDY) in 2014, the Digital India Initiative (2015) and the overall push to enhance digital literacy in the country. In addition to this is the expeditious expansion of the country's digital payments infrastructure, spearheaded

by the National Payments Corporation of India (NPCI). However, despite such measures, while general inclusivity may have been enhanced, digital financial inclusivity still remains a phenomenon focused on urban clusters (33).

An analysis of Digital Financial Inclusion (DFI) possesses a vector-like focus – it provides an understanding of the direction as well as the magnitude regarding both the influencing determinants of DFI and the phenomenon's own impact on an economy's socioeconomic conditions. Therefore, such an analysis can be split into comprehensive classifications of the priors and the posteriors of the phenomenon. It is also for this reason that any policy pertaining to DFI, or financial inclusivity in general, shall first have to accurately analyse it in the context of the economy of its application.

Bearing in mind such an importance of accurately measuring and analysing Digital Financial Inclusion prior to constructing accurate policy, this study aims to develop an independent Index of Digital Financial Inclusion (IDFI). The importance of this study lies in its use of a unique measurement process for the constructing such an index. By making use of such processes, this study also aims to overcome the issues faced by other development-related indices constructed through the pre-existing Linear Averaging methodology popularised by the United Nations Development Program (UNDP).

To develop such an index, the study focuses on a state-level granularity, comparing digital financial inclusion levels across different states in a 5 year time period. To create a multidimensional measure of DFI, the study utilises the variables of Number of Banks Live on UPI, Volume of Digital Payments (per capita), and the Value of Digital Payments (as a percentage of GSDP) as the dimensions of the index.

By understanding the gaps in the literature, the study shall be able to justify the index construction process as well as the dimensions used for the same. The rest of the study is structured as follows. Section 2 reviews the state and issues of Digital Financial Inclusion research currently while providing the theoretical justification as well as the mathematical formulation for the Index of Digital Financial Inclusion. Section 3 proceeds to use the NAMPUS axioms to prove the improvement of this study's method over the UNDP system. The conditions and patterns of Digital Financial Inclusion in India are outlined in Section 4. Finally, the overarching conclusion as well as the limitations along with directions for future research are formulated in Sections 5 and 6 respectively.

DEVELOPING AN INDEX OF DIGITAL FINANCIAL INCLUSION

Past literature on financial inclusion has often attempted to use existent data directly, or develop an index through it, under potential explanatory factors influencing it. A closer look at the range of studies also elicits certain gaps in academia. It is these very gaps that the following study attempts to target.

A particular issue observed is the lack of operational definitions in the understanding of financial inclusion. As Klindt et. al. (1972) aptly states, a lack of consensus regarding the meaning of a term of focus might lead to distortions regarding the implications gleaned from any particular analysis of the term itself. Moreover, an ambiguity in the definition of Digital

Financial Inclusion also translates to an ambiguity in the measurement of the variable during empirical analysis, leading to nugatory results. Fungáčová and Weill (2015), in their study of Financial Inclusion in China, only assume the phenomenon to imply the possession of a formal account. Similar processes are observed in the study by Kunt and Klapper (2013), which employ the popular "banked population" approach to define financial inclusivity. Such a univariable approach to defining (digital) financial inclusion ignores the characteristic of DFI to be a multidimensional phenomenon (Kaligis *et al*., 2018; Mose & Thomi, 2021).

The focus of digital financial inclusion has often transcended borders. That such an approach certainly brings a larger base of data along with a certain each in the measurement of country-level factors cannot be denied. However, with such an approach also comes the ignorance of intra-regional variations, the capture of which is essential for the construction of effective policy measures (Le *et al*., 2019; Cicchiello *et al*., 2021). Sarma, in her 2008 study on measuring financial inclusion, clearly outlines the stark variations in conditions between countries in individual variables. The ignorance of this variation will certainly hamper the quality of policies produced through such analyses. Thus, this study attempts to establish a state-wise analysis in its focus, capturing crucial inter-state variations.

Finally, a large number of studies prefer reliance on the Global Findex Database by the World Bank (Soumaré *et al*., 2016; Datta & Singh, 2019). Not only is the information for such a database derived through survey methodology, the lack of continuity in data presents an issue through the violation of the inherent assumptions of panel-data regression methods (World Bank, 2021). These characteristics evince limitations in the degree to which the results and implications of such studies can be extended to the larger population.

Theoretical Underpinnings of Digital Financial Inclusion

Across several years of literature, a variety of definitions and understandings of Financial Inclusion have been developed. One of the first studies to focus on the phenomenon, Leyshon and Thrift (1995) defined financial *exclusion* as "those processes that serve to prevent certain social groups and individuals from gaining access to the formal financial system". It is important to note the focus on *formal* systems and services. Similarly, Sinclair (2001) states financial exclusion to be the inability of an individual to access the necessary financial systems and services in an appropriate form. Such exclusion can exist through extrinsic factors such as a lack of access or availability of these mechanisms (Kumar, 2011). However, such exclusion can also be intrinsic in nature, resulting through internal biases against existent systems, potentially with a preference for informal systems (Thomas, 1992).

India, too, has developed its definition of financial inclusion through the setup of the Committee on Financial Inclusion (CFI). Its report defines financial inclusion as ""*as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups such as the weaker sections and low income groups at an affordable cost*" (Rangarajan Committee, 2008). In a parallel stream, the 2013 G20 Meet defined it as "a state in which all people who can use them have access to a suite of quality services, provided at affordable prices, in a convenient manner and with dignity to the clients".

Thus, the analysis of such definitions elicits a focus on financial exclusion as a subset of a larger social exclusion, usually of lower rungs of the social or economic ladder. Moreover, given the need to observe this as a multidimensional phenomenon, this study defines Digital Financial Inclusion as "the degree of penetrative-ness, availability and utilisation of digital financial systems and services that is possible by all strata of the economy". Such a definition is particularly useful in outlining the dimensions of penetration, availability and usability of financial mechanisms necessary for the index construction process.

Dimensions of the Index for Digital Financial Inclusion (IDFI)

As evinced from Barik and Lenka's 2022 study, a viable index must comprise demand- and supply-side variables. Doing so shall provide a comprehensive picture consisting of push and pull forces influencing the condition of DFI in a region. The secondary issue faced by the previously mentioned studies applying a single-variable approach is the representation of either of these forces. Based on the set operational definition, the dimensions outlined pertain to either or both types of these forces. Accordingly, the following indicators are used to represent the dimensions:

1. **Number of Banks Live on the UPI per 1000 Population:** The given measure accounts for the availability of digital banking services in the state. It, therefore, becomes an indicator of how easily and flexibly individuals of a region can access digital financial systems and services in the region.

2. **Volume of Digital Payments per Capita:** The given measure accounts for the degree of penetration of digital banking services based on the volume or number of digital transactions in the region per capita.

3. **Value of Digital Payments (as a Percentage of GSDP):** The given measure accounts for the degree of usage of digital banking systems by measuring the total value of digital transactions in the region, normalised to the total GDP of the State.

Construction Methodology of the IDFI

To develop the Index of Digital Financial Inclusion, this study employs a distance-based approach termed the Technique for Order Preference with Similarity to Ideal Solution (TOPSIS) methodology. Such a process, belonging to the family of Multi-Criteria Decision Making (MCDM) methods was presented by Hwang and Yoon (1981) and later by Chen and Hwang (1992). Based on Sarma's 2008 study on index construction, this study's Index calculates the distance from ideal, albeit with certain refinements for augmented robustness. The index in this study takes a simplistic approach of equi-weighted dimensions. However, a range normalisation is first applied to calibrate each dimension to the bounds of 0 and 1 while maintaining their internal variation:

$$d_i = \frac{A_i - m_i}{M_i - m_i} \tag{1}$$

where

d_i = Derived value of dimension *i* (range normalised)

A_i = Actual value of dimension *i*

m_i = minimum value of dimension *i*

M_i = maximum value of dimension *i*

(1) ensures that each dimension d_i lies in the bounds of 0 and 1 inclusive. Hence, a region's higher achievement in DFI conditions will be represented by a higher value of d_i for the relevant dimension under focus. Given the *n* dimensions of the index, region *i* shall be represented by point $D_i = (d_1, d_2, d_3 \ldots d_n)$ in the *n*-dimensional Cartesian plane.

In the n-dimensional space, the point I = (1,1,1,...,1) represents the point indicating the Ideal situation with the highest achievement in all dimensions while the point O = (0,0,0,...0) represents the point indicating the Worst situation. General displaced ideal or TOPSIS systems take the distance from the ideal to measure the conditions of the region.

Sarma's 2008 study uses the Euclidean distance from the Ideal as a measure of the degree of financial inclusivity of a region. However, such would prove insufficient since a point in this n-dimensional space can occupy multiple locations while being equidistant from the Ideal, resulting in the same FII score. To enhance the robustness of the results, this study also takes an inverse Euclidean distance from the Worst (O). The average between these two calculations produces a score with greater robustness that better accounts for the uniqueness of each State economy's position in the plane.

The normalised Euclidean distance, X_1, from the Ideal (I) is calculated as:

$$X_1 = \frac{\sqrt{\sum_{i=1}^{n} d_1^2}}{\sqrt{n}} \tag{2}$$

Similarly, the inverse normalised Euclidean distance, X_2, from the Worst (O) is calculated as:

$$X_1 = 1 - \frac{\sqrt{\sum_{i=1}^{n} (1 - d_1)^2}}{\sqrt{n}} \tag{3}$$

Hence, the FII is calculated for each State in each Year as the average of X_1 and X_2:

$$FII = \frac{1}{2}\left[X_1 + X_1\right] \tag{4}$$

$$FII = \frac{1}{2}\left[\frac{\sqrt{\sum_{i=1}^{n} d_1^2}}{\sqrt{n}} + \left(1 - \frac{\sqrt{\sum_{i=1}^{n} (1 - d_i)^2}}{\sqrt{n}}\right)\right] \tag{5}$$

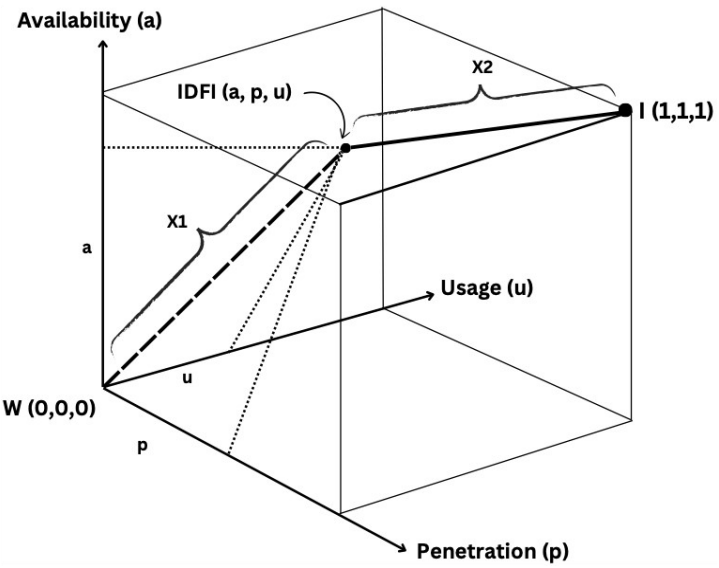

Fig. 1: Diagrammatic Representation of IDFI

Note: Each axis has a maximum point of 1 and a minimum point of 0, creating a three-dimensional Cartesian cube.

In Fig (1), the Index for Digital Financial Inclusion is graphically represented through the formulation given in (5), configured to the bounds of each dimension evinced from the range normalisation previously carried out. I is observed as the Ideal point, possessing maximum financial inclusivity, while O is observed as the Worst point, possessing least financial inclusivity. A state here is represented by point D (a,p,u), described by the dimensions of Availability, Penetration and Usage respectively. Therefore, the closer D is to I and the further away it is from O, the higher its X_1 and X_2 values and their overall IDFI value, indicating greater financial inclusivity. Alternatively, states with lower IDFI values are further away from I and closer to O, indicating lower digital financial inclusivity.

The given index follows the line of thinking similar to the index construction system of the United Nations Development Program (UNDP) in that it makes use of a multidimensional approach. The UNDP's approach of Linear Averaging, which is essentially a linear combination of a set of indicators, is observable in indices such as the Human Development Index (HDI) or the Happiness Index. However, our method of a distance-based approach differs by avoiding any ambiguity of weights. Such a major point of difference helps it overcome two major points of controversy in the UNDP approach. For one, the question of the weights applied arises: how can the weights for each dimension be decided. The same dimensions may possess varying degrees of importances as regions vary. Hence, using the same weights for different would provide biased results regarding the regions' financial inclusivity. Moreover, if these weights are allowed to be altered by region, this would mathematically be a different index for each region and could not be compared to that of other regions for reference.

A secondary issue faced in the UNDP systems is that of "perfect substitutability" across dimensions: "an increase in one dimension can be compensated for by a decrease of equal (in case of arithmetic average) or proportional (in case of geometric average) magnitude in another dimension." (42). Such a phenomena implies that while change might occur in the region, the same is not in measurement due to a static index value for the region. Given that all dimensions of the index are understood to be essential and independent, perfect substitutability diminishes the quality of results derived from the same (43)(44).

Both these issues are overcome by the distance-based TOPSIS method utilised in this study.

AXIOMATIC CHARACTERISATION OF TOPSIS AND LINEAR AVERAGING

Certain axioms can be applied to the characteristics of an index to understand its degree of robustness, interpretability and policy-relevance. A popular set of such axioms is abbreviated as NAMPUS, each measuring a distinct and essential component of the index features (Ambarkhane et. al., 2016).

Description of Axioms

Normalisation (Axiom N): This axiom states that an index must possess a maximum and minimum value. In terms of the IDFI, this would refer to the existence of the Ideal and Worst points respectively.

Anonymity (Axiom A): This axiom states that an index must be indifferent to the exchange of values across dimensions. For instance, consider countries x and y; this would imply that IDFIx= IDFIy despite the interchange of values between dimensions a and p (ax= py and ay= px).

Monotonicity (Axiom M): This axiom states that the value of the index must have a positive movement given an improvement in the score of one dimension, while assuming other dimensions to be constant. For instance, given that ax = ay, px = py, then given that ux uy, then then IDFIx$\gtreqless$IDFIy iff ux$\gtreqless$uy.

Proximity (Axiom P): This axiom states that a higher value of the index should imply a closer condition to that of the ideal situation. Given that the method used in this study applies Euclidean and Inverse Euclidean distances, they shall be monotonic and positively correlated to each other, with higher values implying better inclusivity conditions.

Uniformity (Axiom U): This axiom states that in an index, for a given mean of index value, a higher degree of dispersion across dimensions should imply lower measures in the index. This essentially means that dimension values that are closer to each other i.e. more balanced will be better rewarded. Such a perspective aligns with the notion of balance or uniform human development (Sen, 1999).

Signaling (Axiom S): This axiom states that an index should also indicate an optimal path of growth. Such a perspective aligns with the notion of the role of an index in not only representing the current state of affairs, but also playing a futuristic role. In this case, the index should also be able to provide the optimal path to an improved index value d* = min(dm). Such a role also helps in describing the optimal course of action.

Comparing TOPSIS and Linear Averaging

Based on the axioms of NAMPUS (Normality, Anonymity, Monotonicity, Proximity, Uniformity and Signaling), the methods of TOPSIS and Linear Averaging can be compared.

Normalisation: In both methods, the index is bound by a certain bound. These bounds are (0, 1) and (Worst, Ideal) for Linear Averaging and TOPSIS respectively. Hence, both methods fulfil the same.

Anonymity: Given that both methods use normalised dimensions, an interchange of dimension values shall not alter their overall scores. Even in the TOPSIS method, the interchange of variables will shift the point symmetrically opposite to its original position with respect to the central line. Hence, both methods fulfil this axiom.

Monotonicity: TOPSIS and Linear Averaging systems are intrinsically monotonic. While such monotonicity is more easily apparent in the latter, a reference to Fig (1) explains the monotonic nature of this style of measurement as well. Hence, both methods fulfil this axiom.

Proximity: Since TOPSIS is a distance-based approach, it automatically fulfils such an axiom. However, in terms of Linear Averaging, that might not necessarily be the case. Such a method might give a proximity result that differs from the calculated result. For instance, the values for (a, p) for countries x (0.5, 0.5) and y (0.9, 0.1) indicate such different results.

Uniformity: The TOPSIS method implies minimum distance on the line of equality. This implies that a point positioned on the point of equality will possess the best possible index value, as opposed to any perpendicular deviations from the same. Fig (2) provides a visual representation of the same, with D, on the line of equality, possessing better index scores than D'.

Signaling: Since Linear Averaging is a linear combination of values, there are multiple directions that can be taken for improvement in the index score of the same. On the other hand, by fulfilling the uniformity axiom, the TOPSIS method signals the need to follow the line of equality for achieving the maximum positive movement in the region's index value.

On the other hand, given that the TOPSIS method has a distance-based approach, the linear path between the region's actual position and the Ideal point becomes the ideal pathway. Therefore, the index provides a signalling on the shortest path to the Ideal to be optimal for enhanced inclusivity conditions, as observed in Fig (3).

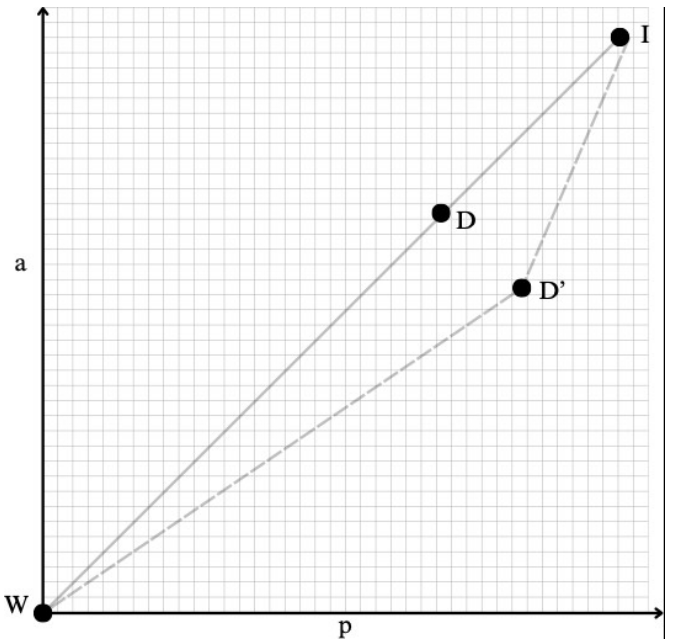

Fig. 2: Graphical Representation of Proximity Axiom

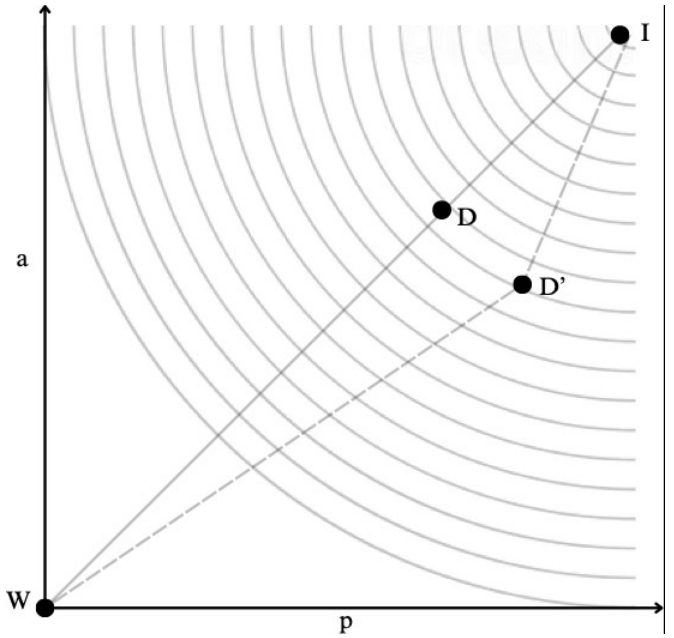

Fig. 3: Graphical Representation of Signaling Axiom

Note: The iso-curves signifies equi-distance from the plane, and equal value in the index. Therefore, point D on the line of equality possesses a better value than point D'.

Conditions of Digital Financial Inclusion in India

Based on the derived Financial Inclusion Index, the conditions of financial inclusivity across India during the 10-year period under focus can be charted. Such a visualization can not only be directed towards the index, but also its individual components.

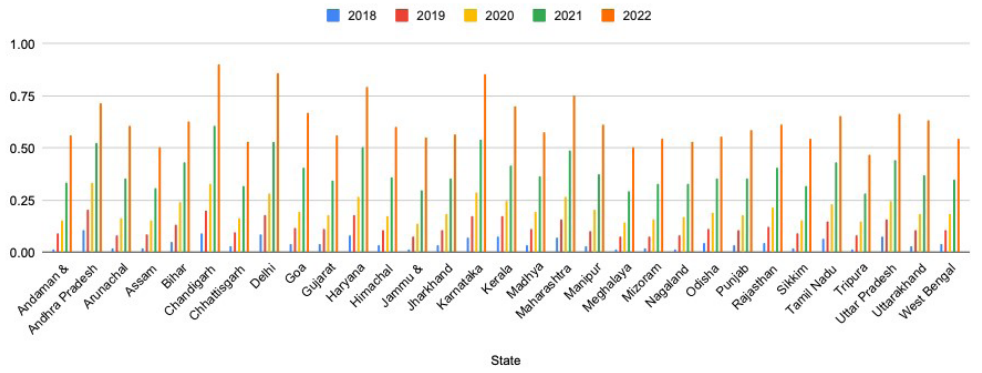

Fig. 4: Comparison of DFI across States

Note: The above bar graph visualises the DFI scores of all states between 2018 and 2022.

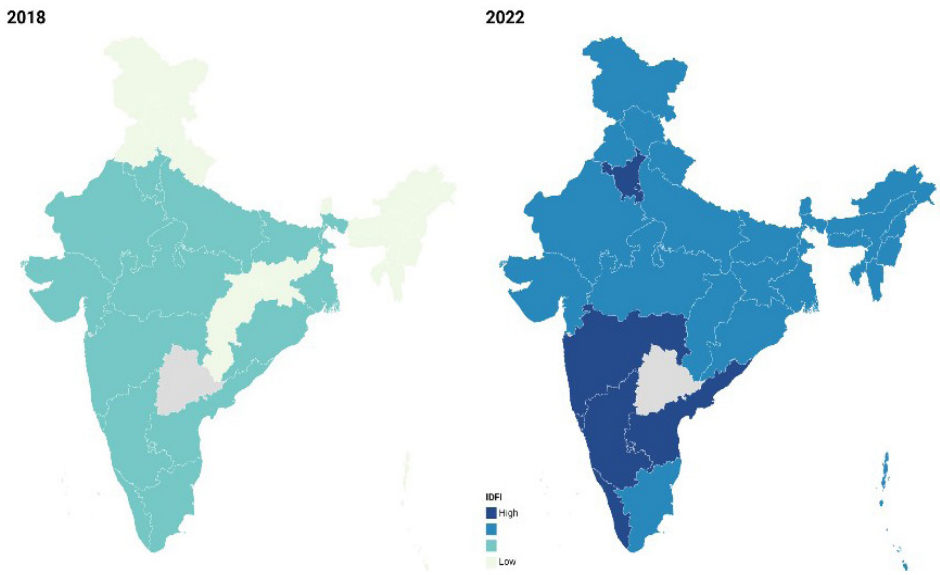

Fig. 5: Heatmap Comparison of Indian States for Financial Inclusion

In Fig (4), the graphical representation of Digital Financial Inclusion in Indian states across the five-year period under focus presents a sharp and exponential growth of DFI between 2018 and 2022. However, while DFI conditions have dramatically improved over the years, the variance between the values has increased as well, indicating a divergence in the degree of digital financial inclusivity between these states over time, as seen in Fig (5). Such a result intensifies

the need for developing appropriate policy that engenders ameliorative transformations to the condition of DFI in India characterized by balanced growth to bridge these widening gaps.

Fig (5) provides a visualization of digital financial inclusion in India through a state-wise heatmap. A certain degree of clustering can be observed amongst the states based on geographical location. For instance, Northern and Southern bands, with the exception of Jammu & Kashmir, possess high levels of FI. Contrastingly, the Central band and North-Eastern bands seem to possess moderate and low levels of financial inclusion respectively.

The implications of such a visualization align with those of the Crisil Inclusix report on FI in India, further adding to the reliability and robustness of the index.

CONCLUSION

The final form and implications of the index developed through this study underscore the pivotal methodological insight of the importance of the process through which the measurement of digital financial inclusion is executed. Prior studies have either used a singular variable to represent the phenomenon, or multiple large regions, or even non-continuous survey data. Contrasting such an approach, this study proceeds to create a multidimensional index of continuous demographic data, comprising demand- and supply-side indicators.

Such an index also provides a wider range of interpretable results due to the relation of each indicator with a myriad of independent variables. The application of a distance-based approach further enhances the objectivity of the results. Such an approach is particularly valuable because it overcomes the issues associated with the population linear averaging method, reducing potential measurement controversies, with the only area of subjectivity being the choice of indicators used to construct the index. The new index, therefore, allows comparison across location as well as through levels granularity. Overall, the FII index enables the study to elicit a comprehensive understanding of the condition of digital financial inclusion in each state.

LIMITATIONS AND FUTURE RESEARCH

Despite the multitude of insights provided by this study into the measurement and determinants of Digital Financial Inclusion in India, there exist certain limitations to it. The primary constraint of such a study is the quality and availability of secondary-level data. Hence, the extent of the granularity under consideration in such a study is also affected by the same.

In addition to this is the limitation in the construction process of the Index of Digital Financial Inclusion (IDFI). While the indicators applied in such an index are certainly backed by logic as well as literature, it may be missing certain extraneous variables in the process as well. For instance, behavioural or qualitative indicators, in terms of the user experiences, preferences and cultural characteristics, could not be applied in this index, despite their potential importance in such a measurement. Additional variables representing the evolving nature of digital financial systems could provide greater accuracy to this index. Therefore, future studies could certainly be applied to integrate qualitative and behavioural indicators

along with the existent set for an improved index. Given the existence of the index through this study, future research projects could also explore a host of socioeconomic and physical infrastructural variables that influence DFI in India, potentially providing directions for policy application. Such an analysis could be carried out through panel-data regression models as well as machine learning models, extracting complex patterns and relationships between the variables and providing a more comprehensive picture of Digital Financial Inclusion in India.

References

1. Ambarkhane, D., Shekhar Singh, A., & Venkataramani, B. (2016). Developing a Comprehensive Financial Inclusion Index. Management and Labour Studies, 41(3), 216-235.
2. Barik, R., & Lenka, S.K. (2022). Demand-side and supply-side determinants of financial inclusion in Indian states: Evidence from post-liberalization period. Emerging Economy Studies, 8(1), 7–25.
3. Chen, S.-J., & Hwang, C.L. (1992). *Fuzzy multiple attribute decision making: Methods and applications*. Springer Berlin Heidelberg.
4. Cicchiello, A.F., Kazemikhasragh, A., Monferrá, S., & Girón, A. (2021). Financial Inclusion and development in the least developed countries in Asia and Africa. *Journal of Innovation and Entrepreneurship*, *10*(1). CRISIL. (2018).
5. *CRISIL Inclusix Report*. CRISIL Inclusix.
6. Datta, S.K., & Singh, K. (2019). Variation and determinants of financial inclusion and their association with human development: A cross-country analysis. *IIMB Management Review*, *31*(4), 336–349.
7. Demirgüç-Kunt, A., & Klapper, L. (2013). Measuring Financial Inclusion: Explaining variation in use of financial services across and within countries. *Brookings Papers on Economic Activity*, *2013*(1), 279–340.
8. Fungáčová, Z., & Weill, L. (2015). Understanding financial inclusion in China. *China Economic Review*, *34*, 196–206.
9. Hwang, C.-L., & Yoon, K. (1981). Methods for Multiple Attribute Decision Making (Vol. 186). Springer.
10. Kaligis, N., Tewal, B., Maramis, J., & Mangantar, M. (2018). Financial Inclusion Profile: Determinant and Barriers. International Journal of Economics and Financial Issues.
11. Klindt, T.H., Beattie, B.R., & Bradford, G.L. (1972). AN Operational Definition of Economic Development: A False Hope. Proceedings, Annual Meeting (Western Agricultural Economics Association), 45, 140–143.
12. Kumar, P. (2011). Financial Exclusion: A Theoretical Approach. *Munich Personal RePEc Archive*.
13. Le, T.T., Dang, N.D.L., Nguyen, T.D.T., Vu, T.S., & Tran, M.D. (2019). Determinants of financial inclusion, comparative study of Asian countries. Asian Economic and Financial Review, 9(10), 1107.
14. Leyshon, A., & Thrift, N. (1995). Financial exclusion and the shifting boundaries of the financial system. Environment and Planning A: Economy and Space, 28(7), 1150–1156.
15. Mose, N., & Thomi, J. (2021). The determinants of Financial Inclusion. *SSRN Electronic Journal*.
16. Ozili, P.K. (2020). Financial Inclusion Research around the world: A Review. Forum for Social Economics, 50(4), 457–479.
17. Rangarajan, C. (2008). Report Of The Committee On Financial Inclusion . SLBC Karnataka.
18. Sarma, M. (2008). Index of Financial Inclusion. ICRIER.

19. Sen, A. (1999). *Development as freedom*. Alfred A. Knopf.
20. Sinclair, S.P. (2001). *Financial exclusion: An introductory survey*. CRSIS, Edinburgh College of Art / Heriot Watt University.
21. Soumaré, I., Tchana Tchana, F., & Kengne, T.M. (2016). Analysis of the determinants of financial inclusion in central and West Africa. Transnational Corporations Review, 8(4), 231–249.
22. Thomas, J. (1992). The Informal Financial Sector. *Overseas Development Institute*.
23. World Bank. (2021). *The Global Findex Database Methodology*. Global Findex Database.

5.4 ESG and Sustainability Reporting: Solutions and Opportunities in the Face of Climate Change and Sustainability Actions

[1]Soomrit Chattopadhyay, [2]Utkarsh Singh, [3]Yakabal Shekhamaheboob

[1]Senior Research Associate, Centre for Sustainable Development Gokhale Institute Pune

[2]Management Trainee, EY, CCaSS, T ERI-SAS

[3]Research Assistant, GIPE

ABSTRACT

India's efforts to address environmental challenges and promote sustainable development have been met with both progress and setbacks. While the country has taken steps to establish regulatory frameworks and guidelines to encourage corporate responsibility and sustainability studying, concerns have arisen regarding the potential dilution of environmental laws and the risk of greenwashing practices. One of the policy instruments that shows promise includes the mandatory ESG disclosures that have been mandated by SEBI as of 2023-24 for top 1000 companies listed on NSE. The other includes the carbon market and carbon credit policy of October 2023. This study is focused on studying large scale sustainability actions that are needed for climate action and how the carbon market and ESG disclosures can be a tool towards achieving this. In 2023, India saw the passage of 3 legislations namely the Green Credit Policy, Compliance Carbon Trading Scheme(CCTS) and the changes to the Environment and Biodiversity Act.

The passage of the carbon credit laws, particularly the Carbon Credit Policy, may impact the existing regulatory framework related to environmental compliance and have raised concerns about regulatory ambiguity and the need for robust oversight to prevent greenwashing and ensure the integrity of the market. The findings of the study reflect the need for more comprehensive reporting standards and stricter implementation.

INTRODUCTION

The term ESG originated in the year 2004 when a group of financial investors pledged a total sum of 6 trillion $ through the effort of the United Nations Global Compact Network and a report titled "*Who Care Wins*" (Values Investment Strategies and Research Ltd, 2005, pp.9-11)

on how the financial markets could play an important role to save the environmental issues into account in the domain of market, research, and development and also funding analysis and how accountable investors believe in the concept that companies who can identify risks with ESG will be able to generate growth in the long term.

Early ESG (Environmental, Social, and Governance) frameworks evolved from broader movements in sustainability, corporate responsibility, and ethical investing. Below is an overview of their origins and development:

Socially Responsible Investing (SRI): The roots of ESG can be traced back to the 1970s with the rise of SRI, which aligned investment decisions with ethical values. SRI gained traction in the 1980s, notably during divestment campaigns against apartheid in South Africa

Corporate Social Responsibility (CSR): In the 1990s, CSR became a prominent concept, focusing on issues like human rights, labor conditions, and supply chain ethics. CSR laid the groundwork for integrating social and environmental concerns into business operations

Environmental Health and Safety (EHS): In the 1980s, EHS initiatives in the U.S. aimed at reducing pollution and improving labor conditions. These efforts influenced corporate sustainability practices

Global Reporting Initiative (GRI): Founded in 1997, GRI was one of the first frameworks to address environmental concerns before expanding to include social and governance issues. It remains a widely used reporting standard

"Who Cares Wins" Report (2004): This UN-backed report officially introduced the term "ESG" and linked ESG factors to financial performance. It marked a pivotal moment in integrating ESG into corporate strategies

Freshfields Report (2005): Published by UNEP Finance Initiative, it highlighted the legal relevance of ESG issues in financial valuation, further solidifying its importance

Principles for Responsible Investment (PRI) (2006): Encouraged investors to incorporate ESG factors into decision-making processes

Climate Disclosure Standards Board (CDSB) (2010): Initially focused on climate-related disclosures but later expanded to broader ESG topics

Sustainability Accounting Standards Board (SASB): Developed industry-specific standards for ESG reporting to improve transparency and comparability.

By the mid-2010s, frameworks like the Task Force on Climate-related Financial Disclosures (TCFD) and alignment with global goals such as the UN Sustainable Development Goals (SDGs) further advanced ESG reporting and integration

ESG involve dealing with the following issues:

Environmental Concerns: Pollution of the land, the efficiency of water and air, management of waste, scarcity of natural resources, and changes in the climate also whether companies invest in sustainable solutions, E.g.: In Plachimada which is in the Southern state of Kerala, the Coca Cola *plant* had to shut its operations as it had polluted the area's groundwater, which led to the possibility of a drought (Berglund and Helander, 2015.pp.-2-3)

Social Concerns:- Safety and health and working conditions of labor employment rights of human and supply chain issues and how the construction of dams affects people's livelihood. E.g.: Due to faulty diligence in South Korea with the Government of China to run forced labor programs against *Nike who was running a forced labor program*. (Knight and Greenberg, 2002. pp.3-5).

Governance Concerns:- In this category generally, the governing concerns of the environment and management of social issues and measures like to deal with corruption and concerns related to morals in business are in. E.g.: Regulation Framework in India are *the Company Act 2013, Prevention of Money Laundering Act 2002*, and *Prevention of Corruption Act.*

Credits and Markets

Carbon credits are permits that allow the owner to emit a certain amount of carbon dioxide or other greenhouse gases. Carbon credits create a monetary incentive for companies to reduce their carbon emissions, and they can be sold to other companies that need them. Carbon credits are part of the compliance carbon market, which is a regulatory system that sets a cap on emissions and allows companies to buy and sell permits to emit greenhouse gases. The voluntary carbon market, on the other hand, is a market where companies and individuals can purchase carbon credits voluntarily to offset their carbon footprint. Green credits, also known as green finance, refer to financial instruments and support aimed at promoting environmentally friendly and sustainable projects, such as initiatives to reduce carbon emissions and invest in renewable energy. Carbon credits are traded in the carbon market.

Green credits encourage financial institutions to consider environmental factors when making lending decisions, thereby contributing to environmental protection and sustainable development.

There is less clarity on how the green credit market will operate or is operating.

Compliance carbon markets are regulatory systems that set a cap on emissions and allow companies to buy and sell permits to emit greenhouse gases. Compliance carbon markets are established by governments as a means of achieving their carbon reduction targets, and they operate on a mandatory basis, meaning that participating organizations are required by law to participate in the market and to meet certain carbon reduction targets. Compliance carbon markets are also known as Emissions Trading Systems (ETS), and they function at both the primary and secondary market levels. The most active compliance carbon offset program is the United Nations Clean Development Mechanism, which is the source of offsets for Kyoto Protocol Signatory Countries and buyers in the European Union.

The voluntary carbon market is a market where companies and individuals can purchase carbon credits voluntarily to offset their carbon footprint. The voluntary carbon market operates on a project-based system in which there is no finite supply of allowances. Within the voluntary carbon market, more carbon credits can be created through the development of environmental projects. Companies can buy these credits to offset unavoidable emissions and reach their targets. The voluntary carbon market is not regulated by governments and is not mandatory, unlike the compliance carbon market. The voluntary carbon market is significantly more fluid and unrestrained by boundaries set by nation-states or political unions.

The voluntary carbon market has the potential to be accessed by every sector of the economy instead of a limited number of sectors. The Taskforce on Scaling Voluntary Carbon Markets estimates that the market for carbon credits could be worth upward of $50 billion as soon as 2030.

These credits are a key component of carbon trading schemes, which aim to mitigate climate change by encouraging businesses and governments to reduce their greenhouse gas emissions. There are several types of carbon credits, each associated with different projects and emission reduction activities. Here are some of the common types:

Certified Emission Reductions (CERs): CERs are generated through the Clean Development Mechanism (CDM) under the Kyoto Protocol. Projects in developing countries that reduce greenhouse gas emissions are eligible for CERs. These projects contribute to sustainable development and help industrialized countries meet their emission reduction targets.

Emission Reduction Units (ERUs): ERUs are generated through Joint Implementation (JI) projects, another mechanism under the Kyoto Protocol. JI allows industrialized countries to earn emission reduction credits by investing in projects that reduce emissions in other industrialized countries with binding emission reduction targets.

Verified Emission Reductions (VERs): VERs, also known as voluntary carbon credits, are generated from projects that voluntarily reduce emissions but are not part of any mandatory compliance mechanism. These credits are typically used by businesses and individuals to offset their own emissions voluntarily.

Gold Standard Credits: The Gold Standard is a certification standard for carbon credits that goes beyond th koe basic requirements of other standards. Gold Standard projects must not only reduce emissions but also contribute to sustainable development goals, such as poverty reduction and environmental protection.

Reduced Emissions from Deforestation and Forest Degradation (REDD+): REDD+ credits are generated through projects that prevent deforestation or promote afforestation and reforestation activities. These projects aim to sequester carbon in forests and contribute to biodiversity conservation.

Renewable Energy Credits (RECs): While not strictly carbon credits, RECs are tradable certificates that represent the environmental benefits of generating electricity from renewable

sources. They are often used to support renewable energy projects and are commonly traded in voluntary markets.

Methane and Nitrous Oxide Reduction Credits: These credits are generated from projects that specifically target the reduction of potent greenhouse gases like methane and nitrous oxide

Additionality

"Additionality" is a key concept in the context of carbon offset projects and the generation of carbon credits. It refers to the notion that a project's greenhouse gas emissions reductions or removals must be additional to what would have occurred in a business-as-usual scenario. In other words, for a project to be considered additional, it must go beyond what would have happened in the absence of the carbon finance provided by the sale of carbon credits.

The concept of additionality is crucial for ensuring the environmental integrity and effectiveness of carbon offset projects. If a project's emissions reductions would have occurred anyway, without the financial incentive from carbon credits, then those reductions are not truly contributing to a net reduction in global greenhouse gas emissions.

There are different types of additionality, including:

Financial Additionality: The project would not have been economically viable without revenue from the sale of carbon credits. The income generated from selling credits is essential for overcoming financial barriers to project implementation

Technological Additionality: The project involves the use of technologies or methods that are not standard practices in the industry or region, and the adoption of these technologies is directly attributable to carbon finance

Regulatory Additionality: The project's emissions reductions are not required by existing regulations. If a project is already mandated by law or regulation, it may not be additional, as the emissions reductions would occur irrespective of the carbon finance.

Barrier Additionality: The project faces non-financial barriers, such as institutional, informational, or cultural barriers, which are overcome with the support of carbon finance.

Ensuring additionality is a critical aspect of the validation and verification processes associated with carbon offset projects. Independent third-party auditors assess and verify whether a project meets additionality criteria before carbon credits are issued. This helps maintain the environmental integrity of carbon markets and ensures that emission reductions claimed by projects are real and additional to what would have happened without the project.

Brief Literature Review

Greenwashing is the deceptive practice of making misleading or false claims about the environmental benefits of a product, service, or company.

In India, several companies have been accused of greenwashing including HUL(TOI, 2021). Other examples of companies caught for greenwashing globally include Volkswagen, Innocent, and IKEA. Greenwashing is a prevalent issue in India due to a lack of strict regulations on environmental claims and eco-labeling, allowing companies to engage in greenwashing with little to no consequences.

This practice can mislead consumers who are increasingly demanding eco-friendly and sustainable products. It is essential for consumers to be aware of greenwashing tactics and to thoroughly research the environmental claims made by companies with the dilutions in the Environment (Protection) Act, 1986 which is a key legislation in India aimed at protecting and improving the environment, the companies are no longer liable for prosecution as per the penal code.

It had empowered the central government to set new standards for emissions, regulate the location of industries, devise procedures for handling hazardous substances, safeguard against accidents causing environmental pollution, and collect and disseminate information. The Act also focuses on the prevention, control, and abatement of environmental pollution, laying down standards for the quality of the environment, as well as for the emission or discharge of environmental pollutants from various sources. It restricts areas in which any industries, operations, or processes shall not be carried out or shall be carried out subject to certain safeguards Furthermore, the Act includes provisions for the protection and improvement of the environment, safeguarding forests and wildlife, and the duty of every citizen to protect and improve the natural environment, including forests, lakes, rivers, and wildlife. The Act has been complemented by other legislations such as the Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, and the Biological Diversity Act 2002, all aimed at safeguarding the environment. The Act is a crucial component of India's environmental legal framework, providing the government with the necessary authority to protect and improve the environment and regulate various aspects of environmental pollution. India's Carbon Credit Policy of 2023 aims to reduce greenhouse gas (GHG) emissions and promote sustainable development. The policy assigns a carbon credit to each tonne of carbon dioxide equivalent (tCO2e) reduced or avoided, which can be bought, sold, and traded. The policy covers approximately 72% of India's total CO2 emissions and has far-reaching implications for India's journey to net-zero carbon emissions by 2070. The policy prohibits the export of carbon credits and is expected to have a significant impact on India's compliance with the Paris Agreement and the Kyoto Protocol. The policy operates primarily under the Clean Development Mechanism (CDM) of the Kyoto Protocol, where projects designed to curtail emissions yield tradable credits. The policy has raised concerns about regulatory ambiguity and the need for robust oversight to prevent greenwashing and ensure the integrity of the market. The policy proposes the establishment of a cross-sectoral regulatory mechanism, under which the Indian Carbon Market (ICM) Governing Board is to be set up, for governing the Indian carbon market. The market shall be administered by the Bureau of Energy Efficiency, also serving as the Secretariat of the board.

The Indian Green Credit Policy of 2023, as outlined in the Green Credit Rules, represents a significant commitment by India towards sustainable practices and climate change mitigation. The policy aims to incentivize voluntary environmental actions by individuals, organizations, and industries through the issuance of green credits for specific environment-friendly activities, which can be traded. The rules define 'green credit' as a single unit of incentive provided for a specific activity that delivers a positive impact on the environment[2]. The program is supported by an inter-ministerial Steering Committee and a dedicated digital platform for registration, verification, and issuance of credits[3]. However, experts have raised concerns about the need for strong regulation to prevent greenwashing and ensure the integrity of the credits[3]. The policy is part of India's commitment to reduce carbon emissions and achieve net-zero by 2070[4].

GAPS IN LITERATURE

The ambitious plan to generate carbon credits and carbon finance is fraught with issues. The carbon credit policy is set to replace current provisions like Renewable Energy certificates and Perform achieve Trade scheme. Perform, Achieve, and Trade (PAT) scheme is a regulatory instrument in India aimed at reducing specific energy consumption in energy-intensive industries. It is associated with a market-based mechanism to enhance cost-effectiveness through the certification of energy-saving targets. The scheme assigns specific energy-saving targets to Designated Consumers (DCs) based on their current levels of energy efficiency. Energy-intensive industries are identified as Designated Consumers (DCs) and are required to appoint an energy manager, file energy consumption returns every year, and conduct mandatory energy audits regularly. The PAT scheme operates on a rolling cycle basis, with new sectors/designated consumers being notified every year.

Renewable Energy Certificates (RECs) are a market-based instrument that certifies the bearer owns one megawatt-hour (MWh) of electricity generated from a renewable energy resource. RECs are used to track and trade renewable energy generation and use, and they play a crucial role in accounting for the amount of renewable energy that flows through the power grid. RECs can be sold for profit to those looking to offset their carbon emissions, and they are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource. In India, the Renewable Energy Certificate (REC) mechanism is a market-based instrument to promote renewable energy and address the mismatch between the availability of renewable energy resources in states and the requirement of the obligated entities to meet their Renewable Purchase Obligations (RPOs). The REC mechanism is regulated by the Central Electricity Regulatory Commission (CERC) and is aimed at incentivizing renewable energy generation and promoting the growth of the renewable energy sector in India.

With no plan or mechanism to interchange Credits earned by industries through voluntary carbon market and compliance carbon market, it will be a disincentive for companies already involved in the carbon credit generation and investment.

Further green credits and carbon credits are not interchangeable.

The over regulation here is visible in terms of the plan to merge a scheme which is actually working namely the renewable energy certificates and PAT scheme with an uncertain carbon credit scheme. Further the need for regulation is visible when looking at the environment protection act and the various dilutions.

BRIEF RESEARCH METHODOLOGY

To achieve the objectives of the research study as mentioned above, the study will follow a mixed-methods approach of using qualitative and quantitative methods of analysing ESG and Sustainability-linked reports of top 50 companies in BSE and NSE who have the highest market cap in a few chosen sectors and have endorsed the CII climate charter. The detailed methodology consists of the following steps:

i. Research Strategy definition for collection of secondary data and use

ii. Data Collection: Relevant data was collected from credible secondary sources such as government reports, industry publications, and sustainability databases.

iii. Data Analysis: The collected data was analyzed to identify trends, patterns, and insights

iv. Conclusion and recommendation formulation based on data analysis results

DATA COLLECTION AND FINDINGS

The choice of 50 companies was done according to the highest market capitalization as per Financial Year(2022-23) in various sectors of operation.

It is challenging to be absolutely precise with some companies as they have diversified interests. However, based on their primary business activities the classification is done

Category I-Energy

1. Adani Green Energy Limited
2. Adani Power Limited
3. Adani Total Gas Ltd.
4. Adani Transmission Limited
5. Coal India Limited
6. Indian Oil Corporation Ltd.
7. NTPC Limited
8. Oil And Natural Gas Corporation Ltd
9. Power Grid Corporation of India Limited
10. Reliance Industries Ltd

Category II-Infrastructure & Logistics

1. Adani Enterprises Ltd. (Diversified, but strong focus on infrastructure)
2. Adani Ports and Special Economic Zone Ltd
3. Bharti Airtel
4. Larsen & Toubro Limited

Category III-Metals, Mining and Materials

1. Grasim Industries Ltd. (Cement, Chemicals, and VSF)
2. Hindustan Zinc Ltd.
3. JSW Steel Limited
4. Tata Steel Limited
5. UltraTech Cement Ltd
6. Vedanta Limited

Category IV-Other Industries

1. Asian Paints Ltd.
2. Avenue Supermarts Limited (Retail)
3. Bajaj Auto Limited
4. Titan Company Limited
5. Maruti Suzuki India Ltd.

Category V-Fast Moving Consumer Goods (FMCG)

1. Hindustan Unilever Ltd.
2. ITC Ltd (Tobacco, FMCG)
3. Nestle India Ltd.

Category VI-Financials

1. AXIS Bank Ltd.
2. Bajaj Finance Limited
3. Bajaj Finserv Limited
4. HDFC Bank Ltd.
5. HDFC Life Insurance Company Limited
6. Housing Development Finance Corp. Ltd (HFDCL)

7. ICICI Bank Ltd.
8. Kotak Mahindra Bank Ltd.
9. Life Insurance Corporation of India
10. SBI Life Insurance Company Limited

Category VII-Information Technology

1. HCL Technologies Ltd
2. Infosys Ltd.
3. LTIMindtree Limited
4. Tech Mahindra Limited
5. Tata Consultancy Services Ltd.
6. Wipro Ltd.

Category VIII-Conglomerates

1. Mahindra & Mahindra Ltd. (Automotive and Farm Equipment)\
2. Tata Motors
3. Siemens Ltd.
4. Sun Pharmaceutical Industries Ltd.
5. Pidilite Industries Ltd. (Adhesives and Chemicals)

Note: Some companies like Adani Enterprises and Reliance Industries have operations across multiple sectors, making strict categorization difficult.

EMISSIONS OF TOP 50 COMPANIES SELECTED FROM 8 MAJOR SECTORS BASED ON MARKET CAP

Table 1: GHG Emissions of The Top 50 Companies Have Been Mentioned Below

SR. NO.	NAME OF COMPANY	SCOPE 1 (in ton CO_2 eq)	SCOPE 2 (in ton CO_2 eq)
1	Adani Enterprises Ltd.	NA	NA
2	Adani Green Energy Limited	NA	NA
3	Adani Ports and Special Economic Zone Ltd	129,438	193,063
4	Adani Power Limited	47,865,758	6,645
5	Adani Total Gas Limited	153,167	22,564
6	Adani Transmission Limited	2,691,062	557,775

(Table 1 Contd....)

(...Contd. Table 1)

7	Asian Paints Ltd.	12,407	36,340
8	Avenue Supermarts Limited	NA	NA
9	AXIS Bank Ltd.	NA	NA
10	Bajaj Auto Limited	NA	NA
11	Bajaj Finance Limited	NA	NA
12	Bajaj Finserv Limited	12,585	26,833
13	Bharti Airtel Ltd.	NA	NA
14	Coal India Limited	1,192,393	3,764,291
15	Grasim Industries Ltd.	4,570,000	1,390,000
16	HCL Technologies Ltd	19,503	136,338
17	HDFC Bank Ltd.	20,876	287,667
18	HDFC Life Insurance Company Limited	NA	NA
19	Hindustan Unilever Ltd.	NA	NA
20	Hindustan Zinc Ltd.	NA	NA
21	Housing Development Finance Corp. Ltd	3,086	12,142
22	ICICI Bank Ltd.	NA	NA
23	Indian Oil Corporation Ltd.	NA	NA
24	Infosys Ltd	8,965	51,717
25	ITC Ltd	1,258	193
26	JSW Steel Limited	NA	NA
27	Kotak Mahindra Bank Ltd.	NA	NA
28	Larsen & Toubro Limited	615,035	274,028
29	Life Insurance Corporation of India	NA	NA
30	LTIMindtree Limited	NA	NA
31	Mahindra & Mahindra Ltd.	NA	NA
32	Maruti Suzuki India Ltd.	NA	NA
33	Nestle India Ltd.	NA	NA
34	NTPC Limited	NA	NA
35	Oil And Natural Gas Corporation Ltd	NA	NA
36	Pidilite Industries Ltd.	NA	NA
37	Power Grid Corporation of India Limited	NA	NA
38	Reliance Industries Ltd	NA	NA
39	SBI Life Insurance Company Limited	NA	NA

(...Contd. Table 1)

40	Siemens Ltd.	11,794	30,565
41	State Bank Of India	NA	NA
42	Sun Pharmaceutical Industries Ltd.	47,743	287,102
43	Tata Consultancy Services Ltd.	16,684	141,045
44	Tata Motors Ltd.	NA	NA
45	TATA STEEL LIMITED	NA	NA
46	Tech Mahindra Limited	8,995	57,851
47	Titan Company Limited	NA	NA
48	UltraTech Cement Ltd	61,453,953	1,049,149
49	Vedanta Limited	59,000,000	3,000,000
50	Wipro Ltd.	72,884	9,660

DATA ANALYSIS AND INFERENCES

Two scopes are used to classify the emissions: 1 and 2 are the scopes. Scope 2 emissions are indirect GHG emissions connected to the production of purchased energy, whereas Scope 1 emissions are direct GHG emissions from sources that the company owns or controls.

Following findings can be drawn:

29 companies out of 50 did not report their Scope 1 or Scope 2 emissions which can be a sign of a lack of transparency or non-compliance.. As more data from the available sources are analyzed, it becomes clear that there is a wide range in the GHG emissions reported by the signatories of the CII Climate Action Charter. Some businesses have taken a proactive stance by disclosing their emissions, but others have not given the required information. There are noticeable variations in emissions levels across industries among the companies that reported their emissions.

For instance, two companies from the cement industry, UltraTech Cement Ltd and Grasim Industries Ltd, both reported unusually high emissions in Scope 1, demonstrating the carbon-intensive nature of their operations. This emphasizes the need for focused policies and scientific developments to cut emissions in these industries. However, organizations like Tata Consultancy Services Ltd., HDFC Bank Ltd., and Larsen & Toubro Limited have made an effort to publish their emissions and show a dedication to openness. This is admirable since it enables stakeholders to assess these enterprises' environmental performance and incites others to do the same.

Accurate evaluation and comparison of the environmental impact of various enterprises are hampered by this lack of transparency. To effectively combat climate change, businesses must give measurement and disclosure of their emissions a priority. Companies must adopt standardized reporting frameworks like the Greenhouse Gas Protocol or integrate with international reporting initiatives like the Task Force on Climate-related Financial Disclosures (TCFD) to improve the credibility and dependability of the data.

Additionally, businesses must set challenging carbon reduction goals and create plans to meet them. Companies can support efforts to prevent climate change and make the transition to a low-carbon economy by incorporating sustainability and ESG considerations into their business models.

Overall, the data analysis shows that to effectively control GHG emissions, organizations must enhance reporting procedures, transparency, and cooperation. Businesses must understand their part in tackling climate change and take aggressive steps to lessen their environmental impact. Also, through overall data another problem that is prevalent among the data is the fact that Scope 1 and Scope 2 emissions have been written in the data which is available in the BRSR (Business Responsibility Sustainable Report) and Scope 3 emissions have been missing which tells the fact that the emissions which account for 70% of greenhouse gas and is the major emitter have been missing which shows a trend of missing as it is felt that many companies buy from the same supplier that is the same and also the prevalence of double counting is also found. Hence the potential for greenwashing has been established.

Table 2: A Description of Best Practices and Targets to Save the Environment by 5 Market Leaders according to CII Climate Charter 2022

(1)	Adani Green Energy Ltd	Power Sector	Best Practices: Adani Green Energy, 2021.pp.10-72) Following the principles of reduce, reuse, and recycle operations run in a manner devoid of plastic. Targets: Increasing the capacity of renewable to *25 GW* by the year *2025* and *45GW* by the year *2030*
(2)	Bharat Petroleum Corporation Ltd	(Oil & Gas)	Best Practices: To ensure that waste is decomposed effectively the waste is composted into a material that can be utilized effectively through recycling waste and turning it into a furnished product which has led to 325 Mega tonnes of organic waste utilized in a manner that is effective. Targets: Through collaboration with ITC Limited a *plastic road* was constructed in Gujarat in the district of Nadiad which was related to the mission of " *Swatch Bharat*" which plays a major role in reducing the emissions of carbon dioxide and also leading the society towards "*Net Zero Emissions*".(Bharat Petroleum, 2022.pp.143- 145)
(3)	Coal India Ltd.	(Oil Gas & Consumable Fuels):	Best Practices: The company has restored a total of 27 Eco Parks where eco-restoration and eco-tourism will be done on 225 hectares of land where a total of 32 crores Rs will be spent which will be done by various sub-branches of Coal India Limited. Targets: Since the consumption of water is the most utilized resource followed by sand, Therefore, sand is divided into mines that use imported sand that is imported. Due to the segmentation of sand, it is available at a cheap price, and also 2 OB (overburden) to sand plants have been created which is available in WCL, and many grains of sand are provided to the government under *Pradhan Mantri Awas Yojana*. The revenue generated from it in the year 2022 was Rs0.74 crore. (Coal India Limited, 2022. pp-53-58)

(Table 2 Contd....)

(...Contd. Table 2)

(4)	Larsen & Toubro Ltd	(Construction)	Best Practices: In the year 2022 a total of 48% of waste was recycled. Targets: Since the year 2008 149 million KWH energy has been saved(Larsen And Toubro, 2022.p-81).
(5)	Tata Power Co. Ltd	(Power)	Best Practices: Tata Power has launched *solar pumps* by replacing diesel-based water pumps which will play a major role in irrigating the crops. Targets: By the year 2045 TATA Power plans to play a major role in decreasing temperature by 2°C(Tata Power, 2022. pp.2-6).

Thus from the above-mentioned data we can see that companies are transitioning into the domain of sustainability by following various practices that will benefit the environment also based on the above data, we can infer that companies need to work towards sustainability in the right manner with collaborative efforts. The problem also arises of data being one-sided and the ground reality is completely different from the reality and the work is just on paper which showcases a one-sided token of representation. This may necessitate field visits and sustainability auditing. Many companies pledge to become carbon neutral as part of a international vision of going Net Zero by 2050. They face challenges in managing Scope 3 emissions (from products bought like fuel) as organizations in energy-focused areas face many difficulties in maintaining Scope 3 emissions from its effect. Decarbonization will need innovation in the banking system as new policies require huge investment, and investing in projects to decrease carbon emissions Lacking knowledge is another concern because industry owners doubt decarbonization for industrial purposes. Increase in energy and fuel prices because of the demand for decarbonized supply can further lead to fuel poverty and other geopolitical supply risks as seen in the present. Further research is ongoing on sector wise analysis and benchmarking of 2022 figures of Sustainability plans with 2030 targets and goals.

CONCLUSION AND RECOMMENDATIONS

As the urgency to tackle climate change amplifies, corporations are progressively acknowledging the necessity to incorporate environmental, social, and governance (ESG) considerations into their strategic planning. From an acclimate-centric perspective, it is of utmost importance for corporations to prioritize ecological indicators that are congruent with the objectives of ameliorating climate change and transitioning towards a sustainable tomorrow. Thepresent article proffers pivotal suggestions for corporations to augment their ESG strategies, with a particular emphasis on environmental metrics. These recommendations are substantiated by pertinent research and industry perspectives.

Carbon Emissions Reduction

Reducing carbon emissions is a vital component of any effective climate strategy. The Harvard Business Review ((Mendiluce, 2022)) emphasizes the importance of setting ambitious targets for corporate emission reductions. Corporates should strive for science-based targets aligned with the Paris Agreement to limit global warming to well below 2º Celsius. Implementing energy efficiency measures, transitioning to renewable energy sources, and adopting clean technologies are effective ways to achieve significant emissions reductions

Renewable Energy Adoption

Increasing the share of renewable energy in corporate operations is a critical step towards decarbonization. Research by BloombergNEF (2021) indicates that corporates can accelerate their ESG strategies by committing to sourcing 100% renewable energy. Companies can achieve this by procuring renewable energy directly, investing in renewable energy projects, and utilizing power purchase agreements (PPAs) with renewable energy providers (McKinsey & Company, 2022).

Sustainable Supply Chain Management

A sustainable supply chain plays a pivotal role in reducing a company's environmental footprint. Corporates should prioritize suppliers that adhere to sustainable practices, such as responsible sourcing, waste reduction, and emissions management ((Shekarian *et al*., 2022, pp.3-8). Engaging suppliers in collaborative efforts to improve environmental performance can lead to enhanced resilience and reduced risks throughout the value chain .

Collaborate with Industry Peers

Engaging in collaborative efforts with industry peers can lead to shared learning, innovation, and collective impact. Companies can join industry associations, consortia, or networks focused on environmental sustainability to exchange best practices, develop common metrics, and drive industry-wide initiatives (Martin, Lazarevic, and Gullström, 2019. pp.3-5)Collaborative partnerships enable companies to leverage their combined resources, knowledge, and influence to accelerate progress towards ESG goals.

Assess and Manage Water Risks

Water scarcity and quality degradation are pressing environmental concerns. Corporates should conduct water risk assessments to understand their water footprint, identify water-related risks in their operations and supply chains, and implement water conservation measures ((Price water house Coopers, 2022)). Collaborating with stakeholders, adopting water-efficient technologies, and promoting responsible water stewardship practices can help mitigate water-related risks and contribute to sustainable water management.

Engage Stakeholders and Communicate Progress

Effective stakeholder engagement and transparent communication are crucial for driving ESG strategy. Companies should actively engage with stakeholders, including investors, customers, employees, and local communities, to understand their concerns, incorporate their perspectives, and build trust (Ågerfalk, Axelsson and Bergquist, 2021. pp.1-5) (Regularly communicating ESG goals, progress, and impact demonstrates commitment and accountability.

Circular Economy

Principles: Adopting circular economy principles can significantly contribute to environmental sustainability. Harvard Business Review (Rizk *et al*., 2019) highlights the importance of designing products for durability, recyclability, and reuse. Implementing closed-loop systems,

promoting recycling initiatives, and adopting product life extension strategies can minimize resource consumption, waste generation, and carbon emissions (Ellen MacArthur Foundation, 2020).

References

1. Decoding the Green Credit Rules 2023 - India Water Portal. (indiawaterportal.org).
2. Green Credit Rules 2023 - Underpinning India's climate pledge - ET EnergyWorld. (energy.economictimes.indiatimes.com).
3. Green credit scheme encourages 'environment-friendly' behaviour, but needs strong regulation to work. (india.mongabay.com).
4. COP28: India calls for focus on 'green credits' as alternative to carbon offsets. (spglobal.com).
5. Unboxing India's 'Green Credit' Rules 2023. (lexology.com).
6. New environmental laws in India: The next chapter of change. (enhesa.com).
7. Environmental Laws in India. (linkedin.com).
8. Environmental Laws in India. (clearias.com).
9. Smith, B., Fricker, H. A., Gardner, A. S., Medley, B., Nilsson, J., Paolo, F. S., Holschuh, N., Adusumilli, S., Brunt, K., Csatho, B., Harbeck, K., Markus, T., Neumann, T., Siegfried, M. R., & Zwally, H. J. (2020). Pervasive ice sheet mass loss reflects competing ocean and atmosphere processes. *Science, 368*(6496), 1–4.
10. Moser, C. S., & Dilling, L. (2007). Toward the social tipping point: Creating a climate for change. [PDF].
11. Li, T.-T., Wang, K., Sueyoshi, T., & Wang, D. D. (2021). ESG: Research progress and future prospects. *Sustainability, 13*(21), 1–4.
12. Napoletano, E., & Curry, B. (2022). What is ESG investing? *Forbes Advisor.*
13. Finger, M., & Rosenboim, M. (2022). Going ESG: The economic value of adopting an ESG policy. *Sustainability, 14*(21), 1–5.
14. Houghton, J. (2005). Global warming. *Reports on Progress in Physics, 68*(6), 4–6.
15. Zhang, R., Sun, C., Zhu, J., Zhang, R., & Li, W. (2020). Increased European heat waves in recent decades in response to shrinking Arctic sea ice and Eurasian snow cover. *npj Climate and Atmospheric Science, 3*(1), 1–3.
16. Goel, A., & Bhatt, R. (2012). Causes and consequences of global warming.
17. U.S. Environmental Protection Agency. (2022). Overview of greenhouse gases. *EPA.*
18. Yasiri, A., & Géczi, G. (2021). Global warming potential: Causes and consequences. *Academia Letters, 3202*, 1–6.
19. Velders, G. J. M., Fahey, D. W., Daniel, J. S., Andersen, S. O., & McFarland, M. (2015). Future atmospheric abundances and climate forcings from scenarios of global and regional hydrofluorocarbon (HFC) emissions. *Atmospheric Environment, 123*, 1–5.
20. United Nations Environment Programme. (2018). About Montreal Protocol. *OzonAction.*
21. United Nations Environment Programme. (2014). *Climate Change 2014 Synthesis Report* (pp. 26–30).
22. United Nations. (2022). What is climate change? *Climate Action.*

23. Ross, J. (2019). An investing megatrend: How climate change and resource scarcity are shaping the future. *Visual Capitalist.*
24. Mallick, J., & Rahman, A. (2012). Impact of population density on the surface temperature and micro-climate of Delhi. *Current Science, 102*(12), 1–6.
25. Centers for Disease Control and Prevention. (n.d.). Safety and health topic: Tickborne diseases. *CDC.*
26. United Nations. (2015). *The Paris Agreement.*
27. van den Berg, R., Bours, D., Brousselle, A., Čekan, J., Chaplowe, S., Chelimsky, E., Davies, I., Felcis, W., Leiter, T., Menezes, D., Picciotto, R., Rogers, P., Rowe, A., & Uitto, J. (2022). What should evaluation learn from COP 26? Views of evaluation practitioners. *Evaluation, 28*(1), 5–6.
28. World Business Council for Sustainable Development. (2004). *The GHG Protocol: A corporate reporting and accounting standard (Revised edition).*
29. Read, S. (2022). What is the difference between Scope 1, 2, and 3 emissions, and what are companies doing to cut all three? *World Economic Forum.*
30. Wallach, O. (2021). Decarbonization 101: What carbon emissions are part of your footprint? *Visual Capitalist.*
31. World Business Council for Sustainable Development. (2004). *The Greenhouse Gas Protocol.*
32. Ghosh, I. (2020). A global breakdown of greenhouse gas emissions by sector. *Visual Capitalist.*
33. Press Information Bureau. (2021). Ministry of Coal, Government of India. *coal.gov.in.*
34. Mahdi, S. M., Nightingale, P., & Berkhout, F. (2002). A review of the impact of regulation on the chemical industry.
35. Jing, Q.-L., Liu, H.-Z., Yu, W.-Q., & He, X. (2022). The impact of public transportation on carbon emissions—From the perspective of energy consumption. *Sustainability, 14*(10), 1–3.
36. Trading Economics. (2019). India GDP from agriculture. *TradingEconomics.com.*
37. Kumar, R., & Raj Gautam, H. (2014). Climate change and its impact on agricultural productivity in India. *Journal of Climatology & Weather Forecasting, 2*(1), 1.
38. Energeia. (2020). The diesel generator: Pollution, policies, and compliance. *Energeia.*
39. Goyal, K. (2021). Six actions to limit global warming to 1.5°C. *Renewable Watch.*
40. International Renewable Energy Agency. (2013). *Smart grids and renewables: A guide for effective deployment (Working Paper)* (pp. 7–10).
41. UNESCO. (2018). Commemorations: World Day for Cultural Diversity. *UNESCO.*
42. United Nations. (2021). *UNEP in 2021* (pp. 4–12).
43. Green Climate Fund. (2020). *Annual report 2020* (pp. 29–30).
44. UNFCCC. (2015). *The Paris Agreement.*
45. Government of India. (n.d.). *India's updated first nationally determined contribution under Paris Agreement* (pp. 1–4).
46. Press Information Bureau. (2022). India's updated nationally determined contributions. *PIB.*
47. Press Information Bureau. (2022). PM launches 'LiFE Movement' for adoption of environment-conscious lifestyle. *PIB.*
48. Ministry of Environment, Forest and Climate Change. (2022). *Lifestyle for environment* (pp. 5–6).
49. Ministry of Environment, Forest and Climate Change. (2022). *Lifestyle for environment* (pp. 10–12).

50. Ministry of Environment, Forest and Climate Change. (2022). *Lifestyle for environment* (pp. 12–13).
51. Press Information Bureau. (2022). Forest Survey report 2021 released; increase of 2,261 sq km in the total forest and tree cover of the country in last two years. *PIB.*
52. National Mission for Clean Ganga. (2020). नमामिगंगे. *Ministry of Jal Shakti, Government of India.*
53. Press Information Bureau. (2022). National Clean Air Programme. *PIB.*
54. Press Information Bureau. (2023a). Green agriculture. *PIB.*
55. Press Information Bureau. (2023b). Green agriculture. *PIB*
56. Press Information Bureau. (2019). New leadership group announced at Climate Action Summit to drive industry transition to low-carbon economy. *PIB.*
57. Schroders. (2022). *What is ESG and why does it matter?* (pp. 1–4).
58. Bose, S. (2020). Evolution of ESG reporting frameworks. In *ESG and Responsible Institutional Investing Around the World* (pp. 1–9). Springer.
59. International Finance Corporation. (2021). *IFC ESG Guidebook* (pp. 24–25).
60. ADEC Innovations. (2018). ESG investing and climate change. *ADEC ESG.*
61. Boston Consulting Group. (2023). *Climate change & sustainability consulting.*
62. Values Investment Strategies and Research Ltd. (2005). *Who Cares Wins 2005 Conference Report* (pp. 9–11).
63. Tata Consultancy Services. (2022). *Business responsibility & sustainability report* (pp. 72–73).
64. HDFC Bank. (2022). *HDFC Bank BRSR report* (pp. 415–416).
65. Infosys Limited. (2022). *Infosys Limited BRSR report* (p. 357).
66. Adani Total Gas Limited. (2022). *Business responsibility sustainability report: Section A – General disclosure* (p. 227).
67. Larsen & Toubro Limited. (2022). *Integrated annual report 2021–22: Business responsibility & sustainability reporting – Section A: General disclosures* (p. 32).
68. HCL Technologies. (2022). *HCL BRSR report 2021–2022* (p. 215).
69. Asian Paints Limited. (2022). *Asian Paints BRSR report* (p. 20).
70. Wipro Limited. (2022). *Wipro Limited BRSR report* (p. 382).
71. Ultratech Cement Limited. (2022). *Business responsibility & sustainability report – Section A: General disclosures* (p. 173).
72. Adani Ports and Special Economic Zone Ltd. (2022). *Business responsibility and sustainability report – Section A: General disclosure* (p. 391).
73. Adani Power Limited. (2023). *Adani Power BRSR report* (pp. 183–184).
74. Tech Mahindra Limited. (2022). *Tech Mahindra business responsibility and sustainability report* (p. 285).
75. Adani Green Energy. (2021). *Standing strong for climate resilience – Renewables* (pp. 10–72).
76. Bharat Petroleum. (2022). *Sustainability report 2021–2022* (pp. 143–145).
77. Coal India Limited. (2022). *Business responsibility and sustainability report – FY 2021–22* (pp. 53–58).
78. Larsen & Toubro. (2022). *Annual review 2022: Technology for sustainable growth* (p. 81).
79. Tata Power. (2022). *Tata Power annual report* (pp. 2–6).

80. Godrej Agrovet. (2021). *Annual report* (p. 44).
81. Mendiluce, M. (2022). Setting science-based targets to combat climate change. *Harvard Business Review.*
82. Shekarian, E., Ijadi, B., Zare, A., & Majava, J. (2022). Sustainable supply chain management: A comprehensive systematic review of industrial practices. *Sustainability, 14*(13), 3–8.
83. Martin, M., Lazarevic, D., & Gullström, C. (2019). Assessing the environmental potential of collaborative consumption: Peer-to-peer product sharing in Hammarby Sjöstad, Sweden. *Sustainability, 11*(1), 3–5.
84. Frishammar, J., & Parida, V. (2019). Harvard Business Publishing Education. *Harvard Business School Publishing.*
85. Pricewaterhouse Coopers. (2022). Helping you manage the gap between water supply and demand. *PwC.*
86. Ågerfalk, P. J., Axelsson, K., & Bergquist, M. (2021). Addressing climate change through stakeholder-centric information systems research: A Scandinavian approach for the masses. *International Journal of Information Management.*
87. Tata Steel. (2022). *Responsible growth. Sustainable future* (pp. 62–68).
88. McKinsey & Company. (2022). An era of renewable energy growth and development. *McKinsey & Company.*
89. Schmundt, W., Georgii, B., Hegnsholt, E., Holm, M., Gardner, S., Klose, F., Gupta, A., Blanc-Brude, F., Lum, L., Wright, A., Mohottala, S., & Selikowitz, D. (2023). *Building the green hydrogen economy.* Boston Consulting Group.
90. Ellen MacArthur Foundation. (2020). What is a circular economy? *Ellen MacArthur Foundation.*
91. AgIS Capital LLC. (2020). Philosophy: How AgIS engages on ESG. *AgIS Capital.*
92. LLC, C. P. (2023). Global warming storyboard by Oliver Smith. *Storyboard That.*
93. SustainoMetric. (2020). ESG to SDGs: Connected paths to a sustainable future. *SustainoMetric.*

5.5 Implementation of Artificial Intelligence for Judicial Efficacy in India

[1]Anmol Patil, [2]Samyukta Satish, and [3]Siddharth Ramkumar

[1]Undergraduate Student, FLAME University

[2]Undergraduate Student, FLAME University

[3]Undergraduate Student, FLAME University

ABSTRACT

Judicial efficacy is a huge problem in India. With more than 50 million pending cases across the country, India's judicial system faces a staggering backlog that could take more than 300 years to resolve at the current pace (Yasir & Scholiers, 2024). The current system is burdened by resource constraints and requires a paradigm shift. By leveraging Artificial Intelligence, courts can automate several administrative tasks that would otherwise delay judgements and can also prioritize cases by filtering them on the basis of urgency to ensure that critical matters receive timely attention.

The Indian Supreme Court Artificial Intelligence Committee recently developed the SUPACE (Supreme Court Portal for Assistance in Court Efficiency) in order to streamline case management and clear the judicial backlog. However, the 'black box problem' caused by the lack of performance transparency of the algorithms poses an impediment to the effective functioning of the tool. Further, the non-explainability of the AI's decision making process creates an asymmetry of information between the makers of the Legal AI tool and its end-users (lawyers, judges, etc.).

Besides, the implementation of such AI tools needs to be examined for systemic biases in the training of its datasets. While SUPACE is only designed to extract relevant facts from previous cases, it is still susceptible to historical and sampling biases that may impact the prioritization of fact extraction. There is, however, only little prescription from the Supreme Court on the prohibition of unacceptable usage of such tools in its judicial functioning. Skewed judgements produced by foreign legal AI such as the USA's COMPAS and the UK's HART further raise precedent to prevent systemic discrimination in the development of SUPACE (Sengupta *et al*., 2021).

Through the application of a mixed-methods approach, this paper will analyze the shortcomings as well as the effectiveness of such a framework. Quantitatively, it will measure the reduction in the workload of cases and inquire into the datasets that train the algorithms. Whereas,

qualitatively, the ethical implications of this system shall be analyzed through primary data interviews with legal professionals (judges in the High Courts and Supreme Court) and academicians researching the ethical implications of AI and Law as well as a review of literature about the perceptions of AI usage in legal research. This shall be complemented by secondary sources such as the former CJI's statements on acceptable usage of AI in court and the official expression of interest by the Supreme Court for developing AI solutions. Advisory opinions of think-tank institutions such as the Vidhi Centre for Legal Policy shall also be considered to develop a robust research proposal.

The solutions for these problems include curating diverse datasets for SUPACE to prevent skewed training, publish openly accessible datasets and Explainable AI (XAI) to provide transparency, and easy-to-understand operations for the end-users of this legal technology. The paper will review the ethical usage of AI tools in the Indian judicial system to ensure quick, accessible, and impartial justice for good governance.

Keywords: Judicial Efficacy, Artificial Intelligence, SUPACE, Transparency, Systemic Bias, Interpretability, Indian Supreme Court, Legal Technology, Judicial Accessibility

INTRODUCTION

The judiciary, India's third pillar of democracy, plays a pivotal role in the preservation of the rule of law and safeguarding the fundamental rights of citizens. However, colossal pendency levels and long case processing times, impedes the judicial system to ensure timely and equitable justice (Agarwal and Behera, 2024). According to the National Judicial Grid, India faces a case pileup of more than 50 million cases. At the current pace, it would take 300 years to completely clear the administrative backlog (Yasir and Scholiers, 2024). Furthermore, case backlogs have exponentially increased over the past 20 years, especially in the district courts, with more than 2.5 million cases pending to be resolved (National Informatics Centre, 2024). India's longest running law case - a bank liquidation case - was settled only last year after 72 years. There is hence a requirement for a serious revisitation of the judicial backlog in India.

Consequently, in order to enable smooth functioning of overburdened pending court proceedings and to maximise the number of cases cleared, the judicial system needs substantial reforms, upgradation of massive court infrastructure, required reallocation and recruitment of judges and court staff (Agarwal and Behera, 2024). In line with this, literature has optimistically positioned technological integration in the Indian judiciary as a solution for the improvement of efficiency and timely delivery of justice. It is therefore interesting to examine discourses about previous usage and evaluate whether it can be used for judicial efficacy if the AI is designed responsibly.

RESEARCH QUESTION & OBJECTIVES

Research Questions

Our primary research question we aim to address is the extent to which AI systems can replace traditional legal methodologies in India's judicial system, and what should their role be decision maker or enabler?

We also aim to address the following secondary Research Questions:

1. What is the contemporary usage of legal AI in the global context? What do we understand from the UK's HART and the USA's COMPAS systems in terms of ethics and the scope of usage of legal AI systems?
2. What are the learning outcomes from the challenges faced from implementation of softwares such as SUPACE?
3. In which specific aspects of legal research can AI systems be most effectively used to enhance efficiency and accuracy?

Research Objectives

This research aims to provide an understanding about the intersection of Artificial Intelligence and Law. By reviewing literature and scholarly pieces, the evolving attitudes surrounding the usage of AI in courts is documented thereby enabling a discussion on the potential of AI systems to replace/complement traditional legal methodologies. The paper shall also deliberate on the limitations of its usage.

Further, it shall conduct an analysis of AI tools in international legal systems and especially evaluate through case studies on HART (used in the UK) and COMPAS (used in the USA) to recognize boundaries on the usage of such tools. It shall conduct a review of India's contemporary usage of AI and the broader discourses surrounding its institutionalization. It shall also address the shortcomings in the attempt to consolidate Indian legal AI. By assessing these trends, this research then aims to underscore the specific roles AI can play in legal research. It shall also discuss the accountability structure if an AI tool were to be used for legal research and the responsibility of judges, lawyers and legal institutions to ensure answerable human oversight.

METHODOLOGY

For this research, we conducted semi structured interviews with lawyers from the Bombay High Court, Pune district court, as well as tribunal lawyers to understand the contemporary usage of AI in courts as well as their perspectives on its future employment. We have proposed a model for its implementation based on their recommendations for its usage as well.

This paper employs an exploratory qualitative methodology to understand the potential as well as limitations of using technology in courts. We conducted extensive review of literature to gain an academic perspective also from an ethical standpoint. Through case study analysis of softwares such as SUPACE and COMPAS, this paper aims to draw insights on also the shortcomings of legal AI integration as well.

LITERATURE REVIEW

We reviewed existing literature on the use of AI in judicial efficacy through a decade wise chronological study of resources to understand how the perspective of this subject evolved. Our review revealed a transition from early speculation in the 1970s to the emergence of

expert systems in the 1980s, a shift towards an interdisciplinary approach in the 1990s, and an increasing focus on the practical and ethical considerations of AI use since the 2010s.

The primary focus of academic papers around this topic in the 1970s was on how computers could assist lawyers in handling the overwhelming amount of legal information available. Buchanan and Headrick's 1970 paper on 'Some Speculation about Artificial Intelligence and Legal Reasoning' marked an early stage of real consideration of the potential of artificial intelligence to model human thought and assist in legal reasoning (Buchanan and Headrick, 1970). The paper describes how early computer systems were already being used for basic legal information retrieval. The authors shed light on the existing legal retrieval systems, such as the University of Pittsburgh-Aspen System and association-factor retrieval systems. These systems primarily aided in finding potentially relevant documents based on keywords.

However, they do not assist with the more crucial task of processing the retrieved information to build legal arguments. The authors suggested a shift in the use of computer systems to be utilized for more than just keyword matches. The authors argued that if AI could comprehend legal concepts and reasoning, it could help lawyers analyze case law, identify relevant precedents, and build stronger arguments. The scholars placed their confidence in the potential of computer systems to demonstrate the capacity to model human thought. These computer systems could also store vast amounts of information, reducing the load on human lawyers. This would be possible through an interdisciplinary and collaborative effort of both computer professionals as well as lawyers.

The authors also highlighted the reasons for potential challenges in such an interdisciplinary approach. Lawyers tend to perceive computers merely as storage devices for retrieving cases and statutes through classification systems. Computer scientists, on the other hand, have often viewed law through a very logical lens - a fixed collection of facts and principles that computers can help with by quickly retrieving the "correct" answers. This view undermines a more nuanced approach in a lawyer's role in constructing arguments and the computer's information processing capabilities beyond just simple storage.

Additionally, the authors also point out another problem in such a development: lawyers often apply complex rules without conscious awareness of them. This makes it difficult to articulate their methods and thought processes. It also makes coding the logical reasoning behind different laws a difficult task. The authors called for a more sophisticated understanding of legal material to interpret the meaning behind different laws. However, due to the complexity of legal language and reasoning, AI at the time was limited to simple search systems that relied on matching words and phrases. It is also clear that during this time, AI was thought to benefit lawyers, and its application for judges had not been thought of yet.

By the 1980s, there was a general call for a rise in the role of expert systems to assist humans in the judicial domain. In his paper, 'Expert Systems in Law: A Jurisprudential Approach to Artificial Intelligence and Legal Reasoning', author Richard E Susskind (Susskind, 1986) highlights that there is a growing recognition of computer systems in law that need to move beyond basic legal information retrieval systems (like LEXIS) to embody knowledge and

demonstrate intelligence. The author also highlighted the limitations of the then-existing expert systems. There was still a lack of trustworthy, well-developed, and commercially available expert systems in the legal field. He criticizes existing law initiatives because they lack a nuanced nature of fact analysis and legal reasoning by excessively depending on deductive logic. The author's primary argument is that the development of expert systems in law must be grounded in sound jurisprudential principles such that it emphasizes the importance of integrating legal reasoning into its design and structure.

In response to the shortcomings identified, the author launched an interdisciplinary research initiative at the Programming Research Group of the University of Oxford. Rather than beginning with surface-level legal rules or practical legal tasks, the project assumed jurisprudence as its starting point. By doing so, they aimed to build formal and theoretically grounded models of legal reasoning. Oxford Project represented a foundational effort to align the construction of legal expert systems with deeper theoretical insights. Efforts during this era continue to be aligned towards lawyers' use and not the court directly.

It was in 1990 when researchers began to explore a deeper role for AI, where it was to be used not just to assist lawyers, but to actually improve how legal decisions were made within the court system itself. The paper "Artificial Intelligence and Law: Stepping Stones to a Model of Legal Reasoning" by Edwina L. Rissland marked the development of AI and Law as a recognized interdisciplinary field by focusing on legal argumentation, reasoning with rules, cases, and precedent. The author's goal was to build computational tools for legal practice and research, with early systems such as LDS (Legal Decision-making System) and HYPO (Hypothetical-Based Reasoning) already leading the way. She underscored the potential of machine learning to improve legal performance. The author defines two goals for AI in the legal domain: First, to understand the fundamental aspects of legal reasoning by applying legal rules and formulating context-specific arguments that support legal education and research. The author identifies several foundational themes that lie at the intersection of AI and law. This includes reasoning with rules, where early rule-based expert systems attempted to formalize legal knowledge through structured "if-then" logic.

The author also addresses the challenge of the treatment of open-textured legal concepts; these are vague or flexible terms that cannot be captured by defined rules. The author's "hard/easy questions" framework combines rules, semantic networks, common sense, and real examples of past cases. This system allows the AI to determine whether a question is "easy" (straightforward) or "hard"(open to interpretation) so that it can decide its path of response accordingly. The author discusses hybrid models that combine rule-based and case-based reasoning, such as Gardner's approach, where case law is used to validate conclusions drawn from rules. She concludes the paper by emphasizing the mutually beneficial relationship between AI and law (Risslandt, 2013).

In the 2010s, the conversation around AI in law began to shift towards more practical applications and ethical considerations. While it saw an active role in predicting case outcomes, automating contract analysis, and enhancing access to justice, this decade also saw growing concerns about bias in AI models, lack of transparency in decision-making algorithms, and

the potential for automation to undermine judicial discretion. It became clear that AI's true potential could only be realized with careful human oversight to ensure fairness, accountability, and ethical decision-making.

CASE STUDIES

The current usage of artificial intelligence in the Indian judicial system is nascent. It is currently utilized for minor procedural efficiencies. Tools such as LexisNexis are used to access case laws and find accurate information through its comprehensive case records quickly (Open AI, 2025). It consists of legal datasets including statues and regulations which are powered through Natural Language Processing and Machine Learning (About Us | LexisNexis®, n.d.). It is also interesting to explore the usage of Artificial Intelligence in the global context. Vidhi Centre for Legal Policy, an established think tank that has worked on legal AI, has documented a global survey on the usage of legal AI. The following table illustrates some examples of foreign countries using AI (Sengupta *et al*., 2021):

Table 1

Country	Usage
Estonia	Adjudicating small claims (robot judge)
China/Russia/Mexico	Giving legal advice
Malaysia	Supporting sentencing decisions
Singapore	Transcribing court hearings in real-time

COMPAS & HART

Instigating a debate on the ethics of its usage, there have also been landmark cases of legal AI such as the COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) from the USA and HART (Harm Assessment Risk Tool) by the UK. The former is a tool that measures the recidivism rate, i.e. the percentage of former offenders who are rearrested for a similar category of offense. In a judicial setting where racial and age bias has been documented in the US, studies have criticized the delegation of normative decisions to proprietary softwares such as COMPAS with opaque algorithmic frameworks (Engel *et al*., 2024). ProPublica, a non-profit investigative journalism organization, produced a breakthrough report on the racial biases feeded onto COMPAS's algorithms. According to their report "Machine Bias" in 2016, black defendants were often predicted to be at a higher risk of recidivism than actuality. "Conversely, their analysis also claimed that white defendants who re-offended within the next two years were mistakenly labeled low risk almost twice as often as black re-offenders" (Larson *et al*., 2016).

Although Northpointe, the developer of the COMPAS system, subsequently refuted the claims of ProPublica, the report divulged a flaw in an otherwise fast developing integration of technology in justice. Scholars were concerned that the risk of mathematical miscomputations inputted into a powerful software endangers the integrity of the justice system. It may institutionalize disproportionate sentencing such as unfairly extending prison time or untimely release of individuals who have not served a complete sentence, etc. (Rudin *et al*., 2020).

Serious concerns have been raised over the use of algorithms for criminal justice purposes even in the usage of HART. This tool analyzes which criminals are most likely to reoffend and assist in making custodial decisions, specifically whether a suspect should be kept in custody (Burgess, 2018). The tool uses random forest forecasting (a ML technique). Nevertheless, it is imperative to understand that the algorithm constructed for these softwares may not have been the source of the biases. The prediction or analysis of cases are only a reflection of the data feeded into the system. Therefore, if the data is inherently biased, the algorithm would only replicate (and in some cases amplify) the existing biases (Babuta et al., 2018).

SUPACE

The backdrop of legal AI in the Indian judicial setting witnessed a catalyst in its development during the COVID pandemic. Launched under the leadership of the former Chief Justice of India, Justice Aravind Bobde in 2021, the Supreme Court Portal for Assistance in Court Efficiency was positioned to be a transformative tool that mitigated India's acute judicial backlog and assisted judges in legal analysis. As part of a larger 'e-judiciary' objective by the government for easier accessibility to justice, the launch of SUPACE arrived at a backdrop of expansioning discourses on digital legal infrastructural transformation, after the Supreme Court's initiative of making SCI Interact and the 17 benches for live transcriptions paperless (The E.L.O, 2024).

SUPACE is a blend of human and artificial intelligence. Its introduction is an attempt to understand the factual matrix of cases with an intelligent search of its precedents (Government of India, 2025).

Developed by the Supreme Court Artificial Intelligence Committee, SUPACE is a user-friendly fact extraction tool that reads case files and drafts court documents (The, E.L.O 2024). The AI-powered workflow of the tool has four parts:

1. File preview
2. Chatbot
3. Logic gate
4. Notebook

Conveniently, the text files can be converted into text from PDFs. The fact extraction system gives information about the case such as overview, chronology, judgement and so on. Finally, an integrated word processor truly makes the tool an end-to-end system (IndiaAI, 2021). The system thereby incorporates adaptive learning modules and machine learning techniques based on learning patterns to enhance its response each time. Nevertheless, this tool is only used as a chatbox. It is an enabler for augmenting rational decision making and not a sole determinant of judgements. As stated by the Chief Justice, SUPACE is not designed to lead the decision but channel the discovery of the facts of the cases that enables judges to decide (National Informatics Centre, n.d.). There would therefore continue to be full autonomy and discretion for the judges to ascertain the facts and declare judgements.

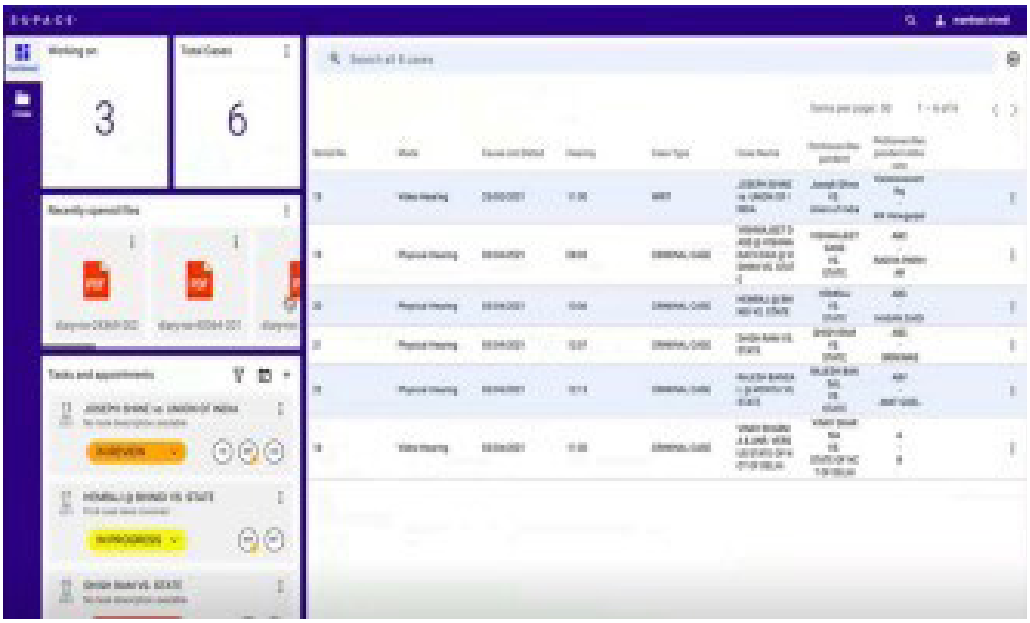

Fig. 1: National Informatics Centre. (n.d.)

Despite an optimistic inception, the adoption and the implementation of the SUPACE program met with constraints. Based on the researchers' interaction with legal professionals from different Indian law courts, the institutionalization of the program is found to be insubstantial. In fact, after its launch, there has been negligible attention in these spaces. Perhaps, this can be attributed to the redirected efforts towards digitization of courts after the shift in the Chief Justices (PTI, 2025). This is also potentially due to the non-binding nature of the program during the introduction. While Supreme Court and High Court judges were encouraged to utilize this technology, efforts were not taken to scale its operations or institutionalize. Nevertheless, this initiative can still be termed to be in its early experimental stages and witness growth subsequently.

Further, as previously established, since the mathematical code behind the algorithm for the AI is not open-source, it creates a black-box problem regarding its rationale (Sengupta *et al*., 2021). The makers of SUPACE, the AI committee of the Supreme Court, are therefore not transparent about its framework - leading to the questioning of its integrity. Even if the algorithm was disclosed, it is imperative to fund efforts for explainability vis-à-vis training the potential users of SUPACE about its functionality. In order to enable public scrutiny and development of the software, there must be prevention of asymmetry of information between the makers and the users of the software by training how to operate it (Sengupta *et al*., 2021).

PROPOSED MODEL

T**his Section Introduces Two Approaches:** AI as a decision enabler for lower courts like Lok Adalats and District Courts and AI to enable procedural efficiency in High Courts.

AI as a Decision Enabler

In the lower courts, AI Judges will primarily focus on minor civil cases that do not require complex legal interpretations. Given that these cases include established precedents, this could include traffic offenses (e.g., speeding, parking violations, running red lights), municipal code violations (such as encroachment or waste management issues), small claims or financial disputes under ₹50,000 and cheque bounce cases (under ₹25,000, excluding fraud allegations) (Section 138 in the Negotiable Instruments Act, 1881, n.d.). However, this model does not accommodate cases that involve custody, marriage, or cases with criminal charges, issues around caste or gender, constitutional matters, or cases involving vulnerable groups. These shall remain within the human jurisdiction.

This can be carried out in two phase rollout strategy:

The Phase 1 will involve a pilot launch in select Lok Adalats. In select urban jurisdictions equipped with advanced e-court infrastructure, the implementation of AI-assisted adjudication will be piloted in order to set precedent for other cases. Petitioners shall apply via a digital portal and will be offered the option to select AI-assisted resolution at the time of filing. However, the end jurisdiction lies in the discretion of the human judge.

In the second phase, during the digital filing process, litigants will have the option to select an AI-enabled "fast-track" hearing. Only upon obtaining the mutual consent of both parties, the AI Judge will examine the submitted documentation, interpret applicable legal provisions, and generate a preliminary judgment (OpenAI, 2025). Again, this system is only applicable for minor civil cases. To ensure legal legitimacy, each AI-drafted verdict will require a signature by a designated magistrate. In order to incentivize the AI method, the participants can be provided with fast track adjudication as opposed to physical court appearances.

Currently, district courts in India usually have around 2–3 additional judges per jurisdiction, with an average of 21 judges per million people (Meghwal, A.R., 2024). Under this model, 1–2 of these judges would act as AI supervisors.

Litigants can log cases through an online portal, thus bypassing the wait for court dates. Cases will be queued digitally based on priority, and an available AI Judge is assigned to the case. The AI Judge will then process the case using legal models and precedents to draft a suggested judgment. The supervising judge will review the AI's suggestion. If it is legally sound, the case is closed. However, if the AI's decision is ambiguous, the case returns to the traditional record for human resolution. Once a case is resolved, the next in line is processed without delay. This ensures continuous, and efficient case handling. This system minimizes backlog, especially in districts with low case volumes, enabling swift case resolution.

AI Support Systems in High Courts: Procedural Efficiency

Unlike lower courts, where AI might play a primary role, AI in high courts will mainly serve as an assistive tool, augmenting human judgment rather than replacing it.

The role of AI in high courts will focus on case sorting and prioritization where it will sort incoming cases (writ petitions, PILs, appeals) based on urgency. AI will generate non-binding legal summaries, referencing relevant past judgments to assist judges in their initial assessments. It can suggest draft orders or format judgments using natural language processing that is based on precedents and case histories (OpenAI, 2025).

AI research assistant modules can be added to bench clerks' terminals and judges' dashboards. The AI model will be trained to flag cases where similar past cases have yielded consistent outcomes. This way, the AI is not making the decision but simply providing statistical transparency. Next, each state's high court can create an AI oversight and ethics committee. This group can be composed of judges, legal tech experts, and data ethicists. It should incorporate a comprehensive safeguarding framework to mitigate risk and uphold procedural integrity. It will strictly comply with the provisions of the Digital Personal Data Protection Act, 2023. In order to avoid the black box problem and include transparency within the framework, the training datasets and algorithmic framework must be made publicly available. This model must also undergo regular evaluations conducted by independent bodies such as legal aid organizations and academic institutions.

CONCLUSION

This proposed model, however, does not aim to disparage the inherent institutionalized issue within India's judicial system. Artificial intelligence cannot be perceived as a method to solve the structural challenges of massive backlogs. Scholars have viewed the optimism around SUPACE's launch as well as other AI models to be a 'technology theatre': "a situation where technology is used to project a solution, but without any serious attempts to consider the structural challenges that cause the problem" (De Souza, 2024).

During this research, it was evident that there is only scarce literature present about this topic. SUPACE as well as other AI models are in their early nascent stages requiring efforts to scale its operations.

Furthermore, SUPACE's opaque algorithmic framework presented as a limitation to independently scrutinize the tool's operations. Given the recency in the launch of such technology, knowledge and expertise surrounding its usage are scattered. There is a requirement to calibrate the understanding of the software and legal AI.

By adopting a comparative approach with other foreign softwares such as HART and COMPAS, the paper divulges a rather discriminatory element within the software that reinforces the biases of its inputted dataset. India still faces one of the lowest judge-to-population ratios globally—21 judges per million of the population across the country (Spandana, 2025). In an attempt to expand accessibility to justice, digital transformation must not neglect equitable judicial reform.

References

1. About Us | LexisNexis®. (n.d.). Www.lexisnexis.com.

2. Agarwal, S., & Behera, S.R. (2024). Mammoth backlog of court cases pending in India: A spatial visualisation. Regional Studies, Regional Science, 11(1), 757–760.
3. Babuta, A., Oswald, M., & Rinik, C. (2018). Machine Learning Algorithms and Police Decision-Making Legal, Ethical and Regulatory Challenges.
4. Buchanan, B.G., & Headrick, T.E. (1970). Some Speculation about Artificial Intelligence and Legal Reasoning. Stanford Law Review, 23(1), 40.
5. Burgess, M. (2018, March 1). UK police are using AI to inform custodial decisions – but it could be discriminating against the poor. Wired.
6. De Souza, S.P. (2024, November 28). AI and the Indian Judiciary: The Need for a Rights-based Approach [HTML version]. Thehinducentre.com.
7. Engel, C., Linhardt, L., & Schubert, M. (2024). Code is law: how COMPAS affects the way the judiciary handles the risk of recidivism. Artificial Intelligence and Law.
8. Government of India. (2025). Use of AI in Supreme Court Case Management. Pib.gov.in. IndiaAI. (2021). Enhancing the efficiency of India's courts using AI. IndiaAI.
9. Larson, J., Mattu, S., Kirchner, L., & Angwin, J. (2016, May 23). How We Analyzed the COMPAS Recidivism Algorithm.
10. Meghwal, A.R. (2024). Government Of India Ministry Of Law & Justice Department Of Justice Lok Sabha Minister Of State (Independent Charge) Of The Ministry Of Law And Justice
11. National Informatics Centre. (2024). NJDG-National Judicial Data Grid.
12. PTI. (2025, February 27). AI can assist but cannot replace human judgment, says former CJI Chandrachud. The Economic Times; Economic Times.
13. OpenAI. (2025). ChatGPT (Mar 14 version) [Large language model].
14. Risslandt, E. (2013). Artificial Intelligence and Law: Stepping Stones to a Model of Legal Reasoning.
15. Rudin, C., Wang, C., & Coker, B. (2020). The Age of Secrecy and Unfairness in Recidivism Prediction.
16. Harvard Data Science Review, 2(1).
17. Sengupta, A., Jauhar, A., & Mishra, V. (2021, April 15). Responsible AI for the Indian Justice System – A Strategy Paper. Vidhi Centre for Legal Policy.
18. Section 138 in the Negotiable Instruments Act, 1881. (n.d.).
19. Spandana, S. (2025, January 29). Will more judges help reduce case backlog? - Supreme Court Observer. Supreme Court Observer.
20. Susskind, R.E. (1986). Expert Systems in Law: A Jurisprudential Approach to Artificial Intelligence and Legal Reasoning. The Modern Law Review, 49(2), 168–194. JSTOR.
21. The, E.L.O. (2024, November 17). India has emerged as a pioneer in digitization of its judicial systems such as its courts, tribunals, etc. As of today, the High Courts and Supreme Court of India has completely adopted the digital infrastructure in various domains be it hybrid hearings, e-filing, viewing case status, maintaining di.
22. Yasir, S., & Scholiers, E. (2024, January 13). "A Lifelong Nightmare": Seeking Justice in India's Overwhelmed Courts. The New York Times.

Kya Aapke Democracy Mein Reel Hai?

5.6

[1]Aadi Sardesai, [2]Stuti Agarwal, and [3]Yaana Postwala

[1]FLAME University

[2]FLAME University

[2]FLAME University

ABSTRACT

In this paper, we try to answer one simple question: why do Indian politicians post the content that they do? In this paper, we aim to explore the motivating factors for engagement undertaken by Indian Politicians on the Internet. Our unit of analysis is national-level ministers and Members of Parliament with significant online presence. We introduce a new framework of 'vernacularisation' to look at how and if there has been a significant change in interactions between the public and the state and if, through the introduction of Social Media, citizens are able to negotiate the Social Contract for their benefit.

Vernacularisation, as we define it, is a process of (i) increased access to forums where there can be communication between subjects and the state, (ii) a greater trend towards participation outside of simply voting and (iii) an increased ability to question authority and demand correction or seek answers for questions. This framework is increasingly important in an ever-changing technological space and allows us to better understand movements, cultural developments, and political actions. Social Media has allowed political movements to organise and rally support from all over. While there have been instances of negative political engagement, such as the January 6th Insurrection, we have also seen positive outcomes, such as India's Public Consultation Process in which people have worked to send important feedback on new legislation. We can often see other important stakeholders in the policy-making process, such as the Media and Industrialists, utilising social media to ask what the nation wants to know by summoning a national sample with a hashtag or to drum up support for something. One can see all this as vernacularisation playing out in process; from a history of allowing only elites into policy-influencing spheres, it is social media that is democratising the field and acting as a leveller for the masses.

We aim to look at how Politicians use their social media as (i) a signalling tool for any agenda at hand, (ii) to upkeep and maintain their image and finally (iii) to help achieve their ideological goals. The methodology we've adopted is a systematic, thematic and quantitative analysis of their Social Media feeds (here, we consider Instagram and X (formerly known as Twitter) as the

two major sources of Social Media). In light of 2024 being a general election year, we saw that outside of conventional political campaigning at the booth and constituency level, politicians and future to-be incumbents could leverage their online feeds to campaign a lot more robustly. Online campaigning proves to be a lot more cost-effective and can also guarantee a larger reach, as it doesn't require a large congregation of people at one time. In our analysis, we look at what iconography and agendas contestants are putting forth to voters; from this, we see a very interesting divergence between Rajya Sabha and Lok Sabha MPs and contestants who are considered to be more politically significant than those who aren't. While we are aware that MPs aren't elected to Rajya Sabha, what is interesting to note is the media output by Rajya Sabha MPs both during and post elections as compared to Lok Sabha contestants and MPs.

Outside of elections, more interesting trends appear in the feeds of elected MPs, such as how they engage with comments, who they follow, the sort of content that is put out, edits, choice of music, and so on. All this comes together to form a cogent, largely homogeneous identity between two groups: Ministers with largely Individualised Social Media feeds and Ministers without. Another interesting thing we have noticed in our preliminary research is that now more and more content is being shot to fit ideal guidelines for reels, such as 9:16 aspect ratios, 30 FPS, at least 720p resolutions, and so on.

While there is existing literature that deals with public relations and discourse analysis done for specific politicians/movements/ideologies, what seems to be missing is an understanding of how citizens are engaging with this. Also, a robust framework is being put out that can make analysis sharper and allow for better policy intervention by either making processes more accessible or re-evaluating public engagement done by politicians on a private level. This research will benefit all stakeholders involved in the process. We believe that this research will have a big effect on how we understand accountability from our elected representatives, how Indians are dealing with so much access given to our elected representatives, and the future of public engagement in an ever-more connected world.

Keywords: Social Media, Political Campaigning. Decentralised Democracy, Reels.

INTRODUCTION

Historically, communication between citizens and the state was top-down and unidirectional. Governments spoke through official statements, press releases, and media, while the public had limited means to respond, participate, or hold power accountable. However, the rise of social media has fundamentally changed this relationship. Platforms such as Twitter, Facebook, and Instagram have democratised communication, enabling real-time, two-way contact between governments and citizens. Citizens are no longer limited to the sidelines; they may now question, criticise, mobilise, and interact directly with politicians, institutions, and leaders. Social media serves as both a megaphone and a mirror, amplifying popular opinion while reflecting the difficulties of democratic discourse in the digital age.

This transition from monologue to dialogue has major implications for how democracy works. It disrupts conventional power structures, introduces new kinds of accountability, and carries with it a variety of issues, including misinformation.

Despite these technical breakthroughs, much of politics is based on traditional, exclusionary norms. Electoral campaigning is frequently limited to party-level performances, and the

essential question—"Why are you not campaigning for yourself?"—emphasises the larger institutional limitations that prohibit grassroots political participation. While platforms have evolved, the structures remain durable.

In our paper, we are trying and developing a framing by introducing the idea of Vernacularisation which refers to the process of negotiation, the social contract, and democratising on three axes: participation, access, and questioning authority.

LITERATURE REVIEW

This literature study delves into the developing academic discussion on the intersection of social media and democracy, emphasising its double potential to boost democratic engagement while also posing major threats to political stability. The review draws on global and Indian contexts to combine significant ideas, identify repeating themes, and highlight critical conflicts in the ongoing debate.

Tucker *et al*. (2017) give a comprehensive analysis of this issue, tracing social media's progression from a tool for freedom to a cause of democratic disruption. Their research shows that, while platforms initially facilitated mass mobilisation and access to information, they have now become grounds for misinformation, polarisation, and authoritarian influence. This sets the tone for much of the discussion about digital media and political life. Zeitzoff (2017) offers a thorough framework for analysing how social media promotes conflict. Rather than favouring incumbents or challengers, He suggests that social media alters the nature of conflict itself, rendering basic narratives ineffective. His work encourages scholars to think about how communication technologies connect with political strategy in various ways. In the Indian context, Jadhav and Sarkale (2021) highlight the positive role of social media in building democratic ideas. They highlight its ability to amplify marginalised voices, increase transparency, and encourage youth participation in politics. Their findings back up the positive idea that internet tools may strengthen participatory democracy, particularly in a diverse and populous country like India. However, the study does not go into detail about the difficulties of misinformation or digital intelligence gathering.

Sahu (2019) broadens the discussion by defining new media as an emerging tool of democracy in India. He emphasises its importance in disrupting established media structures and promoting direct communication between political leaders and the general public. While the work admits the possibility of misuse, it remains mostly optimistic, depicting social media as a democratising force that bridges the divide between the state and the public.

These findings represent an emerging consensus: social media is neither inherently democratic nor undemocratic but rather a contested world formed by political context, regulatory frameworks, and user behaviour.

RESEARCH QUESTIONS AND OBJECTIVES

This literature study delves into the developing academic discussion on the intersection of social media and democracy, emphasising its double potential to boost democratic engagement while also posing major threats to political stability. The review draws on global and Indian

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METHODOLOGY

In this paper, we analyse the interaction between State actors and citizens on social media platforms to (i) identify the pillars of "Vernacularisation" in practice and (ii) apply the framework to understand what the focal points of content posted by politicians are and Indian citizens interact with it. Our unit of analysis is Members of the Union Council. This was done to be able to identify conversations on governance not just at the national level but also at the constituency level, given the background that they are not only overseeing Ministries are also the elected representatives of their constituencies. The assumption here is that since the members are among the upper crust of the politicians with well-established career profiles and political identities, they are more likely to post individualised/decentralised content on their pages, thereby minimising the risk of confirmation bias for our hypothesis. To define our sample set, we chose 16 Ministers out of the 36 active members, amounting to a 44% representation sample for the Union Council. This set currently consists of Members of only one House India's bicameral legislature, the Lok Sabha.

The list of the Ministers included is as follows: Ram Mohan Naidu, Pralhad Joshi, Jual Oram, Giriraj Singh, Bhupender Yadav, Gajendra Singh Shekhawat, Annpurna Devi, Kiren Rijiju, Manohar Lal Khattar,

H.D. Kumaraswamy, Piyush Goyal, Dharmendra Pradhan, Jitan Ram Manjhi, Rajiv Rajan (Lalan) Singh, Sarbananda Sonowal, Virendra Kumar Khatik

The above-mentioned set remains consistent with our goal to analyse governance at the constituency level and minimise bias confirmation. The count of reels is 10 per Minister, with 5 from the recent period of February March 2025 and the other half from the electoral period of April to June 2024. The first half is treated as a control set. This bifurcation serves two purposes: (i) It eliminates time and campaigning pressure dependency in our analyses, and (ii) it helps identify change in posting patterns sans campaigning pressures. With 16 Ministers and 10 reels/posts per Minister, the sample set totals to a significantly acceptable count of 160 reels and posts.

For our thematic analysis, we coded the data into seven categories as defined below:

- **Electoral:** Posts primarily (but not limited to) about rallies, role in humans (e.g., infrastructure, women empowerment, access to essential commodities, etc.), and comments on other parties.
- **Pop-Media:** Includes topics such as movies, sports, and large-scale religious events.
- **National:** The key issues included under this tag are international relations, the "IndiaStory", national-level schemes, and Ministry-specific progress reports and events.
- **Party:** Posts about the party's functioning as a whole, including schemes, candidates, and events.
- **Regional:** This includes reels aimed at the constituency's audience or the larger geographical regions of North, South, East, and West.
- **Personal:** Primarily consists of reels/posts with solely the Minister commenting on ministerial or constituency topics.

In some cases, due to lack of availability of reels, the authors opted to analyse posts as substitutes.

- **Prime Minister Narendra Modi:** All the reels are focused on the PM. This category was introduced after some preliminary research due to the higher frequency of popularity on every minister's profile. To validate the data and maintain an accurate account, the structure of data recorded the Ministers, their parties, the date of posting the content, and a Notes section to detail the general agenda of the reel.

FINDINGS AND ANALYSIS

In the previous sections we outlined what categories we are working with; this section now focuses on our findings from the data that we parsed through. This is done across four sections, namely: (i) The Influence of Modi, (ii) Hashtag Analysis, (iii) Party-wise breakdown, and finally, (iv) Content Analysis findings.

Figure 1 shows how a comparison of electoral vs non-electoral reels shows the influence that we were initially talking about. Considering that this study was conducted on the group of ministers, all of whom are from the current NDA, it is obvious that power concentrates with the head of the bloc, Narendra Modi.

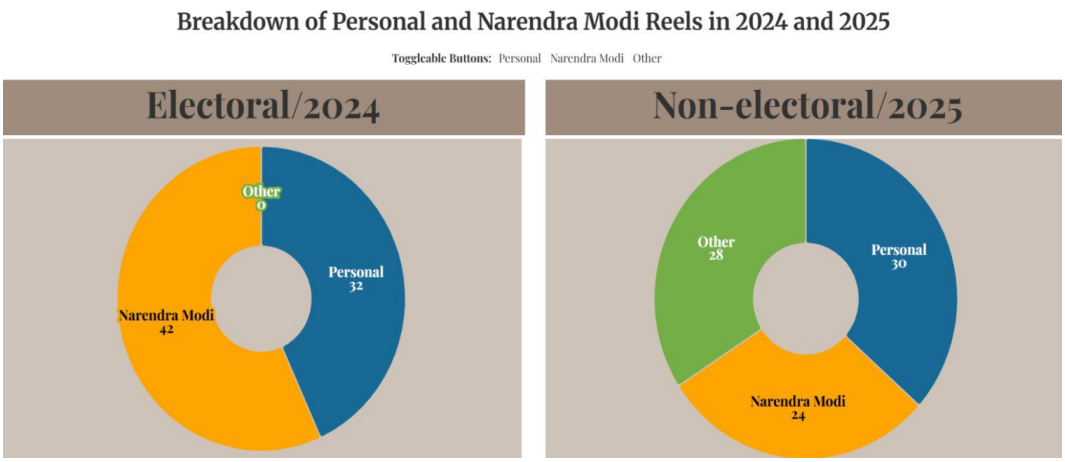

Fig. 1: The Influence of Modi

Figure 1 shows you that in the electoral period of 2024, Narendra Modi and Personal style of reels dominate the posting cycle. In fact, what is strange and to be noted is the fact that Narendra Modi in the 2024 election dominates the posting cycle when he is simply contesting one seat. While one could still chalk this up to "just an election year", the findings from the non-electoral year 2025 are what really put the nail in the coffin. Now that MPs have been elected, what is interesting to note is how Narendra Modi still almost takes up 1/3rd of the air space; do note that Narendra Modi was not even a profile that we sampled in this small study.

While Modi's influence has certainly gone down from the electoral year, this is not great news for vernacularisation. what seems to have happened is that a part of his airspace is simply diverted towards posts relating to contemporary events; the raw number of "personal" reels seems to almost be stuck at the 30 number, almost as if this is a point of saturation. Figure 1.1 is one of the best examples of proving the initial hypothesis.

Figure 2 shows a word cloud with hashtags from posts and reels we've covered. while the first section was largely concerned with what the direct content of the post was, here the object of study was what "meta-data" accompanies the main text.

Findings from Figure 2 seem to only corroborate earlier evidence. While you do now see a diversity of personalities and agendas, for example Lalan Singh, Munger, etc., these really are extreme cases. For example, look at the "lalan singh" label which occupies a lot of space; this isn't because lots of people are talking about Lalan Singh, but rather he just keeps on mentioning himself in hashtags, artificially boosting his count. Munger is Lalan Singh's Constituency which

is why it also sees such great representation. While one sees outliers like these, the general pattern seems to be clear: the discourse really narrows in on talking points of the BJP and the NDA at large, everything from "Ab KiBaar 400 paar" to "vote 4 bjp" and so on. it seems to be clear that there are rarely any individuals that campaign on their own name; it seems to be dominated by ideas of the party, its platform and one or two star campaigners.

Fig. 2: Hashtag Analysis

Figure 3 shows a breakdown of parties that the candidates we surveyed are from; this was to show the breakdown of members that we are considering. What is to be noted here is that the BJP does occupy the lion's share as if it were of the pie chart, but that is only because it is commensurate with its behaviour and performance in the current parliament session and the NDA at large.

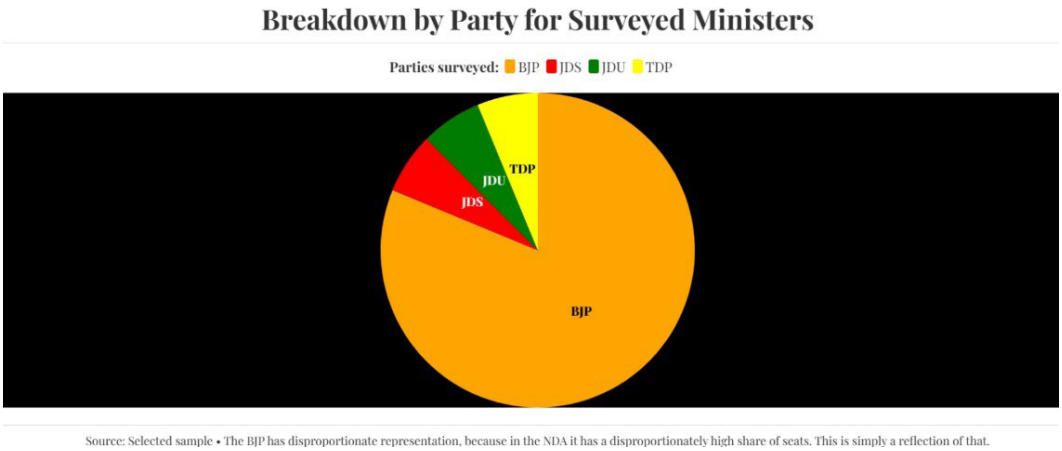

Fig. 3: Breakdown of Party Membership

The BJP here has a whopping 13 seats, with all other parties only having one singular seat. While one may be tempted to discard previous results based on this chart, what is important to note is the following:

(i) the BJP is running a minority government in the sense that it still very much depends on its allies and cannot at all afford to anger them, lest they lose the seat of power, and (ii) that in spite of holding such power, if one goes to the granular level, it seems that even these parties, especially those who were in pre-poll alliances seemed to campaign and jump on the BJP's "hype train". These points come together to once again reinforce previous points, that being, that the power does seem to centralise in certain loci.

Figure 4 comes with some context of its own. Initially, when we had started, we only had 6 categories; however, over the 381 data points that we generated, Narendra Modi showed up so many times that we realised that we would have to accommodate him into our categorisation.

Fig. 4: Content Analysis Findings

Narendra Modi appears 67 times; he is only second to the electoral category, which is so big because half of our sample was collected during the electoral period. Even from the content analysis we see some interesting standouts. While it may seem here that personal is extremely high up, one must realise that this is often accompanied with various other categories. Furthermore, things like National issues, Party issues and Regional issues seem to dominate the feeds of those surveyed. What one would expect in a fully vernacular system would be the fact that the personal would occupy the largest share, with others being mere shadows of what they currently are.

The content analysis seems to show that overall we are still not seeing a devolution of political power towards individuals with parties and powerful personalities still holding the limelight. Other findings include the fact that more and more content is being shot to fit ideal guidelines

for reels, such as 9:16 ratios, 30 FPS, at least 720p resolutions and so on. This is almost optimised content to be posted and there is almost a real economy that politicians are trying to best cater their content for. We also noticed themes which would attract various classes of audiences, in the sense that there were always reels for various types of people, meme posts, some serious posts, some animations, and some that included different languages and scripts, but all ensured to cater to various audiences who may be watching. On the note of various audiences, we also saw that when a generic reel of the party is posted, there is limited engagement in the comment section, mostly just emojis, in contrast to when a reel is posted of the representative himself, the level of participatory democracy increases.

LIMITATIONS AND CONCLUSION

In our most current study we have only been able to map out half the cabinet; our future plans for the study are to map out the whole cabinet. This will also allow us to systematically look at the behaviour of Rajya Sabha MPs. While we have made informal notes and observations about how they behave and they seem to accord with our general observations, in some cases even more so than Lok Sabha MPs, as they have no constituencies who will vote for them, we are yet to put it into a formal form. We also have to map this exercise out to the INDIA bloc, while our informal analysis informs us that the same process is playing out there. What seems to be interesting is that due to the many fractures in the alliance itself, there is no standardised powerful face like that of PM Modi from the NDA. Our observations tell us that the same process plays out but for individual parties and sometimes, in factions of various parties. Finally, most of our standardised analysis was based on Instagram posts; ideally, we would like to diversify across platforms, such as looking at X (formerly known as YouTube and WhatsApp mass forwards. This process will take a lot longer; however, once again from our informal observations, the same pattern seems to be maintained, just slightly differently optimised for the respective medium.

While there are certain limitations in the current study, we still believe that it is internally rigorous enough to hold water by itself. Our major findings from this study of analysing 160 reels stand to be (i) Big personalities end up taking airtime from politicians; (ii) the hypothesis holds true that despite vernacularisation, there isn't devolution of power; and finally, (iii) the debate between structural and process reform is not able to contend with the real issue, that being that at the constituency level public service delivery or good governance isn't able to happen simply because nobody is responsible.

References

1. Abbas, K. (2021, March 8). Navigating the Digital Maze: Freedom of Expression in India's Digital Democracy. HeinOnline. https://heinonline.org/HOL/LandingPage?handle=hein.journals/injloitd5&div=83&id=&page=
2. Dalton, R.J., Scarrow, S.E., & Cain, B.E. (2006). New Forms of Democracy? Reform and Transformation of Democratic Institution. Google Books. https://books.google.co.in/ks?hl=en&lr=&id=J3uBsoEAgiAC&oi=fnd&pg=PA1&dq=democracy+process+reform+&ots=d6q0ugR273&sig=-BTJjmuPx29aEksZkAjD71nFoeU&redir_esc=y#v=one page&q=democracy%20process%20reform&f=false

3. Dollery, B. (2010). Are there Tensions between Democracy and Efficiency in Local Government? A Conceptual Note on the Structural Reform Debate. Urban Policy and Research, 28(1), 117–123. https://doi.org/10.1080/08111140903552704
4. Priya, V. (2015). Digital Democracy Social Media in Political Campaigns "The 2014 Lok Sabha Experience in India." Academic Research International, 6(2). https://core.ac.uk/download/pdf/72803248.pdf
5. Tucker, J.A., Theocharis, Y., Roberts, M.E., & Barberá, P. (2017). From Liberation to Turmoil: Social Media And Democracy. Journal of Democracy, 28(4), 46–59. https://doi.org/10.1353/jod.2017.0064
6. United States Census Bureau. (2022). U.S. Census Bureau Current Population. Census.gov. https://www.census.gov/popclock/print.php?component=counter
7. Zeitzoff, T. (2017). How Social Media Is Changing Conflict. The Journal of Conflict Resolution, 61(9), 1970–1991. https://doi.org/10.2307/26363973

Thank You Note

When we first imagined DigiNiti, it was nothing more than a hopeful conversation - an idea we tossed around over coffee, wondering if a student-led policy conference could really take shape. And then it did. What unfolded over the next few months was a whirlwind of coordination, creation, and collaboration, and it's safe to say: we had no idea just how big this would become.

Now, as we reflect on the journey of DigiNiti: Technology and Policy Conclave 2025, we feel overwhelmed - with joy, with gratitude, and with immense pride. None of this would have been possible without the collective effort of so many people across FLAME University who believed in us and gave their time, trust, and talent to bring this event to life.

To our Institutional Mentors and Champions

We are deeply grateful to Dr. Dishan Kamdar, Dr. Venkatramanan, Dr. Virender Sharma, and Dr. Santosh Kudtarkar for their support and encouragement from the very beginning. Their faith in our student-led vision gave DigiNiti the foundation it needed.

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To our Volunteer Team — our Engine

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What started as a spontaneous conversation between the three of us - Shivangi, Shreyas, and Parth - soon became a whirlwind of spreadsheets, speaker calls, design drafts, campus walkthroughs, budget approvals, and crisis management. Between the three of us, we wrote every email, made every guest itinerary, booked every cab, ran every tech check, built the session flows, designed the signage, coordinated with over 45 volunteers, wrote all the content (including this one!), and somehow found time to breathe and laugh through it all.

We weren't just student organisers - we were a full-fledged conference team. And while none of us expected how intense this would get, we also wouldn't trade this experience for anything else. We poured our heads, hearts, and so many late nights into this. And the fact that it came together the way it did is something we will always carry with us.

To all who were part of DigiNiti - whether in the spotlight or behind the scene - **thank you**. You showed us how powerful collaboration can be, and how far a student-led vision can go when a community believes in it.

With warmth and gratitude,

Shivangi Singhal, Shreyas Ramkumar, Parth Piyush Prasad

The DigiNiti Team
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Group Excel India
www.groupexcelindia.com

Excel India Publishers
91 A, Pratik Market, Munirka, New Delhi-110067
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