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AI on India Stack:
Powering Inclusive Development for Viksit Bharat

Ejaz Ghani

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By

Ejaz Ghani[1]

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Abstract

India has a unique opportunity to leverage its Digital Public Infrastructure (DPI), specifically the India Stack, to deploy Artificial Intelligence (AI) for broad-based development ("AI for Development"), particularly in crucial sectors like agriculture and healthcare. This paper summarizes India's key strengths (DPI, demographics, IT base, startup ecosystem) while acknowledging the critical challenges that must be addressed – the digital divide, the AI skills gap, infrastructure deficits, the need for robust data governance and ethical frameworks, securing adequate funding, and bridging the policy implementation gap. This paper concludes by emphasizing the potential for India to become a global leader and a model for the Global South in using AI responsibly and effectively to achieve inclusive growth and the ambitious goals of Viksit Bharat 2047.

[1] Former Lead Economist, World Bank

1. Introduction: India's Leapfrog Potential - From Digital Services to AI for Development

India's economic development journey has often charted a unique course, defying conventional stage-based theories. Its remarkable digital revolution, particularly in the services sector over the past few decades, represented a significant structural transformation. Challenging the traditional progression from agriculture to manufacturing and then services seen in many East Asian economies, India effectively leapfrogged, embracing modern services like software development, IT outsourcing, and digital finance. This transformation, fueled by a dynamic IT ecosystem and a vast pool of skilled professionals, has been instrumental in India becoming one of the world's fastest-growing large economies, with services now contributing over 50% to its GDP [*National Accounts Statistics*]. This demonstrated success in leveraging technology provides a powerful precedent and foundation as India stands poised for its next transformative leap – harnessing the power of Artificial Intelligence (AI).

The advent of AI presents not just a technological frontier but a profound opportunity to accelerate progress towards India's national aspiration of 'Viksit Bharat @ 2047' – a developed, prosperous, and inclusive nation. The potential extends far beyond conventional economic applications; AI can be strategically deployed to tackle deep-seated developmental challenges. Imagine AI-powered precision agriculture significantly boosting yields for smallholder farmers, AI-driven diagnostic tools enhancing healthcare access in remote villages, personalized learning platforms addressing educational disparities, and smart infrastructure improving urban livability. This vision of "AI for Development" aligns with building both state **Capability** (effectiveness in achieving goals) and societal **Inclusiveness** (ensuring benefits reach all).

This paper argues that India is uniquely positioned to lead this charge. Its established Digital Public Infrastructure (DPI), notably the India Stack, provides an unparalleled platform for deploying AI solutions at scale. Combined with its demographic dividend, a large and adaptable tech workforce, and a vibrant startup ecosystem, India has the core ingredients for success. However, realizing this potential requires navigating significant challenges, including bridging the digital divide, developing AI-specific skills, building necessary infrastructure, establishing robust data governance and ethical frameworks, securing adequate funding, and ensuring effective policy implementation. This paper analyzes these opportunities and challenges, exploring the strategic pathways and policy interventions needed for India to successfully leverage AI as a transformative force for inclusive development, potentially serving as a beacon for the Global South.

2. The Transformative Power of AI: Economic and Social Impacts in India

Artificial intelligence is poised to act as a powerful engine for both economic growth and social progress across numerous sectors critical to India's development. Its applications

promise enhanced efficiency, improved service delivery, and innovative solutions to persistent development problems.

In **healthcare**, AI offers revolutionary possibilities. AI-powered image analysis tools are enabling earlier and more accurate detection of diseases like cancer and diabetic retinopathy, with examples like Niramai Health Analytix showcasing indigenous. AI assists in accelerating drug discovery and can personalize treatment plans based on individual patient data, leading to better health outcomes. These advancements hold immense promise for improving diagnostics, disease management, and access to care, especially in resource-constrained settings, directly contributing to improved human development indicators.

Financial services are being significantly reshaped by AI through enhanced fraud detection (reportedly reducing losses by substantial margins, e.g., [*e.g., up to 40%)*, more accurate credit scoring potentially expanding financial inclusion for underserved populations, algorithmic trading, and personalized financial advice delivered via chatbots, improving efficiency and customer service.

Agriculture, vital for India's economy and livelihoods, stands to benefit immensely. Precision agriculture techniques powered by AI – utilizing drone imagery, IoT sensor data, and machine learning for yield prediction and optimized resource use (water, fertilizer) – can substantially increase productivity and sustainability. Pilot programs have indicated potential for significant yield increases and resource savings. AI can also provide farmers with timely pest warnings and localized forecasts.

In **manufacturing**, AI drives automation, enhances quality control through visual inspection, and optimizes operations via predictive maintenance, boosting efficiency and global competitiveness. AI is similarly transforming **supply chains and logistics** through better demand forecasting and route optimization. The **retail and e-commerce** sectors leverage AI for personalization and operational efficiency. While requiring workforce adaptation, AI is also expected to create new, higher-skilled jobs across these sectors.

Crucially, AI can amplify the impact of India's established **Digital Public Infrastructure (DPI)** for social development. Platforms built on Aadhaar (identity), UPI (payments), Digi Locker (documents), DIKSHA (education), e-NAM (agri-markets), and UMANG (government services) generate vast data and provide channels for delivering AI-enhanced services. For instance, AI could analyze anonymized health data linked via Aadhaar to predict disease outbreaks, use UPI transaction patterns (with consent) for alternative credit scoring, or power personalized learning modules on DIKSHA. India's success with Direct Benefit Transfers (DBT), facilitated by the JAM trinity (Jan Dhan, Aadhaar, Mobile), has already demonstrated the power of DPI in reducing leakages and improving welfare delivery. Effectively integrating AI with these platforms offers a unique pathway to scale social impact programs, enhance **Capability** in service delivery, and promote **Inclusiveness**, provided robust data governance and ethical considerations remain central.

3. India's AI Fundamentals: Strengths and Foundations

India's ambition to lead in AI for Development is grounded in several unique strengths:

- **Pioneering Digital Public Infrastructure (DPI):** The India Stack layers (Aadhaar, UPI, DigiLocker, DEPA consent framework) create a population-scale, interoperable digital backbone unmatched globally, significantly lowering barriers for AI service deployment.
- **Demographic Dividend & Adaptable Workforce:** A large, young population (median age ~28.7) offers a vast potential workforce adaptable to AI skills, contrasting with aging demographics elsewhere. The existing large IT workforce ([*e.g., 5M+*]) possesses foundational skills and demonstrated adaptability, aided by widespread English proficiency ([*estimated number, e.g., 125 million*]).
- **Established IT Ecosystem:** Decades of IT service leadership provide technical expertise, project management skills, and infrastructure adaptable to AI development and deployment.
- **Vibrant Startup Culture:** A dynamic AI startup ecosystem is emerging across sectors, fostered by government initiatives like Startup India, developing context-specific solutions.
- **Vast Data Resources:** Scale and digitalization generate enormous datasets, crucial for training AI models, necessitating responsible governance.
- **Focus on "AI for Development" & Frugal Innovation:** National strategy emphasizes societal applications, leveraging India's strength in cost-effective, scalable solutions ("frugal innovation").
- **Global Collaboration & Late-Mover Advantage:** Strong ties with global tech firms and research institutions facilitate knowledge transfer. India can potentially learn from global experiences in AI governance and ethics.

India's rapid digital adoption, especially via mobile broadband, has surpassed many emerging economies in user numbers. However, there remains a persistent gap in overall internet penetration and fixed broadband infrastructure compared to developed countries and leaders like China or Singapore. While India's UN E-Government Development Index (EGDI) ranking has improved significantly (e.g., 97th in 2024), reflecting strong online service delivery potential, it still indicates room for enhancing overall digital governance effectiveness (**Capability**) to match global leaders.

4. Critical Challenges on the Path Forward

Despite significant strengths, realizing India's AI potential requires confronting substantial challenges:

(4.1) Bridging the Digital Divide: This remains a fundamental obstacle to **Equity** and **Inclusiveness**. Significant disparities persist across multiple dimensions:

- *Connectivity:* Reliable broadband remains unavailable to large swathes of rural India
- *Devices:* Affordability limits ownership, especially of computers, for low-income groups

- *Literacy:* Foundational digital skills are lacking among many, particularly women, older citizens, and rural populations
- *Gender Gap:* Women consistently lag behind men in internet access and usage
- *Content:* Lack of multilingual content restricts access.
- Despite overall growth in digital access, significant portions of the population, particularly rural women and marginalized groups, remain excluded. This severely limits their ability to benefit from AI-driven services and opportunities, directly undermining the **Inclusiveness** goal of Viksit Bharat and necessitating urgent, targeted interventions.

(4.2) Building the AI Talent Pool: A severe shortage of skilled AI professionals hinders innovation and adoption. Educational curricula need urgent reform for industry relevance, requiring stronger academia-industry partnerships. Scaling up quality vocational training and continuous upskilling programs is essential.

(4.3) Overcoming Infrastructure Deficits: Beyond connectivity, core AI infrastructure is lacking. Access to High-Performance Computing (HPC) is limited. Data center capacity needs significant expansion, focusing also on energy efficiency. Domestic production of specialized AI hardware remains nascent. Infrastructure development is also spatially lopsided, concentrated in major cities.

(4.4) Establishing Robust Data Governance and Ethical Frameworks: Leveraging data requires trust. Effective implementation of the DPDPA 2023 is critical, including operationalizing the Data Protection Board. Policies for governing non-personal data are needed. Frameworks must address ethical concerns proactively – algorithmic bias, fairness, transparency, and accountability – to ensure AI serves societal interests (**Rule of Law**, **Equity**, **Accountability**).

(4.5) Securing Adequate and Sustained Funding: India's current investment in AI (e.g., India AI Mission allocation of ~$1.24Bn over 5 years) lags significantly behind global leaders like the US and China. A comprehensive, long-term funding strategy involving increased public budgets, private investment incentives (VC, PPPs), and international collaborations is needed.

(4.6) Addressing the Policy Implementation Gap: A gap often exists between policy articulation and effective execution due to bureaucratic hurdles, coordination failures between ministries/agencies, and capacity constraints. Translating AI strategies into tangible outcomes requires overcoming these implementation bottlenecks.

5. Reigniting India's AI Drive: A Strategic Policy Agenda

A revitalized, action-oriented strategy is needed to overcome these challenges and accelerate India's "AI for Development" journey. Key elements, synthesized from the analysis and potential solutions, include:

- **Focused Implementation:** Establish clear implementation roadmaps for national AI strategies with specific timelines, responsible agencies, KPIs, and robust monitoring. Create empowered coordination bodies (e.g., AI Implementation Task Force).
- **Strategic Funding:** Develop a comprehensive, multi-year funding plan based on needs assessment, increasing public allocations while actively mobilizing private and international capital through targeted incentives and innovative financing models. Ensure transparent fund management.
- **Talent Ecosystem Development:** Execute large-scale reforms in education (AI curricula integration) and skilling (industry partnerships, quality focus, inclusive outreach), creating a pipeline of AI-ready professionals and promoting AI literacy broadly.
- **Building Data & AI Infrastructure:** Implement a time-bound plan for expanding nationwide broadband (BharatNet completion), HPC facilities, green data centers, and edge computing infrastructure. Foster domestic hardware capabilities. Ensure robust data governance through effective DPDPA implementation and NPD frameworks.
- **Championing Responsible AI:** Develop, implement, and enforce a national ethical AI framework focusing on fairness, transparency, accountability, and safety. Promote research in XAI and ethical auditing.
- **Prioritizing AI for Social Good:** Launch sector-specific AI missions (health, agriculture, education, climate adaptation) leveraging DPI. Incentivize frugal innovation tailored to local needs and languages.
- **Bridging the Digital Divide:** Implement a comprehensive national strategy combining infrastructure, device affordability, targeted digital literacy (esp. women/rural), and accessible e-governance design.
- **Strengthening Regional Capacity:** Provide targeted support (funding, expertise) to build AI ecosystems in lagging states and promote inter-state knowledge sharing.
- **Fostering Global Collaboration:** Engage proactively in global AI governance discussions, advocate for Global South priorities, and build international research and development partnerships.

6. Conclusion: Leading AI for Development in the Global South

India possesses a unique and powerful confluence of factors – population scale, world-class Digital Public Infrastructure, a vast and adaptable talent pool, a dynamic startup ecosystem, and a stated government commitment – positioning it to become a global leader in leveraging Artificial Intelligence for Development. By strategically harnessing AI to address core challenges in sectors like healthcare, agriculture, education, and public service delivery, India has the potential to significantly accelerate progress towards its Viksit Bharat 2047 goals, improving the lives of millions and unlocking substantial economic value.

However, this potential is contingent on proactively addressing significant challenges. The deep digital divide remains a critical barrier to inclusive adoption. Bridging the AI skills gap requires urgent and comprehensive reforms in education and training. Substantial investments are needed to build the requisite compute power, data infrastructure, and connectivity. Robust data governance and ethical frameworks are non-negotiable for building public trust and ensuring responsible AI deployment. Securing adequate, sustained funding and overcoming bureaucratic implementation hurdles are practical necessities.

India's path forward requires a concerted national effort involving government, industry, academia, and civil society. A revitalized AI mission, focused on pragmatic implementation, strategic investments, inclusive skill-building, responsible governance, and bridging the digital divide, is essential. By embracing this challenge, India cannot only transform its own development trajectory but also offer a unique model of "AI for Development" – one that prioritizes human well-being, equity, and sustainability – providing inspiration and practical pathways for the Global South and contributing significantly to shaping an inclusive global AI future. The AI moment is here; India must seize it strategically and responsibly.

Appendix

Table 1 provides a detailed matrix outlining specific policy actions across these areas, including rationale, implementation considerations, and monitoring metrics.

Appendix Table 1: Comprehensive Policy Actions for India's AI For Development

Policy Area	Specific Policy Actions (Illustrative Examples & Quantifiers)	Rationale/Impact	Implementation & Monitoring Considerations	Priority / Indicative Timing	Key Responsible Agencies
1. AI Strategy & Implementation	Establish dedicated AI Implementation Task Force; Publish quarterly progress reports on IndiaAI Mission KPIs; Streamline grant/approval processes (e.g., 30% faster).	Address implementation gap; Ensure accountability; Track progress.	Implementation: Task Force, Digital tracking platform, Simplified SOPs. Monitoring: Quarterly KPI reports, Annual independent audits, Stakeholder feedback mechanism.	Immediate (I)	MeitY, NITI Aayog, PMO, Line Ministries

2. Funding & Investment	Allocate ₹20,000 Cr+ annually in budget for AI Mission; Launch ₹5,000 Cr PPP fund for AI Infra; Create ₹2,000 Cr AI Startup Fund; Establish funding oversight committee; Attract FDI.	Ensure sustained investment; Diversify sources; Promote transparency; Attract private capital.	Implementation: AI Investment Promotion Agency, VC Fund, PPP framework, Clear guidelines. Monitoring: Quarterly financial reports, Annual audits, Investment impact tracking (startups funded, infra built, FDI attracted).	Immediate (I)	Finance Ministry, MeitY, NITI Aayog, Industry Depts, DPIIT
3. AI Talent & Education	Integrate AI in [X] school curricula; Establish [Y] new AI degree programs (5 yrs); Train [Z] M individuals via govt schemes (3 yrs); Fund [N] industry-academia partnerships; Upskill existing workers.	Address skills gap; Align education with industry; Ensure inclusivity.	Implementation: National AI Skills Council, Standardized curricula (annual review), Training centers (incl. rural/mobile), Internships, Certifications. Monitoring: Track trained & employed nos., Employer satisfaction surveys, Participation of women/marginalized groups.	Immediate - Medium Term (I-M)	Ministry of Education, MeitY, MSDE, Universities, Industry
4. Data Governance & Access	Fully operationalize Data Protection Board & DPDP Act rules; Develop National Data Gov Policy (incl. NPD); Establish National Data Ethics Framework & Audit; Publish [N] new open datasets/yr.	Build trust; Ensure privacy & security; Facilitate responsible data sharing; Address bias.	Implementation: National Data Governance Authority, Ethics Committee, Secure data sharing platform, OGD portal enhancement. Monitoring: Track data breaches, Public trust surveys, Open dataset usage, Ethics audit compliance.	Immediate (I)	MeitY, Data Protection Board, NITI Aayog, Line Ministries