Preparing India for AI Adoption: Challenges and Solutions

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Abstract

Artificial Intelligence (AI) is quickly changing economies and societies around the world. It is being used in healthcare, farming, education, and government to make systems more efficient, accurate, and scalable. India, with its young population, large amounts of data, and growing digital ecosystem, is well-placed to benefit from this AI revolution. But to unlock its full potential, India must overcome several challenges—such as gaps in technology, infrastructure, education, regulation, and ethics. This essay looks at the main obstacles to AI adoption in India and suggests practical solutions for building a sustainable and inclusive AI-powered future.

India's digital infrastructure has made significant progress in recent years through initiatives such as Digital India, the JAM Trinity (Jan Dhan, Aadhaar, Mobile), and the India Stack, which includes UPI, Aadhaar, and Data Exchanges (Ref 1 and 2). However, gaps remain, especially in rural and semi-urban areas. AI requires strong digital connectivity, high-performance computing, and reliable cloud services. Limited access to high-speed internet in remote regions restricts the rollout of AI-powered solutions such as telemedicine, smart farming, and e-learning. Today, AI needs special hardware – such hardware has to be imported and is one of the major hinderance for AI becoming widespread in India.

AI also depends heavily on data. While India generates vast amounts of it, much of the data is not properly classified, fragmented, or siloed. Access to high-quality, annotated, and diverse datasets is limited, and there are few interoperable platforms or standardized protocols in key sectors like health, agriculture, and education.

To address these challenges, India can focus on a few key solutions:
- Build public-private partnerships to expand digital infrastructure in underserved areas.
- Accelerate 5G rollout and leverage satellite internet initiatives like Starlink and BharatNet to achieve nationwide coverage.
- Establish regional AI infrastructure hubs with compute clusters and data centres outside major cities.
- Create national data exchanges with sector-specific platforms to enable sharing of anonymized, structured data.
- Expand open data initiatives with clear APIs and compliance rules.
- Develop data stewardship models that ensure ethical collection and use of data, with user consent, privacy protections, and participatory governance.

India has several initiatives to establish data exchange platforms, including the upcoming National Data Platform (NDP) for a unified national data marketplace and the operational India Urban Data Exchange (IUDX), which facilitates secure data sharing for urban development. Another key initiative is the Agricultural Data Exchange (ADeX), a consent-based platform for sharing agricultural data. These platforms are designed to promote data-driven decision-making, innovation, and the development of data-based ecosystems across various sectors. However, these efforts are seriously in need of public out reach programmes.

India's education system is not yet fully aligned with the needs of an AI-driven economy. While top institutes like the IITs and IISc are advancing AI research, most other institutions face challenges such as outdated curricula, a shortage of qualified faculty, and limited access to hands-on AI tools. As a result, there is a shortage of skilled AI professionals, particularly in Tier 2 and Tier 3 cities. Possible solutions include updating school and college curricula to integrate AI, machine learning, and data science under the National Education Policy (NEP); introducing faculty development programs through workshops, online courses, and industry-academia partnerships; expanding accessible AI learning via government initiatives like SWAYAM and Skill India in collaboration with platforms such as Coursera, edX, and NPTEL; and creating AI-focused vocational training programs for ITI students, working professionals, and entrepreneurs.

As AI systems begin to influence decisions that directly affect people's lives, it is essential to ensure transparency, accountability, and fairness. At present, India does not have a comprehensive AI policy or legal framework to deal with issues such as algorithmic bias, surveillance, data protection, and liability in automated systems. There are several strategy papers – salient amongst them are from the Niti Aayog (Ref 3). and India AI mission (Ref 4).

The India AI mission has seven pillars: India AI Innovation centre for the deployment of indigenous LLMs, India AI Application Development Initiative for AI applications' development in critical sectors, AI Kosh Data Platform for creating datasets, models and toolkits for innovation in AI platforms, India AI Compute Capacity for providing IT infrastructure for AI, India AI Start-up Financing, India AI Future Skill for training manpower and Safe and Trusted AI for creating adequate guardrails for development, deployment and adoption of responsible AI.

Possible solutions include formulating strong AI ethics guidelines in line with global standards such as those from the OECD and UNESCO, with a focus on inclusivity, fairness, and transparency; setting up regulatory sandboxes where startups and companies can test AI solutions under oversight; developing adaptive legal frameworks for emerging technologies through regular consultations and expert reviews; and creating a national AI ethics board to oversee large-scale deployments and track their societal impact.

India has over 22 official languages and hundreds of dialects, but most AI systems are trained on English-focused datasets. This limits their ability to reflect the country's rich linguistic and cultural diversity. If AI tools are not designed with inclusion in mind, they risk widening social inequalities, especially for marginalized communities whose specific needs are often overlooked. Possible solutions include strengthening the Bhashini initiative (Ref 4) to develop multilingual AI tools such as speech-to-text, machine translation, and natural language processing across Indian languages; involving local communities in the design of

AI applications tailored to their contexts, whether in tribal healthcare, rural education, or urban sanitation; creating and open-sourcing region-specific datasets that capture diverse voices, accents, and cultural contexts; and promoting greater participation of women and minority groups in AI development teams to reduce bias and support more equitable adoption.

India lags behind global leaders in areas such as AI research output, patents, and startup funding. While institutes like the IITs and IISc produce high-quality research, there is still a strong need for closer collaboration between industry and academia, as well as better pathways to turn research into commercial applications. Niti Aayog report says that India has less than 100 researchers out of a worldwide number of 25000.

Possible solutions include setting up National AI Research Centres or Centres of Excellence across regions, modelled on successful global institutions; supporting AI startups in sectors like health tech, edtech, aggrotech, and fintech with seed funding, mentorship, and testing facilities; building international collaborations with leading countries and organizations to share knowledge and best practices; and boosting domestic startups by integrating their AI solutions into public service delivery through platforms like the Government e-Marketplace (GeM). Integration of AI with Digital Public Infrastructure (DPI) will give rise to interesting possibilities – large amount of data availability for training and multi-lingual capabilities of AI can be extremely beneficial to DPI. Public understanding of AI in India is still limited. Many people are unclear about what AI is, how it works, and what its impacts might be. This lack of awareness can lead to fear, misinformation, or resistance, especially when AI is introduced in sensitive areas like healthcare or law enforcement.

Possible solutions include running mass awareness campaigns through media, digital literacy programs, and local-language content to explain AI's benefits and limits; using community engagement models where citizens are involved and educated during pilot deployments; investing in explainable AI systems that can justify their decisions in simple, human-understandable terms to build trust; and creating citizen feedback mechanisms so users can report errors, biases, or harms caused by AI systems, ensuring they improve over time.

As AI adoption increases, new concerns are emerging around environmental impact, misuse, and employment. Training large AI models requires significant energy, raising sustainability challenges. AI can also be misused for harmful purposes such as deepfakes and misinformation, while automation poses risks of job displacement. The biggest fear is a scenario where AI could lead to large scale unemployment (Ref 6). India needs to ensure that AI growth balances people, environment, and productivity.

Possible solutions include promoting energy-efficient AI models and infrastructure powered by renewable energy; prioritizing AI projects that address social challenges in health, the environment, disaster management, and poverty reduction; launching reskilling and transition programs for workers whose jobs may be affected by automation; and funding research on responsible AI that emphasizes fairness, inclusivity, and sustainability.

Conclusion

AI presents both a challenge and an opportunity for India. It has the potential to address some of the country's most critical needs, such as better healthcare, quality education, sustainable farming, and more efficient governance. However, these benefits will only be realized if adoption is proactive, inclusive, and ethical. By strengthening the infrastructure, improving data systems, encouraging innovation, and building human skills, India can not only adopt AI but also play a role in shaping its global future. What is needed is more than a policy—it is a national effort that prepares every citizen, institution, and business for the era of intelligent machines.

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