Realizing "AI for all" in India

Contents

Foreword

The prowess and potential of Artificial Intelligence (AI) technologies have been recognized the world over. With record consumer adoption of generative Artificial Intelligence (AI), the technology witnessed its pivotal moment in late 2022. The technology has already been growing at a steady pace over the last few years with multiple sub-technologies reaching commercialization. Examples include recognition of handwriting, speech, images, reading comprehension, and language understanding. In each of these domains, AI systems have outperformed human benchmarks, creating a real impact on enterprises with efficiencies and automation.

AI is attracting huge investments, sparking debates about policy preparedness, capturing the attention of researchers, and driving accelerated innovation and industrialization of the technology. National level policy interventions are aimed at effectively seizing the opportunity while minimizing exposure to harms from AI. India embarked on the journey towards "AI for all" in its national strategy vision for AI in 2020.

Four years later, how prepared are we to realize AI's potential? The report examines India's readiness and key considerations to fulfill the ambition of bringing significant societal impact through AI. We apply six lenses to understand the readiness of the country for AI: technology infrastructure (computing capacity, networks and devices); research capabilities; data readiness; skills; regulatory environment; and ethical AI development. With this strong foundation, AI has the potential to democratize access to healthcare and education, unleash creativity and create numerous entrepreneurs. Use cases are emerging in sectors such as healthcare, education, public infrastructure, and agriculture.

The government needs to address the trade-offs involved in AI development while devising the right policy interventions. Some of these trade-offs include – access to data for public good versus data privacy; automation to improve economic productivity versus increasing risks of job displacement; fostering innovation versus responsible use of AI; or using AI in public policy versus the risk of exclusion of large section of population unaware about the technology or without access to high-speed internet or smartphones.

Steps such as the Personal Data Protection Act, Digital India bill, and the National Semiconductor Mission cater to some of these aspects. Continued policy thrust is needed to revive investments in telecoms infrastructure to support AI innovation, setting up open data ecosystems, promoting regional language AI research, developing ethical AI frameworks, incentivizing an entire ecosystem of AI hardware manufacturing, and promoting public awareness and reforming education.

I hope this report helps to shape the dialogue on realizing AI as the force to unlock the potential of billions of Indians.
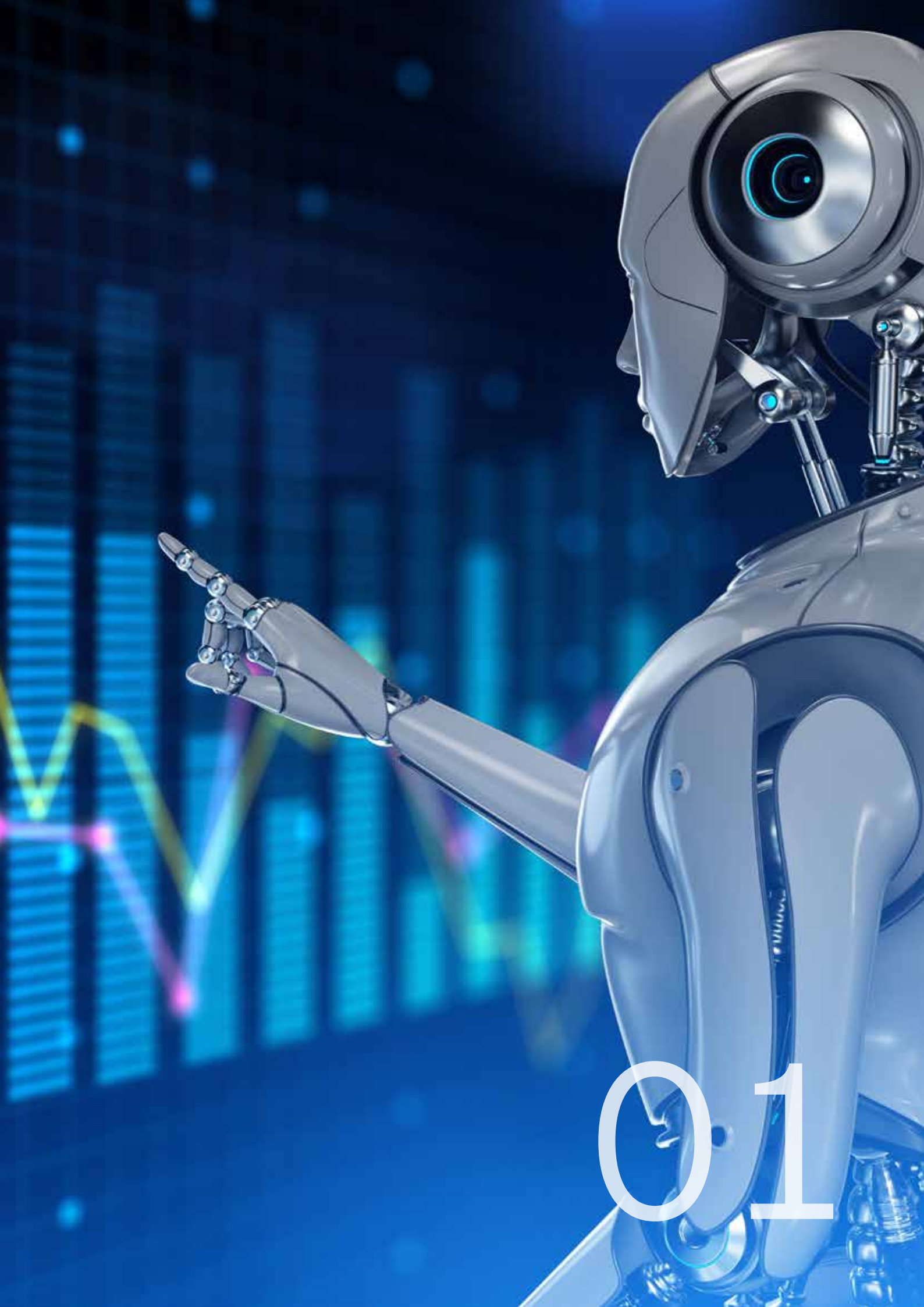
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Executive
summary

Social responsibility aur AI ke beech vilay AI ko human touch se samriddh karega. Teamwork of AI with humans humare desh ke lie chamatkaari saabit hoga.

Ye vichaar Bharat ke pradhanmantri shree Narendra Modi ne haal hi mein vyakt kiye the, jo darshata hai ki AI is poised to bring about a transformational impact on India, akin to what mobile internet achieved in the past decade. Recent digital investments, notably the India stack, Jan Dhan, and Aadhar, have laid a solid foundation to create a broader impact and drive equitable growth through AI. With access to the right AI tools, there is a potential to democratize access to healthcare and education, unleash creativity, and nurture numerous grassroots entrepreneurs.

Impacting a billion lives

> *"Kya hum samaj ki 10 aisi samasyaon ki pehchan kar sate hain jinka samadhan AI ke madhyam se ho sakta hai?"*
>
> - Honorable PM Narendra Modi

Addressing the nation, India's honorable prime minister Narendra Modi, issued a clarion call to harness the power of AI for societal impact. Since then, researchers, entrepreneurs, government bodies, and the industry have identified several use cases to leverage AI for extensive economic development. Sectors like healthcare, education, agriculture, and public services are well-positioned to spearhead such an impact.[1]

AI user persona 1

13 million kirana stores in India, employing 8% of India's workforce and contributing to 10% of GDP

Kirana shop owner in small town

Solutions through AI based tools

Can I determine right stock of milk I should keep without any wastage?

▶ **Prediction:** Insights of inventory data in real time can help to:
  ▶ forecast demand appropriately and reduce wastages
  ▶ ensure supply chain efficiency, by reducing demand/supply fluctuations

Can I understand changing customer behavior?

▶ **Optimization:** Insights through analysis of data on customer behaviour:
  ▶ can help to better plan inventory and sales
  ▶ lead to improved productivity through reduction in waste, leading to better revenue

Can I prevent theft from warehouse or incidens of shoplifting?

▶ **Safety:** Analysis of video footage can help to detect suspicious behaviour both at warehouse and at the shop and prevent loss of inventory

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1   Economic times, "How digital technology is empowering the kirana stores", 3 Jan 2022, Ibef, "Retail Industry in India", Aug 2023

Scaled use cases in these areas can accelerate economic growth and development, given the right thrust and direction at the government level. To illustrate the impact, we define three user personas (which represent a large chunk of the population of India - Kisan, Shramik, Kirana shop owner), their common problems, and how AI can enhance their lives.

A Kirana shop owner can determine the right inventory, reduce wastage, and better understand customer behavior. These use cases barely scratch the surface in terms of the overall impact that AI can create in the next several years. The solutions highlighted are proven to work, scalable, and readily deployable now.

In healthcare, AI can solve issues of public access, shortage of healthcare infrastructure, doctors, and radiologists through remote consultations, drug discovery, and patient data analysis for proactive interventions. In Agriculture, AI is[2]

AI user persona 2

58% of India's' population engaged in agriculture, with **15%** share of GDP contribution

Solutions through AI based tools

Kisaan in a farm

Can I predict the accurate quantity of Bajra I can grow?

▶ **Optimization:** Adopting best practices for sowing, irrigation, harvesting, storage, by analysing data on soil moisture, weather patterns, plant growth. This will help to reduce waste, increase output and accurately predict the quantity grown.

Can I predict loss of crops due to diseases?

▶ **Prevention and prediction:** AI tools help farmers diagnose crop diseases and pests by analysing images of plant leaves, ultimately helping them to plan harvests effectively

Can I receive funds to meet various needs?

▶ **Financial needs:** Access credit by analysing creditworthiness and providing personalized loan offers to meet various needs of farmers such as buying equipment's, seeds, fertilisers and personal needs such as healthcare, insurance, etc.

reducing information asymmetry among farmers and optimizing areas such as planting, fertilization, and harvesting through precision farming, and predicting crop yields based on weather patterns and soil moisture. In the education sector, AI-powered language learning platforms can provide personalized language instruction, speech recognition, and translation services to support multilingual education. Furthermore, AI promotes the quality of life of citizens through improved utilization of public transportation infrastructure, environmental monitoring, women empowerment, disaster response, public safety, and financial inclusion.

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2   Pib, "Contribution of Agriculture Sector towards GDP", 3 August 2021

Policy thrust to foster economic growth and societal development

As technology is still in its adoption stage, the government can direct and accelerate its penetration across the country. Mission-oriented innovation policies in the past have helped in channeling investments and contributed to development, generating large economic returns, and spurring private innovation spending. *Startup India jaise programs ne pichle dashak mein aisa prabhav dala hai, jisse desh ko global innovation map par rakh diya hai.*

Government's thrust on improving the lives of people through technology is clear: *"Har budget mein technology ki madad se ease of living ko badane par zor diya gaya hai"*

AI user persona 3

594 million labour force in India, second largest after China

Solutions through AI based tools

Can I increase my efficiency at work?

▶ **Enhance skills:** Learn new skills through personalized learning experiences, leading to better productivity at work

Can I improve/take care of my health to ensure minimum loss of work?

▶ **Focus on health:** Access healthcare services by providing personalized recommendations.

Can I meet my social security needs?

▶ **Financial Inclusion:** Access to social security benefits such as health insurance, education of children, home, personalised loans by determining right creditworthiness

Shramik at a construction or mining site, or a factory

To ensure the success of AI in India, several infrastructure-related gaps need to be addressed. Notable among these are[3]:

1) Reviving telecom infrastructure investments and implementing reforms in mobile handset financing.

2) Creating data trusts, open data ecosystems, and dedicated data platforms to collect the right quality and quantity of data.

Next, as AI becomes pervasive in the lives of citizens, AI literacy and education have become important to fill the gap that exists between the "producers", who understand the strengths and limitations of this technology, and the "consumers", who may lack knowledge about AI and are more vulnerable to its harmful applications. Widespread knowledge about AI can accelerate the acceptance of new technology and its integration into society.

The country needs to step up AI funding and research in regional languages. The honorable prime minister of India, Narendra Modi rightly emphasized the focus on research to reinforce national foundations, in his 76th Independence Day speech, *"Aazadi ke amrtikaal ke liye ek aur anivaaryata hai aur wo hai jai anusandhan. Yaani jai jawaan, jai kisaan, jai vigyaan, jai anusandhan."*

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3   Trading economics, "India - Labor Force, Total", 2022, World bank, "Labor force - total", 2020

India has showcased its leadership in frugal innovation in areas such as space exploration. What can the country learn in developing capabilities in AI from this success story? Key hallmarks of the effort in space exploration include indigenous technology building and partnerships and a focus on national development. The same principles can guide the development of AI in India with the setting up of local AI centers of excellence, regional clusters for AI-related high-tech manufacturing, and the creation of ethical frameworks. As part of the New Delhi declaration at the Global Partnership on AI (GPAI) summit, India along with 27 other countries, committed to take concerted action to ensure safe, secure, and trustworthy AI. India can continue to drive concerted action by framing AI regulations, policies, and standards to enhance public welfare.

"National Education Policy 2023 mein paaramparik gyaan aur bhavishy kee praudyogikiyon ko samaan mahatv diya gaya hai"

Furthermore, there is a need to implement systems to continuously monitor the impact of AI on society. The government can enable an ethical AI testing framework to guide startups and companies on the ethical development of AI algorithms and spread awareness about its unintended consequences. Such a step can help gain the confidence of the investing community.

Making India as the global hub of AI will rest on the timeless principles prescribed during the launch of the national program on AI: teamwork, vishvaas (trust), sahayog (collaboration), jimmedaaree (responsibility) aur samaaveshita (inclusivity).

Key considerations to make India as an AI hub	
Revive investments in telecoms infrastructure to support AI innovation	Telecom infrastructure is critical to enable AI-driven applications: ▶ Rationalize telecom levies and minimize Right of Way (RoW) charges. ▶ Subsidize capex on fiber using a viability gap funding model such as the Universal Service Obligation fund and establish a partnership framework to collaborate with multi-system operators (local cable service providers) for providing Fiber to the Home (FTTH) connectivity to rural households, leveraging the Bharatnet network. ▶ Implement TRAI's recommendation of establishing a neutral host for digital infrastructure (DCIP license), which could lead to lower capex and faster time-to-market. ▶ De-risk handset financing to facilitate the purchase of internet-enabled handsets by the lowest-income households, lower tax on entry-level 4G/5G smartphones, and encourage private players to set up an ecosystem for refurbished 4G/5G enabled handsets in rural areas.
Expedite setting up of open data ecosystems to support AI development	A robust data infrastructure is needed to create powerful AI applications: ▶ Encourage private players to share data by providing incentives such as tax exemptions, subsidies, reduced compliance burdens, improved goodwill, etc ▶ Create data trusts and develop sector-based open data ecosystems focused on specific priority areas, such as agriculture or healthcare.

Key considerations to make India as an AI hub	
Promote AI research and AI CoE (Centre Of Excellence)	*Akhil bharat mein AI ko badava dene ke liye,* regionalization and localization of AI is critical ▶ Create large, diverse, and high-quality datasets for each major Indian language for new AI technologies such as large language models (LLMs). Invest in research and development of algorithms and models that cater specifically to Indian languages. ▶ Earmark funds for international AI research work, remove operational or bureaucratic impediments and increase institutional support to international collaborators. ▶ Establish more state-level CoE hubs for AI with focus areas such as Generative AI, and computer vision, or even create sector-driven CoE such as those focused on agriculture, education, public services, etc.
Implement ethical AI frameworks	Concerted efforts are needed to resolve issues of algorithmic bias and other ethical considerations ▶ Lead the establishment of ethics guidelines for AI uses. ▶ Promote bias prevention, detection, and mitigation in AI systems. ▶ Develop open-source AI testing frameworks and toolkits for startups, researchers, and private and public players. ▶ Select indigenous universities/institutions that can spearhead research in responsible AI and conduct independent formal audits of AI systems.
Promote public awareness of AI and reform education	AI education about its potential and risks will broaden participation of populace ▶ Incorporate fundamental aspects of AI systems starting from the secondary school level. ▶ Create mandatory training around automated decision systems' societal, legal, ethical, and political impacts. ▶ Impart working knowledge for non-professional users of AI. ▶ Build teaching capacity and accelerate digital delivery of education.
Establish AI clusters	Towards a vibrant, self-reliant AI ecosystem ▶ Set up AI clusters in line with bio-incubators and bio-clusters announced by the government of India to further biotech innovation under the Startup India program. ▶ Encourage rural innovation through dedicated funds for AI startups in rural areas.

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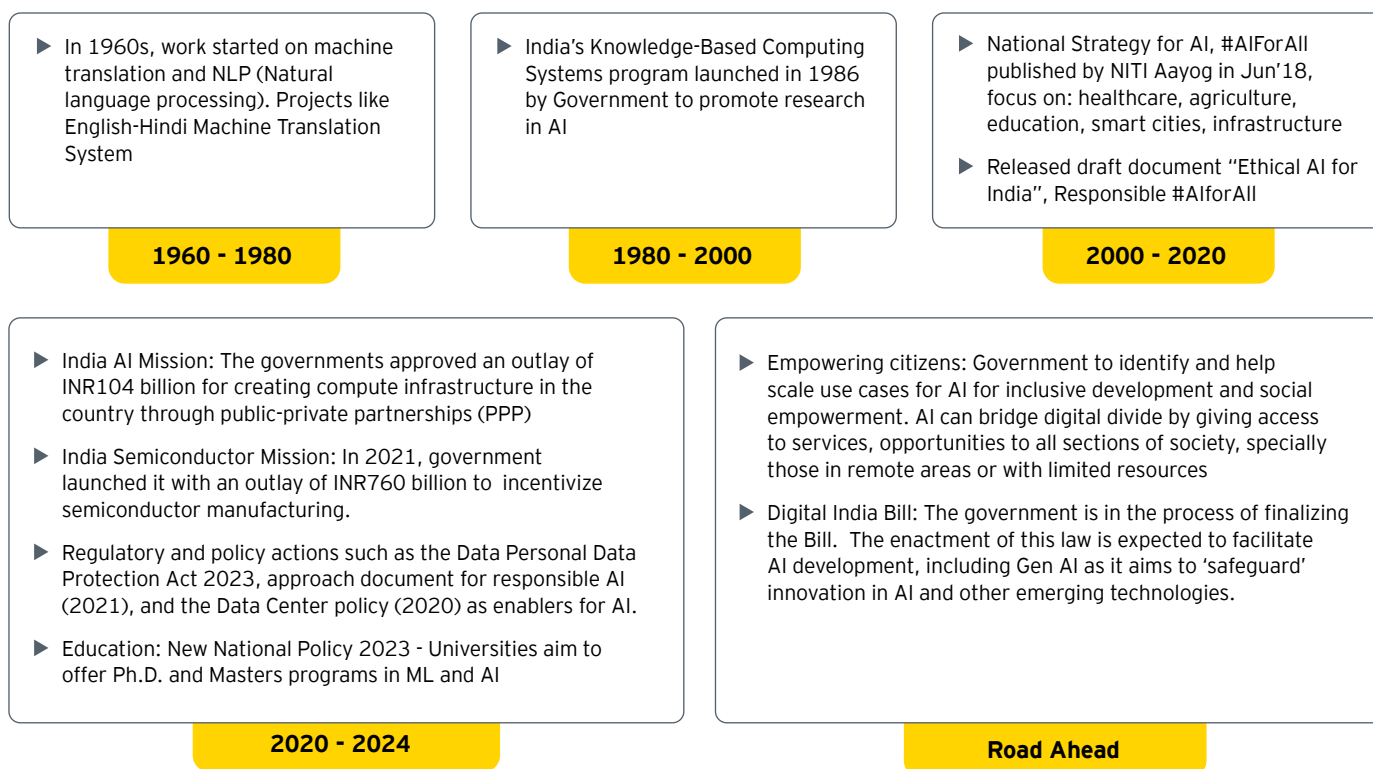
AI is a
game changer for
development

Like any general-purpose technology, AI's potential is immense in creating value and enhancing the well-being of people. The Internet era is a case in point. Internet contributed an estimated 6% of the GDP in 2015-16, which grew to 16% of GDP in just five years up to 2020, translating into $538 billion of impact.[4] The impact of AI will likely be bigger. Generative AI (GenAI) alone has the potential to add a cumulative US$1.2-1.5 trillion to India's GDP over the next seven years. By fully capitalizing Gen AI, India can add US$359-438 billion in FY2029-30 alone, reflecting a 5.9% to 7.2% increase over and above baseline GDP.

Beyond the commercial impact, people are beginning to assess AI's broader contribution, including its role in accelerating UN Sustainable Development Goals (SDGs). Studies suggest that it can help us achieve targets that are most likely to be missed by 2030. AI can be an enabler to meet 79% or 134 of the SDG targets. It has strong applicability in meeting goals such as zero poverty, affordable and clean energy, industry, innovation & and infrastructure, and sustainable cities & and communities.[5]

AI can enable **79% or 134** of the UN **SDG** targets

source: JP Morgan, "ESG – the long view," 02 Aug 2023

Evolution of AI technology in India: AI has evolved significantly over the years in India, with advancements in research, adoption, and application across various sectors[6]

▶ In 1960s, work started on machine translation and NLP (Natural language processing). Projects like English-Hindi Machine Translation System

1960 - 1980

▶ India's Knowledge-Based Computing Systems program launched in 1986 by Government to promote research in AI

1980 - 2000

▶ National Strategy for AI, #AIForAll published by NITI Aayog in Jun'18, focus on: healthcare, agriculture, education, smart cities, infrastructure

▶ Released draft document "Ethical AI for India", Responsible #AIforAll

2000 - 2020

▶ India AI Mission: The governments approved an outlay of INR104 billion for creating compute infrastructure in the country through public-private partnerships (PPP)

▶ India Semiconductor Mission: In 2021, government launched it with an outlay of INR760 billion to incentivize semiconductor manufacturing.

▶ Regulatory and policy actions such as the Data Personal Data Protection Act 2023, approach document for responsible AI (2021), and the Data Center policy (2020) as enablers for AI.

▶ Education: New National Policy 2023 - Universities aim to offer Ph.D. and Masters programs in ML and AI

2020 - 2024

▶ Empowering citizens: Government to identify and help scale use cases for AI for inclusive development and social empowerment. AI can bridge digital divide by giving access to services, opportunities to all sections of society, specially those in remote areas or with limited resources

▶ Digital India Bill: The government is in the process of finalizing the Bill. The enactment of this law is expected to facilitate AI development, including Gen AI as it aims to 'safeguard' innovation in AI and other emerging technologies.

Road Ahead

Sources: EY Analysis, NASSCOM, press articles

In India, AI has already made significant strides in various sectors. For instance, AI-powered systems help analyze images and provide access to healthcare facilities at the grassroots level. Likewise, generative AI tools are enabling personalized learning programs for students. India has a history of innovative enterprises working at grassroots levels to solve societal problems. With the integration of AI tools and access to researchers, innovation can be taken to the next level, creating a virtuous cycle of growth and development.

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4   The Times of India, "The economic impact of Internet in India," 10 March 2021
5   JP Morgan, "ESG – the long view," 02 Aug 2023
6   Indiaai, "Ayushman Bharat -National Health Protection Mission," 2021

3.1 Multiplier effect through scaled AI

India has made significant strides in putting AI at the forefront as a development tool. The Four sectors below have the potential to drive a broadly beneficial impact on society:

- **Healthcare:**

  - **Remote consultations:** use cases around telemedicine, teleconsultation, and remote patient monitoring are on the rise as AI-enabled platforms facilitate remote consultations between patients and healthcare providers.

  - **Proactive interventions:** AI is augmenting drug discovery, the use of virtual assistants for patient care, and the analysis of patient data to identify patterns to predict the risk of diabetes, cardiovascular conditions, and cancer, enabling proactive interventions.

  - **Support with detection:** AI algorithms are helping to analyze medical images: X-rays, CT scans, and MRIs to assist in the detection and diagnosis of diseases. For example, Predible Health, an AI-based health startup is engaged in the application of deep learning for radiology imaging. Their flagship product LungIQ uses ML to generate visual and quantitative reports from CT scans.

- **Education:**

  - **Personalized learning:** AI-powered language learning platforms can provide personalized language instruction, speech recognition, and translation services to support multilingual education. For example, the government of India is developing Bhashini, a National Public Digital Platform for languages. Leveraging the power of AI, it is building up language data that can be used by researchers to develop AI language models for building innovative products and services for citizens.

  - **Real life experiences:** AI-powered AR and VR technologies can provide immersive simulations, virtual field trips, and interactive visualizations. For example, upGrad partnered with Israel-based EyeWay Vision to pilot AR-based immersive learning experiences on its platform, to improve interactivity, and engagement among its students.

  - **Quality teacher time:** AI-led products such as DeepGrade are addressing issues such as shortage of teachers. The tool can grade handwritten descriptive answers,content,student responses. It helps in improving regular classroom education, teaching, tests, and homework and allows teachers to spend quality time with students to clear concepts and interact with students.

  - Other use cases such as task automation, smart content creation, 24/7 educational support, intelligent tutoring systems, adaptive assessments, early intervention, and student support are emerging too.

- **Agriculture:**

  - **Precision farming:** AI is enabling precision farming by analyzing data from sensors, drones, etc. to optimize planting, fertilization, and harvesting. Researchers at the University of Pune have developed an AI-based precision farming system that uses ML algorithms to optimize irrigation and fertilizer applications.

  - **Yield prediction:** AI is helping with crop yield prediction by analyzing weather patterns, soil moisture, and fertilizer usage to predict crop yields. For example, a Startup, RMSI Cropalytics, is deploying satellite imaging, weather forecasting, geo-location, AI, and analytics with government land records, historical crop yield data, and agribusiness metrics to provide vital information to every stakeholder

  - **Disease and pest detection:** AI helps to analyze images of crops to detect diseases and pests, to minimize crop losses. For example, the Plantix app in India uses ML, helping thousands of farmers detect and diagnose disease and pest damage. Other use cases can be seen around soil analysis, irrigation management, livestock management, supply chain optimization, farm equipment optimization

- **Public services:** AI-driven products and services are improving the quality of life of the public through the following notable use cases:

  - **Public Transportation:** AI is helping in smart parking systems, accident prevention, and traffic management. For example, Bangalore city authority launched an AI-based traffic management system that optimizes traffic flow, reduces congestion, reduces air pollution, and improves travel times

  - **Environmental monitoring:** AI-based use cases can be seen around climate change impact assessment, wildlife conservation, green energy, home automation, and air quality monitoring. For example, the BreeZo app, developed by the Indian Institute of Tropical Meteorology, uses AI and ML to provide real-time air quality information and health advisories to users

  - **Women empowerment:** AI-enabled platforms are providing support in entrepreneurship, employment opportunities, and girl child education. For example, Project Shiksha, an initiative that uses AI and ML to provide personalized and adaptive learning experiences for students, including girls, in rural and underserved areas of India

▶ **Disaster Response:** use cases can be seen around drone-based damage assessment, NLP for crisis communication, VR for training and preparedness, supply chain optimization, and predictive analysis. For example, Google is developing an AI framework to forecast floods in India and alert consumers through Google Maps and Google Search.

▶ **Public Safety:** AI can be used in various fields of public safety:

  ▶ AI-powered crime prediction models

  ▶ AI-powered accessibility services, assisting people with disabilities

  ▶ AI-powered cybersecurity systems can detect and respond to cyber threats in real time and protect critical infrastructure and sensitive information from hackers

▶ **Financial Inclusion:** AI-powered models are supporting financial literacy, financial inclusion for women, fraud detection, and microfinance platforms. For example, companies like MoneyTap and NiYO are already offering AI-based microfinance solutions in India.

Public Services

▶ Public Transportation
▶ Environmental monitoring
▶ Women empowerment
▶ Disaster Response
▶ Public Safety
▶ Financial Inclusion

Agriculture

▶ Precision farming
▶ Crop yield prediction
▶ Disease, pest detection
▶ Soil analysis
▶ Irrigation management
▶ Livestock management
▶ Supply chain optimization
▶ Farm equipment optimization

Healthcare

▶ Telemedicine, teleconsultation
▶ Drug discovery and development
▶ Medical imaging analysis
▶ Remote patient monitoring
▶ Virtual assistants for patient care
▶ Predictive analytics for disease prevention
▶ Synthetic Data Generation

Education

▶ Personalized learning
▶ Multilingual education
▶ AR and VR
▶ Task automation
▶ Smart content creation
▶ 24/7 educational support
▶ Intelligent tutoring systems
▶ Adaptive assessments
▶ Early intervention and student support

Source: Press articles, Web search

04

Reinforcing the foundations

To understand India's preparedness to create a broad social impact by using AI for development, we have taken a five-pronged approach: technology infrastructure, research capabilities, skills, regulatory environment, and ethical AI frameworks.

Technology infrastructure readiness
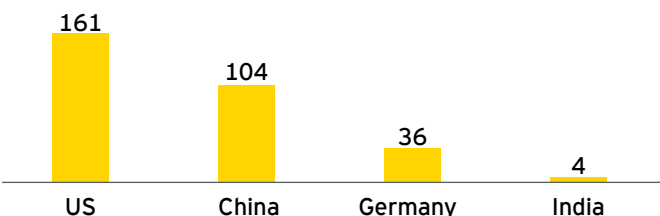
Computing infrastructure:

Limited computing power and high model training costs can deter the deployment of AI-based services for the wider public. For instance, training a large language model is expected to cost five times more by 2030, with increasing model size.

Graphics processing units (GPUs) offer high computational power and are crucial to train and run computationally intensive AI applications, especially large language models (LLMs) . Limited GPU capacity and shortage of GPU chips in India is leading to months-long wait times for companies and startups implementing AI.

India needs to accelerate its plan to develop a 25,000 GPU cluster (a group of computers with a GPU on each node). the highest GPU cluster available in India has 2,000 to 2,500 GPUs, compared to 25,000-30,0000 GPU clusters in countries such as the US. Among the clusters with 1,000 GPUs, India has less than[7] five. (a group of computers with a GPU on each node).

The Government of India approved the 'IndiaAI Mission' with an outlay of INR104 billion. Its aim is to develop infrastructure and ecosystem for AI, including building compute infrastructure of 10,000 or more GPUs through public-private partnership and enabling access to quality non-personal datasets to Indian startups and researchers for AI innovation.Supercomputing and AI are coming together to solve complex challenges that require vast processing and storage capacity for datasets. Access to supercomputing facilities help promote scientific research

Number of supercomputers by country in the top 500 ranking in terms of computing capacity

Source: Top500 rankings

and discovery in areas such as weather modelling/predictions, drug discovery, LLM development, and robotics. India's fastest supercomputer ranks 75th worldwide and runs on 675[8] GPUs. India has access to 23 supercomputers, of which only four rank among the highest in terms of global performance benchmarks. Under the National Supercomputing Mission, nine more supercomputers will be added. However, this is low compared with countries such as China (104) and the US (161).

India needs to expedite the launch of more supercomputers with processing power in the exaflops range.

Networks and devices:

To impact the population at a broad scale with AI initiatives, there is a clear need to strengthen the network and devices ecosystem.

Broadband access is available to 885 million people, or 60% of the population. There remains severe disparity in the rural and urban internet penetration. In urban areas it stood at 107% in 2023, compared with only 40% in rural areas.[9] The Public Wi-Fi Access Network Interface scheme, launched in December 2020, is aimed to enable anyone to connect to Wi-Fi broadband from any location in the country.

The Government of India, through its initiatives like Digital India, BharatNet, and the National Broadband Mission, is focusing on increasing India's optical fiber cable coverage to ensure nationwide, seamless data connectivity. Key initiatives include:

Fiberization: The total optical fiber length deployed as of June 30, 2023, stands at 3,726,577 kilometers and will be increased to 50 Lakh Km by 2024-25.[10]

Telecom towers: As of March 2023, nearly 7,50,000 towers[11] are deployed in India which are targeted to almost double to 15 lakhs by 2024-25. Approximately 38.44% of telecom Towers are fiberized with a target to double the fiberization rate by 2024-25.[12]

However, there is a high risk of these targets being missed and would require immediate intervention by the government to incentivize expansion by telecom operators.

Smartphone adoption: In India, Smartphone adoption is expected to increase from 77% in 2022 to 95% in 2030.[13] Increase in disposable incomes and higher internet adoption are some of the factors that have led the Indian smartphone market to grow into one of the largest smartphone markets globally. Incentives are needed to drive end users to upgrade to smartphones to access the wide range of AI-powered services.

7   The Economic Times, "Government plans 25,000 GPUs cluster to support Indian AI startups".

8   (https://www.business-standard.com/industry/news/10k-gpus-under-indiaai-mission-to-be-in-place-over-18-24-months-it-secy-124030800941_1.html)

9   TRAI website, yearly performance indicators 2022-2023.

10 http://timesofindia.indiatimes.com/articleshow/103273204.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

11 Read more at: https://telecom.economictimes.indiatimes.com/news/65-telecom-towers-need-fiberisation-12l-towers-to-be-deployed-to-make-india-5g-ready/98612401

12 Pib, "Progress of National Broadband Mission", July 2022

13 https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-economy/wp-content/uploads/2023/07/Mobile-Economy-Report-Asia-Pacific-2023.pdf

Broadband access

▶ Broadband access available to 885 million people, or ~60% of the population.

   ▶ In urban areas internet penetration stood at 107% in 2023, compared with only 40% in rural areas.

▶ Public Wi-Fi Access Network Interface scheme (Dec'20): aimed to enable anyone to connect to Wi-Fi broadband from any location in the country

Resilient internet

▶ Government through initiatives: Digital India, BharatNet, National Broadband Mission, is focusing on increasing India's optical fiber cable coverage for nationwide data connectivity. Key steps:

▶ Fiberization - Total Optical Fibre Cable (OFC) laid: ~37.3 Lakh Km (Jun'23); to be increased up to 50 Lakh Km by 2024-25.

▶ Towers: 7.50 Lakh towers installed (Mar'23); to be increased up to 15 Lakh towers by 2024-25.

▶ Fiberization of Telecom Towers/ Base Transceiver Station (BTS) (%): 38.4% of Telecom Towers/ BTSs fiberized (Jun'23); to be increased up to 70% by 2024-25

Smartphone adoption

Smartphone adoption is growing in India, with further progress expected

Smartphone adoption in India (as % share of population)

2022	2030
77%	95%
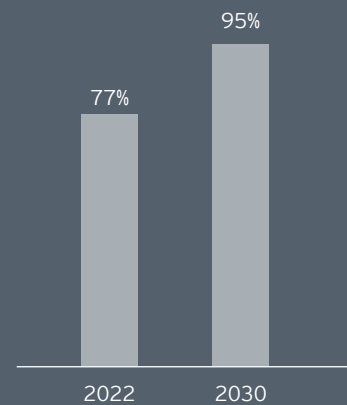
Source: News articles, Analysys Mason, EY analysis
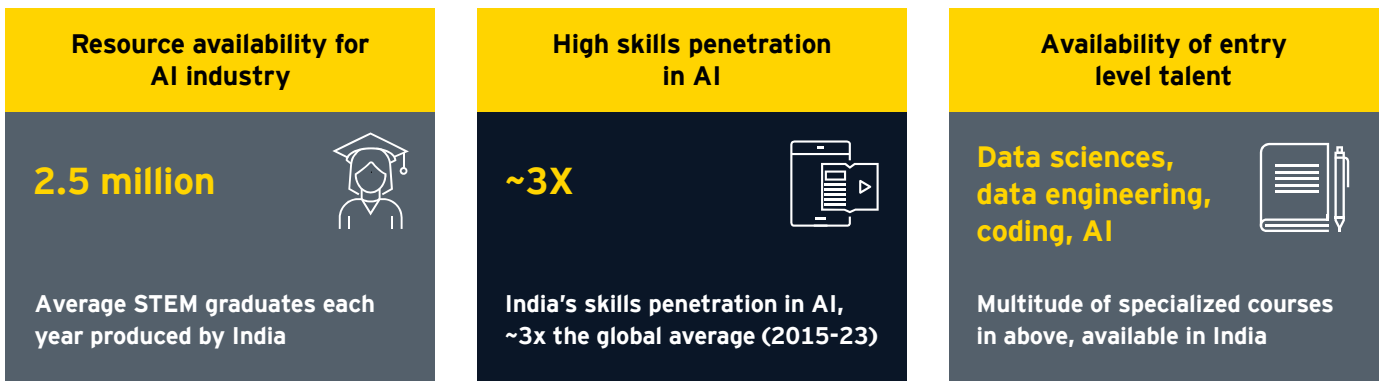
Research capabilities

India stands third, only behind the US and China, in terms of the number of AI-related scholarly articles published between 2010 to 2019, with 84,384 AI papers. However, India has a long way to go before it catches up with China and the US which published 471,726 and 310,562 AI papers respectively in the same period.[14] Furthermore, India stands 15th in citation count for AI papers, which reflects the weaker quality of papers compared to authors from other countries.

As of 2023, a large proportion of GitHub AI projects (GitHub is a web-based platform where individuals and coding teams can host, review, and collaborate on various code repositories) were contributed by software developers in US (22.9%) followed by India (19%), EU and the UK (17.9%). However, in terms of stars (A GitHub star is similar to a "like" on a social media platform and indicates support for a particular open-source project), GitHub AI projects from the US received the most stars, followed by the EU and the UK, and then China. This shows the need to improve the quality of AI projects in India by leveraging cutting-edge technologies, better management of data, and mitigating the skills gap.[15]

14   Analyticsindiamag, "AI Ecosystem: Where Does India Stand Compared To The US & China" 2021
15   Stanford AI Index, 2024

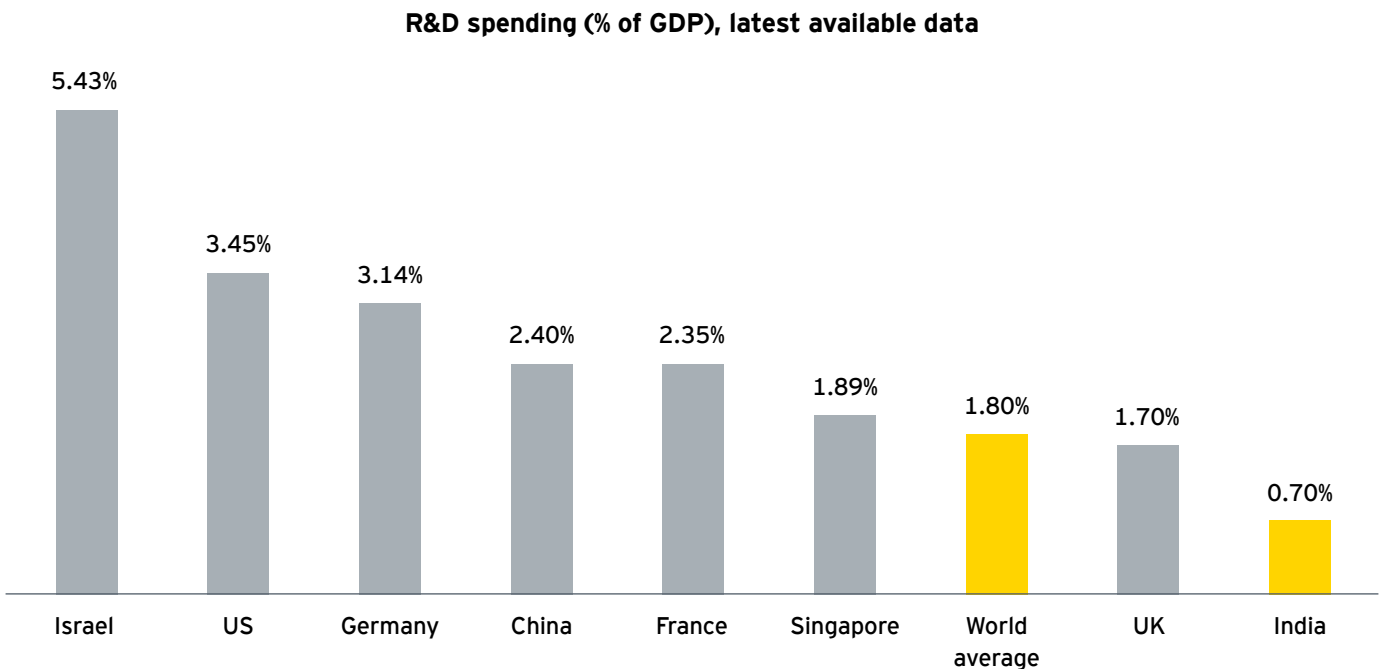| Resource availability for AI industry	High skills penetration in AI	Availability of entry level talent
2.5 million	**~3X**	**Data sciences, data engineering, coding, AI**
Average STEM graduates each year produced by India	India's skills penetration in AI, ~3x the global average (2015-23)	Multitude of specialized courses in above, available in India

Source: Stanford AI Index, News articles

India's R&D expenditure-GDP ratio is of 0.7%, or $43 per capita, is very low when compared to major economies and is much below the world average of 1.8%.[16] The main reason is the low investment in R&D by the corporate sector. Several countries have targeted higher R&D spend as compared to GDP. While the UK aims to step it up from 1.7% to 2.4%, the US and Germany aim to spend 3% and 3.5% of their GDP on R&D, respectively. There is a need to establish targets to step up this spending in line with other countries.
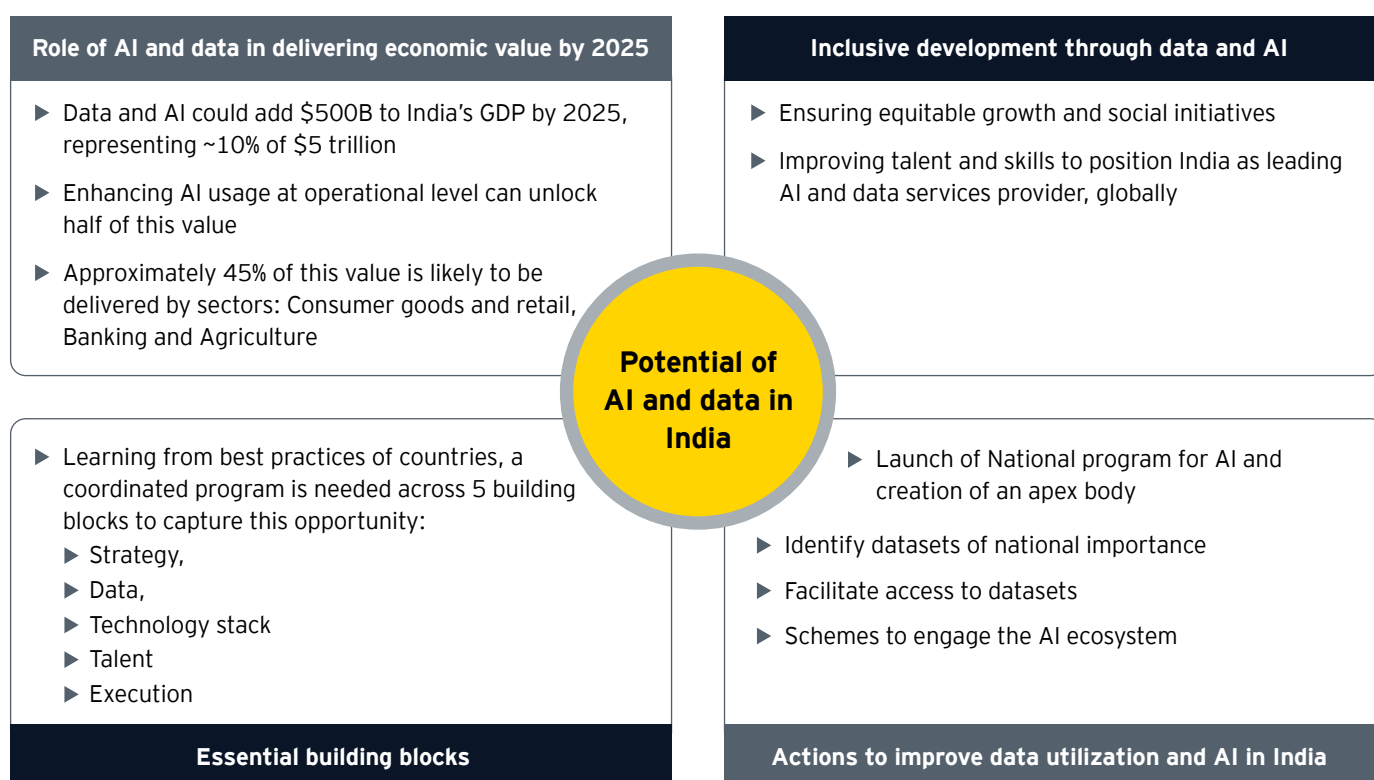
R&D spending as % of GDP, latest available data

R&D spending (% of GDP), latest available data

Israel	US	Germany	China	France	Singapore	World average	UK	India
5.43%	3.45%	3.14%	2.40%	2.35%	1.89%	1.80%	1.70%	0.70%

Source: World Bank, world development indicators

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16   Forbes, "India's R&D expenditure is one of the lowest in the world: NITI Aayog", 2022

Data readiness

Data and AI could address dual goals of economic and social value creation and recovery. To help India realize its 2025 Vision, Data and AI are going to play an essential part, as they can add US$500 billion to India's GDP.[17] This vision also aims to:

▶ Support social initiatives and equitable growth

▶ Enhance talent and skills to position India as a hub for AI and data services, globally

Role of AI and data in delivering economic value by 2025

▶ Data and AI could add $500B to India's GDP by 2025, representing ~10% of $5 trillion

▶ Enhancing AI usage at operational level can unlock half of this value

▶ Approximately 45% of this value is likely to be delivered by sectors: Consumer goods and retail, Banking and Agriculture

Inclusive development through data and AI

▶ Ensuring equitable growth and social initiatives

▶ Improving talent and skills to position India as leading AI and data services provider, globally

Potential of AI and data in India

▶ Learning from best practices of countries, a coordinated program is needed across 5 building blocks to capture this opportunity:
  ▶ Strategy,
  ▶ Data,
  ▶ Technology stack
  ▶ Talent
  ▶ Execution

Essential building blocks

▶ Launch of National program for AI and creation of an apex body

▶ Identify datasets of national importance

▶ Facilitate access to datasets

▶ Schemes to engage the AI ecosystem

Actions to improve data utilization and AI in India

Source: EY Analysis, NASSCOM

India began its open data journey in 2012 with the launch of open government data (OGD) policy. The Digital India program has recognized OGD as one of its core pillars, and NITI Aayog launched the National Data and Analytics Platform (NDAP):

▶ **Limited and low-quality data:** Datasets available on the OGD portal are often outdated, duplicated, incomplete and not appropriately referenced, rendering them unusable. A high-value dataset (HVD) is dataset that is beneficial to the community at large and shared as a public good. As per a NASSCOM report which analyzed 19 HVDs, there were data quality gaps in the areas of agriculture, census,

shipping, healthcare, finance, and telecom. The concerns ranged from data completeness, consistency, timeliness, to relevance of datasets. This is impacting user adoption of such datasets for building AI use cases.[18] There is a need to expand upon the number of HVDs.

▶ **Data security and privacy:** India witnessed 1.39 million cybersecurity incidents in 2022 as reported by the Indian Computer Emergency Response Team (CERT-In). Every organization in India saw an average of 2,108 weekly cyber-attacks for the first quarter of 2023, compared to 1,248 attacks per week globally.[19]

17 Techcircle, "NASSCOM, Microsoft launch new programme to drive AI innovation", 2021

18 NASSCOM, "Unlocking potential of India's open data,"September 2022

19 FeminismInIndia, "18% Increase in Cyberattacks in India: Facts and Challenges Ahead,", 16 May 2023

Data quality initiatives in Singapore and EU

Singapore: The government introduced the Trusted Data Sharing Framework to boost the sharing and re-use of data in the private sector.

The framework covers four elements:

► data-sharing strategy,

► legal and regulatory considerations,

► technical and organisational considerations, and

► operationalising data sharing.

The European Union: The EU pushes for common data spaces in strategic sectors to create a data-sharing ecosystem.

The European Commission is building a European Health Data Space in collaboration with the EU member states. Under the program, the EU is engaging with partners from different member states to advance the secondary use of health data. The project focuses on governance, data quality, and infrastructure requirements to support the secondary use of data.

To address some of the challenges around data, the Government in its 2023 Budget has chalked out some plans, such as creating the National Data Governance Policy (NGDP). The policy aims to realize 'Make AI in India' and simplify the KYC process while anonymizing individual data. NDGP allows the government to sell anonymized public data sets for researchers, start-ups, and companies. As part of the IndiaAI Mission, the government will develop a non-personal data collection platform and indigenous foundation models with 100 billion parameters. It will provide access to diverse datasets and facilitate data exchange between organizations. The enactment of the Digital Personal Data Protection Act, 2023 was timely in this regard. It aims to create a framework that respects individuals' right to safeguard their personal data while acknowledging the need for lawful data processing.

Skills

India produces an average of 2.5 million STEM graduates each year which showcases an abundance of base resource availability for the AI industry.[20] India is among the best in terms of skills penetration in AI, ~3 times the global average between 2015 and 2023.[21] The availability of a multitude of specialized courses in data sciences, data engineering, coding, AI, etc. ensures the availability of requisite entry-level talent. However, challenges remain around practical exposure and combinatorial skillsets. India's workforce faces a skills gap in AI, which has led to a shortage of AI-first startups in the country. The IT industry in the country still has a mix of low-end employees, and there is a need to develop a skilled workforce to ensure advancements in AI.

Research capabilities

3rd
India stands third in terms of AI-related scholarly articles published: **84,384** AI papers, between 2010-19. China and the US published 471,726 and 310,562 AI papers, respectively

15th
India stands 15th in **citation** count for AI papers

GitHub AI projects

19%
GitHub AI projects contributed by software developers in India

USA - most stars
GitHub AI projects from the US received the most stars, followed by the **EU and the UK, and then China.** This shows need to improve quality of AI projects in India

Source: Stanford AI Index, 2024, Press articles

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20 ToI, India's STEM talent sees shortage despite maximum graduates, 2018

21 Nasscom AI adoption index, 2022

Entry-level talent lacks practical exposure to developing AI solutions for real-life business challenges, requiring the need of pre-job training needs. Currently, organizations invest 3-6 months in training freshers, a part of the training being on the job to focus on practical exposure

Supportive regulatory environment:

Mission-oriented innovation policies of the past have created a huge impact on economic outcomes. Programs such as Startup India in the last decade have put the country on the global innovation map. The government can step in and give it the right direction to deliver maximum impact for society. India has made significant strides in putting AI at the forefront as a development tool. The national AI strategy was promulgated in 2019. Policy initiatives such as the Digital

Personal Data Protection Act, the India AI Mission, and the Indian Semiconductor Mission pave the way for development of an AI ecosystem in India. The focus of its 'AI for all' scheme has been to foster the all-round development of society and people's well-being. The government is putting in place many enablers for the growth and development of technology with a special focus on society.

Yet, more needs to be done to expedite the implementation of AI. Setting up a semiconductor value chain, for example, will require a comprehensive review of business and regulatory environment to promote R&D, raw material sourcing, design, manufacturing, assembly, testing, and packaging. Immediate steps are needed to speed up manufacture of chips (GPUs and application specific integrated circuits (ASICs)), networking switches and optical transceivers, cooling systems, servers, printed circuit boards, etc.

There is a global thrust on policymaking around AI

The race for domination in the field has accelerated. Over 69 countries have adopted national AI strategies, as per the OECD Policy Observatory. Policy orientations range from attracting capital or economic growth, controlling the use of technology, minimizing risks or harm from AI, as well as accelerating innovation.

Governments across the world are implementing governance and regulatory frameworks, support programs, and other enablers to harness the potential or mitigate the harmful effects of AI.

Policy instruments for AI globally
(Number of initiatives)

Category	Number
Governance	697
AI enablers and other incentives	517
Guidance and regulation	354
Financial support	352
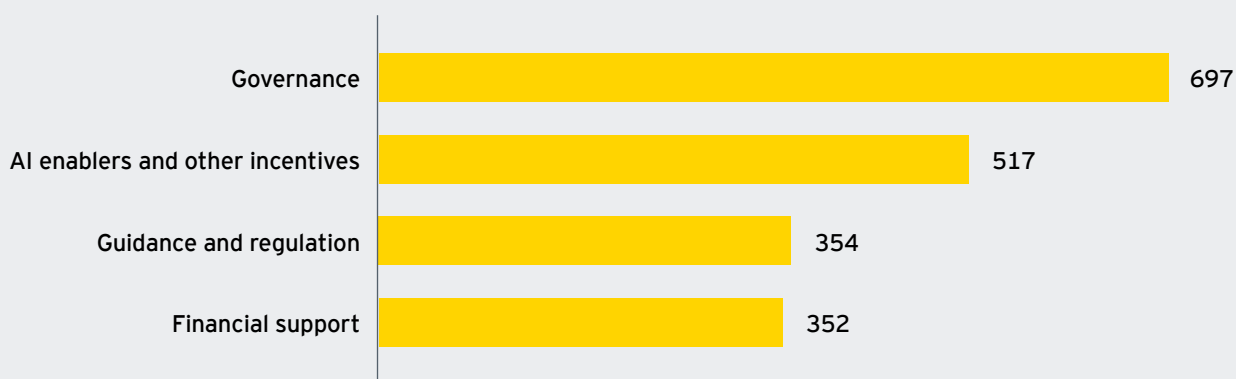
Source: OECD.AI (2021), powered by EC/OECD (2021), database of national AI policies, accessed on 15/04/2024, https://oecd.ai

Some key aspects of policy include:

▶ Governance: the top two most popular initiatives are drafting national strategies, agendas, and plans and public consultation of stakeholders and experts on the topic

▶ Financial support: the most popular initiatives are around doling out project grants for public research and grants for business R&D and innovation

▶ AI enablers: governments are creating their own networking and collaborative platforms and data access and sharing protocols to boost open innovation in the domain

▶ Guidance and regulation: countries are defining regulatory objectives and frameworks for emerging AI challenges and forming regulatory oversight and ethical advice bodies

Ethical AI

The absence of standard principles for ethical AI in India has led to significant flexibility and reliance on self-regulation, which has resulted in most companies encountering challenges in adopting ethical AI. This has led to a loss of confidence among investors, who are increasingly looking for companies that consciously manage their impact on society. The government has taken a few measures to address some concerns to ensure ethical AI is in place. There is a need for external support to promote and simplify ethics in AI across industries.

Steps by government to ensure ethical AI in the country

Responsible AI through the Constitution of India

Principles for responsible management of AI in India are aligned to the Constitution under Fundamental Rights (such as Article 14: Right to Equality; Articles 15 & 16: Right against Discrimination; Article 21: Right to Life and Healthcare; and Article 38: State Directive for Economic Equality)

Niti Aayog published Responsible AI in collaboration with World Economic Forum Centre for 4th Industrial Revolution

Approach Document under this collaboration, "aims to establish broad ethics principles for design, development, deployment of AI in India,". AI regulations must be designed to include FAT (fairness, accountability, transparency)/ FATE (fairness, accountability, transparency, ethics) for responsible, ethical, accountable deployment of AI

Union Ministry of Commerce and Industry, set up 'AI Task Force' in 2017

Task Force set for creation of legal framework for deployment of AI technologies, provide recommendations for government, industry, research programs. India has provisions for safeguarding personal information u/s 43A and u/s 72A of the Information Technology act; same gives right to compensation for improper disclosure of personal information, similar to General Data Protection Regulation (GDPR)

Ways to tackle threats and misinformation from AI underway

Government proposes to hold a Security Council Counter-Terrorism Committee meeting to discuss ways to tackle the danger of terrorists exploiting emerging digital technologies, from crypto and NFTs to 3D-printing and AI. MeitY is considering regulation of "deliberate" misinformation under fresh legislation, expected to replace the Information Technology Act, 2000
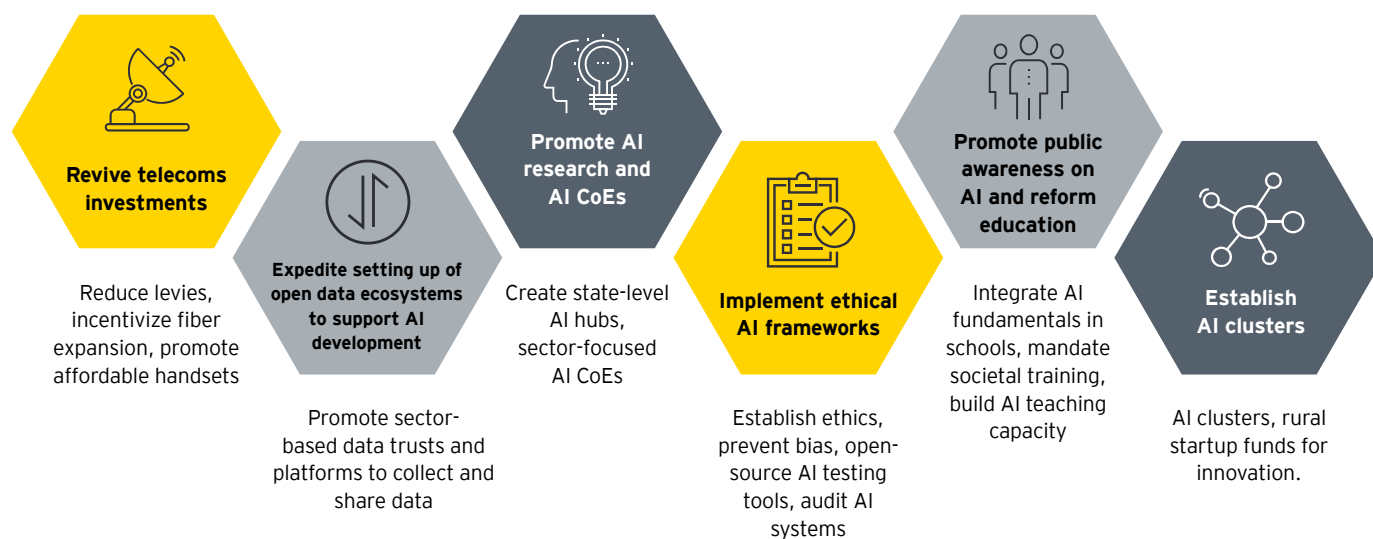
05

Key policy considerations

India has placed social objectives at the center of policymaking around AI, which is commendable. This focus on inclusion and empowerment reverberates with its theme, "AI for All." To bring the objectives to fruition, the government should:

▶ Create a detailed roadmap to achieve AI objectives, specifying key pillars and workstreams,

▶ Publish assessment indicators on which the objectives can be measured over time,

▶ Announce a set of time-bound activities within each sub-timeframe.

The government can play a role in steering AI development towards the beneficial use of technology. Below are a set of policy considerations to fast-track AI development and democratization:

Revive telecoms investments
Reduce levies, incentivize fiber expansion, promote affordable handsets

Expedite setting up of open data ecosystems to support AI development
Promote sector-based data trusts and platforms to collect and share data

Promote AI research and AI CoEs
Create state-level AI hubs, sector-focused AI CoEs

Implement ethical AI frameworks
Establish ethics, prevent bias, open-source AI testing tools, audit AI systems

Promote public awareness on AI and reform education
Integrate AI fundamentals in schools, mandate societal training, build AI teaching capacity

Establish AI clusters
AI clusters, rural startup funds for innovation.

Source: EY analysis

5.1   Revive investments in telecoms infrastructure to support AI innovation

Investment in telecom infrastructure is critical to enable AI-driven applications. The targets set by the National Broadband Mission will likely be missed due to the lack of incentives and viability of infrastructure investments. Steps must be taken to ensure the viability of such projects through:

▶ **Rationalization of telecom levies**

  ▶ Rationalization of regulatory levies and taxation, license fees, GST, etc., which are one of the highest in India and equals 30% of annual gross revenues cumulatively for telecom operators.

  ▶ Minimize Right of Way (RoW) charges that account for 70%-80% of the cost of deploying fiber and differentiate RoW charges across fiberization of core networks, mobile towers, and FTTH. Align and implement State and local bodies' RoW policies in line with the Central Indian Telegraph RoW Rules, 2016

- **Subsidize capex on fiber**

  - Foster investments in enabling internet infrastructure such as optical fiber, telecom towers, internet exchange points, and cable landing stations. The last mile of OFC deployment requires significant capex. This can be subsidized using a viability gap funding model such as utilizing the Universal Service Obligation (USO) fund. The fund has an unutilized balance of around INR 796 billion.[22]

  - Establish a partnership framework to collaborate with multi-system operators (local cable service providers) for providing FTTH connectivity to rural households, leveraging the Bharatnet network. Explore creating a common infra company (PPP model or a private initiative with government support) to develop last-mile infrastructure in rural areas; the PPP model is recommended to encourage participation from private players.

  - Implement TRAI's recommendation of establishing a neutral host for digital infrastructure (DCIP license), which could lead to lower capex and faster time-to-market.

- **De-risk handset financing**

  - Governments can take over some of the financing or credit risk to facilitate the purchase of internet-enabled handsets by the lowest-income households

  - Create mechanisms for easy financing of handsets such as flexible payment terms to finance individuals with irregular incomes, group liability financing, or having trusted intermediaries at local levels in the absence of collateral for loans.

  - Lower tax on entry-level 4G/5G smartphones.

  - Encourage private players to set up an ecosystem for refurbished 4G/5 G-enabled handsets in rural areas.

5.2 Expedite setting up of open data ecosystems to support AI development

The quality of data determines the effectiveness of an AI model. India has taken steps such as Data Empowerment and Protection Architecture (DEPA) and India Data Management Office (IDMO) to facilitate access to high-quality data. DEPA is a public-private collaboration that builds on the concept of consent managers to create a platform that allows data transfers from one entity to another. On GenAI, the government, as part of the IndiaAI Mission, will develop a non-personal data collection platform, which will be accessible to Indian startups and companies.

But accessing data at scale is still a challenge. The low maturity of external ecosystems is cited as one of the critical challenges for enterprises in India, as per the NASSCOM AI adoption index in 2022. Below are some ways to make significant, high-quality data sets publicly available.
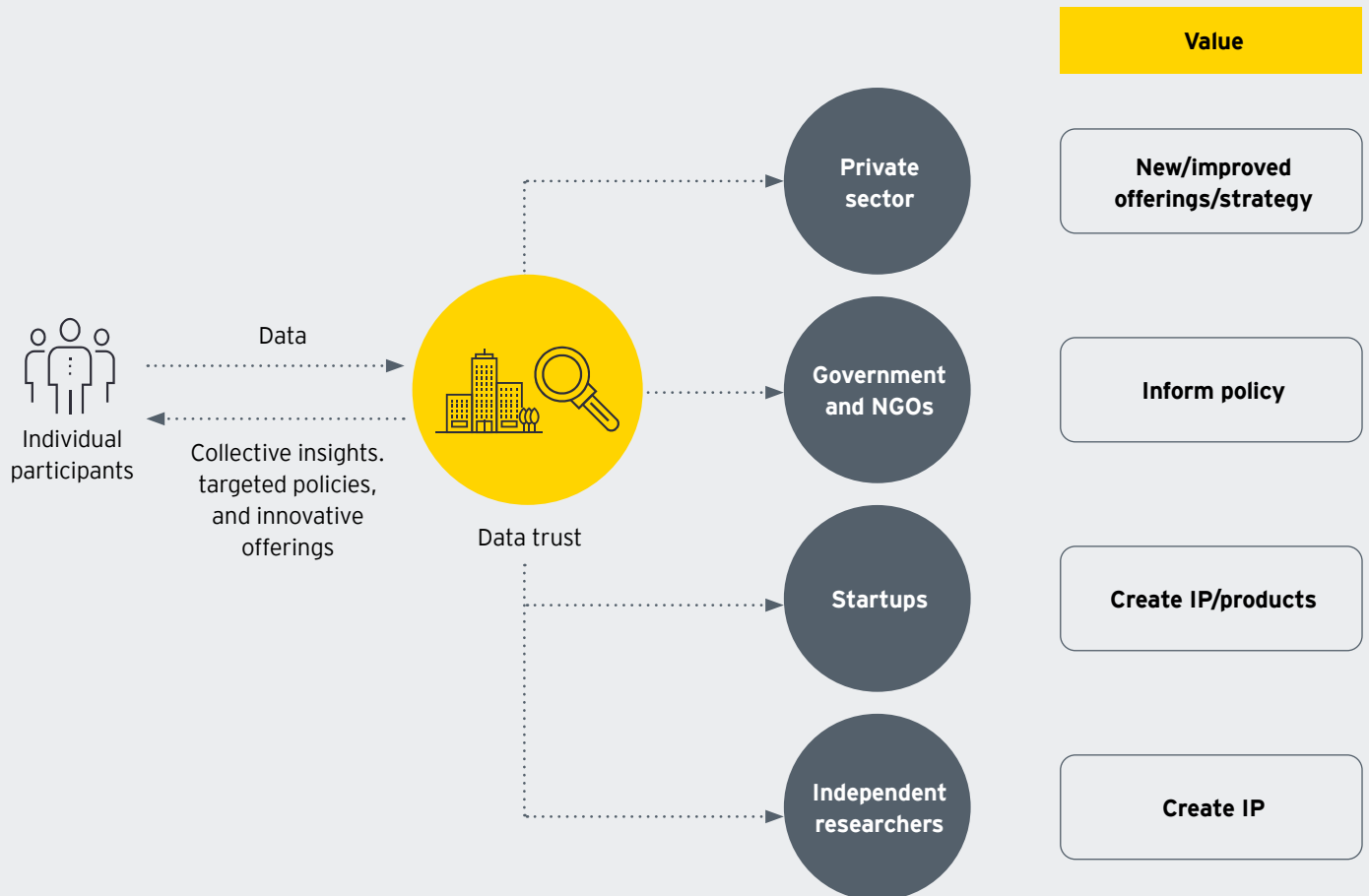
- **Identify pilot use cases:** The government can identify and build stakeholder support for common problems or challenges which can be addressed by through data ecosystems. Those can later be scaled and help promote usage.

- **Create data trusts:** A data trust is a legal entity that secures and manages data on behalf of someone else. With the recent Personal Data Protection Act, India's recognition of individual rights over personal data has become vital, further enhancing the possibility of data trusts acting as intermediaries. Vehicles such as data trusts or cooperatives can be empowered to manage data in the collective interest.

  Better access to long-term funding and other resources to enable data trusts can be helpful. The Non-Personal Data Governance Framework (the "NPDR") also recommends the creation of 'data trustees' as intermediaries to exercise rights on behalf of the group/community. Encourage private players to share data by providing incentives such as tax exemptions, subsidies, reduced compliance burdens, improved goodwill, etc

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22   USOF website, accessed 22 December 2023. (https://usof.gov.in/en/fund-status)

Data trust in action

	Value

- Private sector → New/improved offerings/strategy
- Government and NGOs → Inform policy
- Startups → Create IP/products
- Independent researchers → Create IP

Individual participants — Data → Data trust
Collective insights. targeted policies, and innovative offerings

▶ **Setup sector-based open data ecosystems:** Each data ecosystem can focus on specific priority areas such as agriculture, healthcare, mobility, etc. Encouraging open-source projects and sharing resources, such as datasets, pre-trained models, and tools, can foster innovation and make AI development more accessible to smaller organizations and individual researchers.

Agriculture data to assist small shareholder farmers in India

Smallholder farmers make up nearly 86% of all farmers in India. In a study conducted by Global Partnership on AI (GPAI), researchers explored solutions such as data trusts to improve smallholder farmers' lives.[23]

Challenge: Current data collection efforts in the agriculture domain are disparate, and their resultant datasets are siloed, with little benefit accruing to farmers.

Solution - data trust: Smallholder farmers could benefit by forming a data trust. The data trust could collect data from farmers. Aggregating information on farm size, soil type and quality, water usage, types of seeds used, types and quantities of fertilizers, insecticides, and pesticides used, and crop yield, governments, research institutions, and industry players can facilitate farmers with tailored advice and information on sustainable farming practices, which could also help them increase their yield.

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23   Gpai, "Enabling Data Sharing for Social Benefit Through Data Trusts: Data Trusts in Climate", 2022

5.3 Promote AI research and AI CoEs

India has substantially increased its focus on research and development as an enabler of innovation and entrepreneurship. It has started to score high on talent availability for AI. However, there is a clear need to increase expertise in cutting-edge AI development and make the curriculum targeted to industry needs. Kerala-based Advanced Skill Development Centers (ASDCs) are a case in point. To bridge the skill gap in engineering and polytechnic institutions and to connect students with future technologies, ASDCs were set up in 66 engineering colleges and 45 polytechnics across Kerala. ASDCs partner with industry leaders and offer advanced courses in, among other subjects, AI and machine learning, and robotic process automation.[24]

▶ **Regional language focus:** Digitize government data/documents (especially in Indian languages) and open up existing structured non-personal or anonymized government datasets for wider consumption. Standards may appropriately be notified to facilitate integration of crowd-sourced data for faster creation of training datasets. Create large, diverse, and high-quality datasets for each major Indian language for new AI technologies such as large language models (LLMs). This involves gathering text from various sources, such as books, articles, websites, and social media, ensuring that the data is representative of the language's cultural and regional nuances. Invest in research and development of algorithms and models that cater specifically to Indian languages. This includes funding research projects, academic institutions, and research labs working on LLMs.

▶ **International AI research collaborations:** As per a research study in 2021, only 16% of the research papers from an Indian author was produced in collaboration with a foreign author. This share is the lowest among all the top 10 AI research-producing countries.[25] International research collaborations drive research quality and impact. The government needs to work on removing obstacles to international research partnerships by earmarking funding for international work, removing operational or bureaucratic impediments, and increasing institutional support to international collaborators. India can leverage its recent international partnerships (GPAI, Indo-US, Indo-Israel collaborations) to create high-quality research output in the field.

▶ **Establish more CoEs on AI:** The government of India established three centers of excellence (CoEs) on AI at leading educational institutions. Similar policy needs to be encouraged at state levels to promote the formation of CoE hubs; the government can also identify areas within the CoEs to accord special attention such as Generative AI, and computer vision, or even create sector-driven CoE such as those focused on agriculture, education, public services, etc.
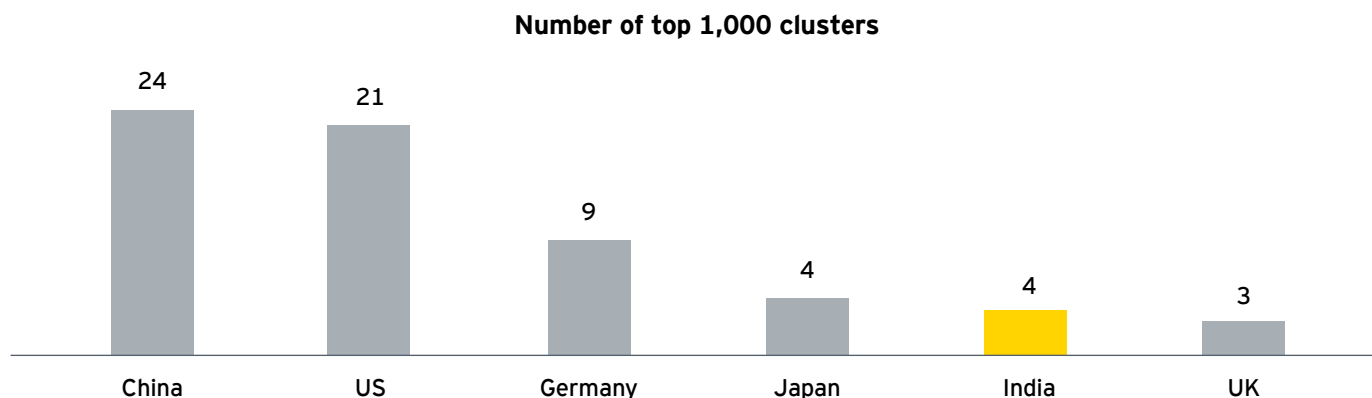
This will facilitate the creation of more regional clusters and attract a wide variety of actors in the AI space. India has only four of the top 1,000* science and technology clusters, compared with 21 in the US and 24 in China.

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24 Kerala Development Report 2021
25 CSET, "Mapping India's AI potential," March 2021

Economies with three or more science and technology clusters in the top 1,000 rank, in 2023

Number of top 1,000 clusters

Economy	Clusters
China	24
US	21
Germany	9
Japan	4
India	4
UK	3

Source: WIPO statistics database, May 2023

https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023-en-main-report-global-innovation-index-2023-16th-edition.pdf

*Top 1,000 clusters are based on the number of scientific publications, patent filings

5.4 Implement ethical frameworks

There is a need to steer AI towards a beneficial use aligned with human rights and the rule of law by adopting ethics guidelines and legal frameworks. India is working on domestic policy frameworks and regulations to ensure the responsible use of AI tools. The Tamil Nadu Safe & Ethical Artificial Intelligence Policy 2020 by the Tamil State is an example where the policy provides a roadmap for the state's policymakers to adopt AI-based solutions in specific sectors and recommends a framework for evaluating AI-based systems.

▶ **Promote diversity in AI.** There is a need to have a diverse population working on developing and overseeing AI applications. This includes encouraging people from minority groups, women, and ethnic communities to take up AI as a career. Furthermore, AI and STEM curricula need to include socio-technical and psychological topics to build an understanding of responsible AI.

▶ **Create AI testing frameworks:** Singapore is a case in point in creating an open-source governance testing framework. AI Verify, an AI Governance Testing Framework, and Toolkit, helps organizations validate the performance of their AI systems against internationally recognized AI governance principles through standardized tests. AI Verify is extensible

so that additional toolkits (e.g., sector-specific governance frameworks) can be built on top of it. Contributors are encouraged to build components as plugins to AI Verify and participate in growing the AI testing ecosystem.[26]

▶ **Educational institutions/non-profits as evangelists on AI ethics:** Select indigenous universities/institutions that can spearhead research in responsible AI. They can offer their expertise to organizations in conducting formal audits of AI systems, and function as second-party or third-party auditors. Globally, several university-based centers and research groups have emerged to focus on the social, technical, and legal aspects of algorithmic harms. This includes the AI Now Institute at New York University and the Institute for Ethics in AI at Oxford.

The technology landscape in AI is quickly evolving. To keep pace with technology, regulation must be agile, data-driven, and based on principles, not prescriptions. Involving a diverse set of stakeholders is important in policy development around AI. This means engaging with industry leaders, researchers, civil society organizations, and representatives from marginalized communities to ensure that their perspectives are considered.

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26   Microsoft press release, "Singapore launches AI Verify Foundation to shape the future of international AI standards through collaboration," 12 June 2023

5.5   Promote public awareness on AI and reform education

Widespread knowledge about AI can lead to its faster acceptance and penetration in society. However, there is a gap among the producers and consumers/users of AI systems. Producers understand the strengths and limitations of AI, while consumers may lack knowledge about AI but are exposed to its harmful applications. AI literacy and education help fill this gap.

Technology affects the public in ways it might not be aware of, such as in justice, raising credit from financial institutions, securing government grants, shaping public opinions, etc. If people remain unaware of the general ways of working with the technology, the population becomes vulnerable to the hands of cybercriminals. Following policy actions can be considered to facilitate this:

▶ **Incorporate fundamental aspects of AI systems starting from secondary school level.** The New Education Policy (NEP) 2023 proposed a credit-based system for extra-curricular learning. It can explicitly recognize building AI skills under the proposal to encourage students to build their expertise in the field. Furthermore,

    ▶ Update course content as and when required to keep pace with technology evolution.

▶ Conduct pilot studies and seek feedback from teachers, students, and academic and industry experts. Understand the impact of implementing AI curricula and their impact on students' understanding of AI.

▶ Integrate complementary concepts in the curricula such as design thinking, problem-solving, digital citizenship, and social ethics.

▶ **Create mandatory training around automated decision systems' societal, legal, ethical, and political impacts.** The government engages with private sector companies such as Microsoft and Intel to design AI courses. It can also consider engaging more deeply with bodies such as the ITU AI for Good, Global Partnership on AI members, and other regional and international initiatives to address challenges and opportunities around the technology holistically.

    ▶ The government should encourage the labeling of AI-generated content and create mechanisms to inform the public when interacting with an AI system.

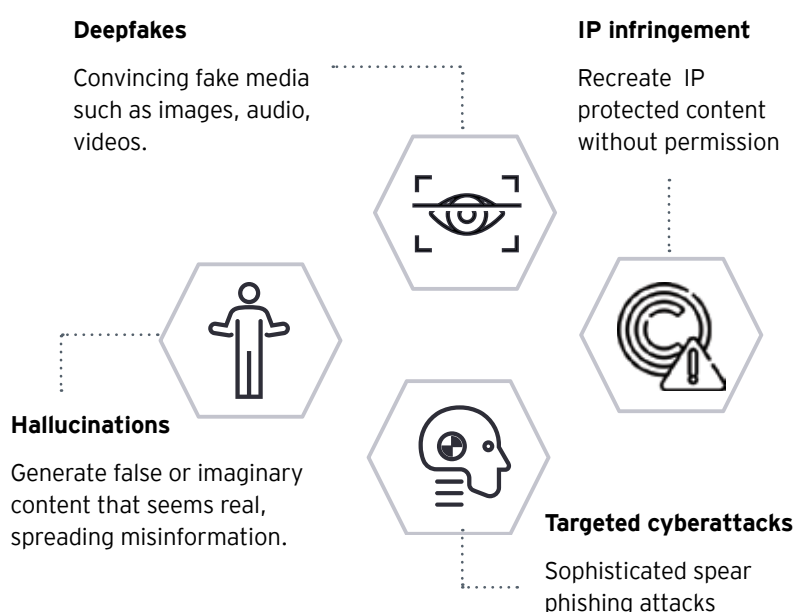## Education and awareness can help in navigating the risks of AI

Cyberattacks are becoming increasingly sophisticated and harder to detect with the use of AI. With the opening up of the field of generative AI, these risks have multiplied. For example, Generative AI models can scrape information from a target's social media feed and use it to create highly personalized messages, improving the odds of committing fraud.

A large section of the population, such as uneducated youth or the old aged are more vulnerable to these threats. There are huge implications for society as it can influence election results, defame ordinary individuals to celebrities, or cause widespread financial harm to people.

70%
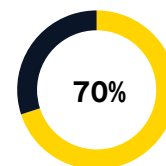
Of Indian consumers are likely to respond to audio requests for financial aid from friends and family citing emergencies such as theft.

Source: McAfee, Beware the Artificial Impostor, May 2023

Deepfakes

Convincing fake media such as images, audio, videos.

IP infringement

Recreate IP protected content without permission

Hallucinations

Generate false or imaginary content that seems real, spreading misinformation.

Targeted cyberattacks

Sophisticated spear phishing attacks

Political misinformation, defamation, and identity fraud

Deepfake news

Financial fraud and cybercrimes

Data infringement or loss of revenue to rightful owners of content

Legal challenges such as manipulation of evidence

Source: EY analysis; "Identifying and Mitigating the Security Risks of Generative AI," Clark Barrett, Brad Boyd et al, 2023; "Ethical and legal challenges of deepfakes," Srishti Dey, 2021

The government of India has a role to strike the right balance so as not to thwart AI-led innovation yet prevent its potential harm to citizens. Active collaboration among government, industry, experts, and academia is the logical first step. Moving forward, a shared vision and concerted effort can lead to well-informed and balanced policies that embrace the opportunities while addressing the challenges of AI.

► **Impart working knowledge for non-professional users of AI.** Non-professional users' decisions can have far-reaching impacts on society. Such groups include politicians, judges, doctors, civil servants, journalists, etc. For example, a research study demonstrated how AI can worsen medical decisions. Radiologists performed worse when given the AI recommendations, being less likely to recommend a scan when it was needed (a "false negative" interpretation of the x-ray) and being more likely to recommend a scan when it was unnecessary (a "false positive").[27]

► **Build teaching capacity and accelerate digital delivery of education.** In 2021, there was a shortage of 1.2 million teachers in India, according to UNESCO. There is a need to prepare for aggressive capacity expansion of teachers. The Indian government can explore digital delivery mechanisms for such courses, through mobile, OTT, etc. to address the gaps.

5.6 Establish AI clusters

India needs to step up AI funding. India has showcased its leadership in frugal innovation in areas such as space exploration. The country needs targeted incentives to promote the commercialization of AI applications:

► **Set up AI clusters:** These should be in line with bio-incubators and bio-clusters announced by the government of India to further biotech innovation under the Startup India program. The government of India announced specific targets to foster bio-tech innovation. Biotech ecosystem in India is emerging at a rapid pace, with more than 6500 start-ups and 75 Bio-incubators by 2024 [28]. A similar dedicated focus for AI clusters is needed to develop the technology.

► **Encourage rural innovation:** Set up dedicated funds for startups from rural areas to promote equal development. Create special mechanisms for rural entrepreneurs, such as funds of funds, to provide easy access to funds to rural innovators.

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27   Random Acts of Medicine Substack, "Does AI change the way doctors think?", 3 August 2023
28   Source: India Press Information Bureau (PIB) website

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Survey No 83/1, Raidurgam
Hyderabad - 500 032
Tel: + 91 40 6736 2000

Jamshedpur
1st Floor, Fairdeal Complex
Holding No. 7, SB Shop Area
Bistupur, Jamshedpur – 831 001
East Singhbhum Jharkhand
Tel: + 91 657 663 1000

Kochi
9th Floor, ABAD Nucleus
NH-49, Maradu PO
Kochi - 682 304
Tel: + 91 484 433 4000

Kolkata
22 Camac Street
3rd Floor, Block 'C'
Kolkata - 700 016
Tel: + 91 33 6615 3400

Mumbai
14th Floor, The Ruby
29 Senapati Bapat Marg
Dadar (W), Mumbai - 400 028
Tel: + 91 22 6192 0000

5th Floor, Block B-2
Nirlon Knowledge Park
Off. Western Express Highway
Goregaon (E)
Mumbai - 400 063
Tel: + 91 22 6192 0000

Pune
C-401, 4th Floor
Panchshil Tech Park, Yerwada
(Near Don Bosco School)
Pune - 411 006
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