Grant Agreement No.: 101135632 | **Call:** HORIZON-CL4-2023-DATA-01
Topic: HORIZON-CL4-2023-DATA-01-06 | **Type of action:** HORIZON-CSA

The Cognitive Computing Continuum Policy Landscape: India

Dr Andrew A. Adams
Prof Kiyoshi Murata
(CBIE, Meiji University, India)

Executive Summary

India is the world's largest democracy and one of two countries with the largest populations. As a developing economy it has seen many constraints on the digitisation of its economy and government but also has the opportunity for technological leapfrogging in both infrastructures, and in avoiding strong network effects preventing the growth of federated, open systems. The opportunities for collaborative development of pooled digital sovereign supporting systems exists, but requires sustained effort by other countries seeking to avoid dominance by the US or China in digital services. An existing semiconductor strategy, now moving into its second phase, shows the interest in freeing themselves from digital neo-colonialism, but the cognitive computing continuum policy space is still fragmented. The very recently adopted EU-Japan free trade agreement provides a useful springboard for building closer ties and bringing India into a potential oligopoly-free digital zone.

Co-funded by the European Union

Project funded by
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

Background

India's Geopolitical Situation

India is a former UK colony, gaining independence in 1947 during which the former colony was partitioned into majority Muslim Pakistan (later splitting into Pakistan and Bangladesh) and majority Hindu India. Disputes around the status of various regions continue to this day, particularly in regions with a majority of Sikhs or substantial minorities of Muslims. India remains a developing economy, although like China it has seen considerable economic growth in recent decades and has recently become the world's fifth largest economy by GDP (World Bank) just behind Japan and just ahead of the United Kingdom. It is either the largest or second largest country by population, with an estimate population of over 1.4B, very similar to China. It is a major member of the G20 group of countries, and the "I" in the BRICS(+) grouping. India is the world's largest democracy (Economist Intelligence Unit (2024) describes it as a "flawed democracy" but so too on their measurements are France and the United States of America).

India's economy includes approximately 15% agriculture, 25% industrial and 50% services (Ministry of Finance, 2026). The services sector is a major export for India's economy and is grounded in business process support (e.g. telephone and online chat call centres), software development, and finance (including accounting). According to a survey of LinkedIn profiles reported in Maslej *et al.* (2025) India is only just behind the US in self-reported skills in AI[1].

India is a partial federal republic with 28 states (with their own state governments) and 8 territories which are directly run by the central federal authority (referred to as the Union government). India is linguistically diverse with 22 native languages recognised in the constitution (and many more spoken by substantial numbers of Indian citizens (PolSci Institute, 2025)). At the Union level both Hindi and English are formally recognised as valid languages for government documents and interactions. An initial attempt by the Union government to move towards only Hindi as the national language of the government was amended to allow English in parallel effectively in perpetuity due to the widespread use of English as a common language between groups speaking non-Hindi languages.

India's current economic policies are often grounded in concepts of "leapfrogging" (Lee, 2021), seeking to adopt new technology such as mobile communications rather than installing older technologies such as fixed line telephony.

In January 2026 India signed a new trade agreement with the EU (European Commission, 2026).

---

[1]Such self-reports should be considered sceptically, particularly when comparing across nations, as what people in one country regard as "skilled with" may differ substantially with self-evaluations in another.

Co-funded by the European Union
Project funded by
Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra
Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

India's Digital Infrastructure

India has embarked on a mostly successful, though with setbacks, program of digital public infrastructure (DPI) creation (Nasscom and Arthur D. Little, India, 2024). Its Aadhaar digital identity scheme was ground-breaking when introduced in a number of ways. Rolling out digital identity to a country of over 1 billion people, many of whom had limited access to electricity and clean water/sewage was seen by some as a pipe dream, and initial roll-out saw some resistance from the initial target populations, due to concerns over government surveillance and discrimination, and over security (McKenna, 2012) and privacy issues (Rao and Greenleaf, 2013). The lack of a comprehensive national privacy law until 2025 was one of the issues raised early on (Greenleaf, 2010). The most successful elements of the DPI development have been the coverage of over 97% of the population by the Aadhaar digital ID system, a quarter of the population using the universal individual/small business digital payments system (UPI) and the gradual roll-out of the Open Network for Digital Commerce (ONDC).

The DPI services have required a major upgrade of India's late-emerging digital connectivity. Like most developing economies, Internet and mobile data availability in the late 2000s were quite limited, except in the major cities. Government support for backbone fibre optic connections to smaller cities and rural areas, combined with the availability of 4G and recently 5G mobile access has increased Internet access to around 95% of the population, but wired broadband access is still only accessible to a small minority with around 39 million subscribers in 2024 (representing perhaps 100 million household members, still well below 10% of the population) (Rakshitha, 2024). ECommerce represents around one fifth to one quarter of India's GDP.

India's Digital Policy Organisations

The Ministry of Electronics and Information Technology (MeitY), and its non-profit Digital India corporation, leads both the public and commercial sector promotion of digitisation in India. It also runs the IndiaAI bureau promoting research, development and deployment of AI technologies.

The Ministry of Communications, and its subsidiary Department of Telecommunications, are responsible for regulating and promoting fixed line and mobile telephony[2].

The Ministry of Science and Technology primarily focusses on health and biological sciences through the Council of Scientific and Industrial Research (CSIR) but has a minor role in funding telecommunications research and infrastructure through the Centre for Development of Telematics (C-DOT). The somewhat autonomous Department of Science and Technology within the confusingly identically-named Ministry oversees the Anusandhan National Research

[2]These two ministries were created in 2016 by splitting the former Ministry of Communications and Information Technology.

Co-funded by the European Union
Project funded by
Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra
Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

Foundation (ANRF), which is the main general research funding body formed in 2023 from new elements and mergers of former funding bodies.

The Ministry of Housing and Urban Affairs (MoHUA) is responsible for Smart City developments.

Policy Review

Overview

India has a number of major digital policies (or digital parts of other policies) which mirror EU policies. These include Digital India, Make in India, Startup India and IndiaAI. The National Digital Communication Policy underpins many of these more targeted policies by aiming to provide the digital infrastructure needed for their implementation. India is not a signatory to the World Trade Organization agreement on government procurement (which requires government tenders to allow overseas bidders except where national security is an issue).

The Digital India Bureau promotes the development of universally accessible digital infrastructure. In addition to Internet access, as noted above primarily via mobile devices at present, they promote the provision of a secure, trusted, authenticated digital document service underpinned by the Aadhaar digital identity system, including space for storing scans of legacy paper documents. The resulting DigiLocker service is part of the suite of Digital India's egovernment systems including Aadhaar, UPI and others mentioned above. These services are referred to as the "IndiaStack", a set of open APIs and digital public services designed to form a universal digital backbone, not only for citizen/business interaction with government (G2C and G2B) but increasingly supporting C2C (citizen to citizen), B2C (business to consumer) and B2B (business to business) interactions.

Cloud-Edge-IoT Policy

As with a number of other jurisdictions, concerns about the security and privacy of publicly held information (including key privacy and security services such as Aadhaar and UPI) have resulted in a cloud selection policy, updated on 20th March 2026) requiring government bodies to identify information held (and associated services provided) by government organisations which requires storage/processing on private government cloud services/approved "sovereign cloud providers". MeitY oversees the designation of sovereign cloud providers, private companies operating secure sites within India under strict security requirements. Around 60% of government cloud deployments are either government-run cloud services or sovereign cloud providers (imarc, 2025). Some internal government services are being shifted to India providers, such as the shift of 1.6m Union government email accounts to Indian cloud provider Zoho completed in 2026 (India Times, 2026).

The business cloud service sector is less dominated by US hyperscalers than in many other countries, according to most open analysis, putting Amazon and Microsoft at around 40% market share between them. Despite the public service sovereign cloud shift and calls for greater digital sovereignty in general, the government does not seem to be prioritising promoting increased use of Indian or open cloud systems for the private sector.

Edge and IoT are noted by some analysts as major growth areas of technology deployments in India (Razdan, 2025). However, the Digital India (2025) report on its first ten years of operation did not mention Edge or IoT once. The primary policy documents mentioning Edge or IoT are security guides/standards from technical groups.

Co-funded by the European Union
Project funded by Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER State Secretariat for Education, Research and Innovation SERI

Artificial Intelligence Research, Innovation and Promotion Policy

MeitY runs the IndiaAI platform promoting a variety of programs and "missions" to make use of AI in government and promote the adoption of AI in commercial and non-governmental sectors. These include:

- The National Mission on natural language translation. This mission aims to ensure that translation between English, as the international Lingua Franca of science and scholarship, and a variety of Indian regional language is sufficient to support teaching, learning, research and innovation. In addition to academic research on the topic, this will fund start-up enterprises.
- The recently formed IndiaAI Safety Institute, which is constituted as a small core within the bureau and various associated groups at academic research institutions and commercial AI companies.
- Support for Smart Cities (see **Error! Reference source not found.**).
- Expansion of AI data centre facilities, including public private partnerships.
- AI education in schools, colleges and universities.

Semiconductor Design/Production Policy

India has had a policy of promoting local design and fabrication of semiconductors since 2021 when MeitY established the India Semiconductor Mission (ISM). It's initial five year mission ISM 1.0 was renewed in 2026 for a second phase (ISM 2.0) to build on the outcomes of the first mission including expanding relevant education, research and development as well as expanding on international cooperative works, which included:

- a Memorandum of Cooperation with Japan's METI to create the India-Japan Semiconductor Supply Chain Partnership;
- a Memorandum of Understanding with the European Union on a semi-conductor supply chain partnership
- a Memorandum of Understanding with the Singapore on a semi-conductor supply chain partnership

The ISM 2.0 is explicitly aimed at improving India's digital sovereignty in semiconductor design and fabrication (PIB, 2026), also tying into the Make in India (domestic manufacturing for domestic consumption) and Make for the World (domestic manufacturing for export) policies. It aims to supply over 70% of India's internal market for semiconductors by 2029, including the installation of 3- and 2- nanometre fabrication capabilities, as well as "full stack" ownership of designs.

Data Spaces Policy

As noted **Error! Reference source not found.**, the introduction of the Aadhaar digital ID system in 2009 raised increasing concerns about the lack of data protection/privacy legislation. This came to a head in the 2017 verdict by the Supreme Court in Puttaswamy v. Union of India, which declared that the right to privacy was a fundamental element of the Indian Constitution under a number of its articles. This decision meant that not only must the government provide a sufficient reason for its own gathering and processing of personal data to justify its invasion of privacy, but also granted data subjects the right to make claims against private entities (the origin of the case was Facebook's acquisition of WhatsApp and merging of their privacy policies) who gather personal data indiscriminately. This led to the eventual

Co-funded by the European Union
Project funded by
Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra
Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

creation of the 2023 Digital Personal Data Protection Act which governs both state and commercial use of digital personal data.

This is seen by some such as Sharma and Akolkar (2025), as insufficient to provide legal certainty for individual and organisations in promoting the development of data spaces, leading them to call for an Indian equivalent to the EU's Data Governance Act.

Although technical discussions on data spaces have included Indian commercial organisations and researchers, such as the 2025 Data Spaces Week event organised by Japan's Data-Ex: Data Society Alliance in cooperation with India's Anna University, there is limited government policy promoting the development of data spaces in India.

The Open Government Data Platform (ODG) is limited to government produced data sets, not even including data produced by publicly funded research projects.

Smart City Policy

The government elected in 2014 introduced the Smart Cities Mission in 2015 under the authority of the MoHUA. This aimed to provide funding and other support (e.g. regulatory or legal foundations) for the deployment of smart city projects in 100 cities across the country. As noted above India is a large country with a still developing economy, and as such many of its smaller cities still struggled with basic infrastructure such as universal water, sewage and electricity. In some cases, the smart city initiative has focussed on a leapfrog provision of new smart infrastructure, whereas in others it is focussed on new digital-related capabilities. PIB (2025) reported that as of 2025 94% of the projects from the 2015 mission have been completed. Each of the 100 cities has created an integrated command and control centre which coordinate existing and new digital public infrastructure technology. Deployed projects include:

- CCTV and public address systems;
- Digitally connected water and sewage networks;
- RFID tracking of solid waste management vehicles ensuring efficient routing and collection timetables;
- Public transport including RFID tracking for buses, with bus stop and smart phone information provision, and improved cycling infrastructure with monitored cycle lanes and digitally-enabled cycle hire schemes.

Claims by MoHUA of success of the Smart Cities mission have been criticised by opposition politicians, however, as long on grand promises but delivering only limited benefits to much of the population of the cities (The Hindu, 2026). As of writing, there has been no announcement of a further smart city mission, although IndiaAI promotes increased use of AI for existing projects.

Digital Sovereignty Policies

As Unnikirshnan (2025) argues, India is seeking to enforce privacy and accountability on global players such as X (formerly Twitter), Meta and other US hyperscalers, without following China's digital censorship model. While the open protocols of the IndiaStack provide a bulwark against certain forms of digital recolonisation (Benyera, 2021) the reliance on imported chips (95%) and US hyperscaler operating systems (Google's Android, Apple's iOS and Microsoft's Windows) represent a major weakness in India's digital sovereignty. Other issues such as the reliance on US companies as the root or direct issuer of the vast majority of digital encryption certificates provide potential leverage for US firms and the US government in disputes with India. The imposition of individual sanctions on judges and prosecutors of the International

Co-funded by the European Union
Project funded by Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER State Secretariat for Education, Research and Innovation SERI

Criminal Court in recent years shows the vulnerability of non-sovereign technological dependency for individuals, even major public officials.

So, as with many other countries outside the US, India remains dependent on US hyperscalers (and Taiwan for semiconductors) and although it has some significant policies in place on localisation of processing for some government data, and a semiconductor strategy to become not only a supplier for its own market but to grow its market, the current digital sovereignty approach remains piecemeal and somewhat incoherent.

CONCLUSIONS

As a growing power, geopolitically and economically, the world's largest democracy already has some ties with the European Union. Its economic ties with authoritarian regimes in Russia, Brazil and China should be a cause for concern in Brussels, Tokyo, Seoul, Ottawa and Wellington. Seeking to include India in the developing digital sovereignty movement, based on portability, federability and open systems, should be possible, but will take sustained diplomatic effort on behalf of these other countries. India's post-colonial and developing economy status, combined with its large size, present greater challenges than integration with other potential partners. However, these factors also present opportunities. As a still fast-growing developing economy, India can potentially provide a rapidly expanding market without too much incumbent pressures and network effects.

Co-funded by the European Union
Project funded by
Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra
Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

REFERENCES

Banerjee, D. (2026a). Computing in the Age of Decolonization: India's Lost Technological Revolution. Princeton: Princeton University Press.

Banerjee, D. (2026b). India's tech sovereignty is built on digital dependence. Rest of World, 3rd March, 2026. Available from: https://restofworld.org/2026/dwaipayan-banerjee-india-technology-book/ Accessed 9th March 2026.

Benyera, E. (2021). The fourth industrial revolution and the recolonisation of Africa: The coloniality of data. London: Routledge.

Digital India (2025). Ten Years of Digital Progress. Available from https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/jun/doc2025630578601.pdf Accessed 6th April 2026.

Economist Intelligence Unit (2024). The Democracy Index. Available from https://www.eiu.com/n/global-themes/democracy-index/ Accessed 9th March 2026.

European Commission (2026). The EU-India trade agreement. Available from https://commission.europa.eu/topics/trade/eu-india-trade-agreement_en Accessed 6th April 2026.

Greenleaf, G. (2010). India's national ID system: Danger grows in a privacy vacuum. *Computer Law & Security Review*, *26*(5), 479-491. Available from https://doi.org/10.1016/j.clsr.2010.07.009 Accessed 6th April 2026.

The Hindu (2026). 'Nation was sold a half-baked scheme': Rahul Gandhi slams government on Smart Cities Mission. 31st March. Available from https://www.thehindu.com/news/national/nation-was-sold-a-half-baked-scheme-rahul-gandhi-slams-government-on-smart-cities-mission/article70806203.ece Accessed 8th April 2026.

imarc (2025). India Government Cloud Market Size, Share, Trends and Forecast by Component, Deployment Model, Service Model, Application, and Region, 2026-2034. Available from https://www.imarcgroup.com/india-government-cloud-market Accessed 6th April 2026.

India Times (2026). Centre migrates 16.68 lakh email accounts to Zoho platform at ₹180.10 crore expenditure: Jitin Prasada. 2nd April 2026. Available from https://telecom.economictimes.indiatimes.com/news/policy/government-moves-1668-lakh-email-accounts-to-zoho-platform-for-18010-crore/129966072 Accessed 6th April 2026.

Lee, K. (2021). Economics of technological leapfrogging. The challenges of technology and economic catch-up in emerging economies, 123-159. Available from https://doi.org/10.1093/oso/9780192896049.003.0005 Accessed 6th April 2026.

McKenna, C. E. (2012). India's Challenge: Preserving Privacy Rights While Implementing an Effective National Identification System. *Brook. J. Int'l L.*, *38*, 729.

Maslej, N. *et al.* (2025) "The AI Index 2025 Annual Report," AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA. Available from https://doi.org/10.48550/arXiv.2504.0713 Accessed 9th March 2026.

Ministry of Finance (2026). Economic Survey 2025-6. Available from https://www.indiabudget.gov.in/economicsurvey/ Accessed 9th March 2026.

Nasscom and Arthur D. Little, India (2024). India's Digital Public Infrastructure. Available from

Co-funded by the European Union

Project funded by Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Swiss Confederation — Federal Department of Economic Affairs, Education and Research EAER State Secretariat for Education, Research and Innovation SERI

https://new.nasscom.in/sites/default/files/publicreport/Digital%20Public%20Infrastructure%2022-2-2024_compressed.pdf Accessed 6th April 2026.

PIB (2025). 10 Years of Smart Cities Mission. Available from https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=154736&ModuleId=3&reg=3&lang=2 Accessed 8th April 2026.

PIB (2026). India Semiconductor Mission 2.0: A Major Push in Budget 2026 towards Semiconductor Self-Reliance. Available from https://d2p5j06zete1i7.cloudfront.net/Cms/admin/PressRelease/1770478760.pdf Accessed 7th April 2026.

PolSci Institute (2025). Linguistic Diversity in India: Understanding Linguistic Groups. Available from https://polsci.institute/state-politics-india/linguistic-diversity-in-india/ Accessed 11th March 2026.

Rakshitha, N. (2024). The Rise of Wired Broadband in India: A 20% Surge in Subscribers. Jaze Networks' Blog. Available from https://www.jazenetworks.com/tech-news/the-rise-of-wired-broadband-in-india-a-20-surge-in-subscribers/ Accessed 6th April 2026.

Rao, U., & Greenleaf, G. W. (2013). Subverting ID from above and below: The uncertain shaping of India's new instrument of e-governance. Surveillance & Society, 11(3), 287-300. Available from https://ojs.library.queensu.ca/index.php/surveillance-and-society/article/download/India_ID/India_ID/ Accessed 6th April 2026.

Razdan, Y. (2025). Is Cloud the Blind Spot in India's Edge Boom? EETimes, 28th July. Available from https://www.eetimes.com/is-cloud-the-blind-spot-in-indias-edge-boom/ Accessed 6th April 2026.

Sharma, A. and Akolka, A. (2025). Addressing the Regulatory Void: Strengthening India's Data Economy Legislation. Available from https://www.cbflnludelhi.in/post/addressing-the-regulatory-void-strengthening-india-s-data-economy-legislation Accessed 7th April 2026.

United Nations, Human Rights Office of the High Commissioner (2025). US sanctions on ICC officials undermine independence of tribunal and justice for victims: UN experts. Press release. Available from https://www.ohchr.org/en/press-releases/2025/08/us-sanctions-icc-officials-undermine-independence-tribunal-and-justice Accessed 6th April 2026.

Unnikirshnan, P. (2025). India's digital sovereignty: The promise, the peril, and the path ahead. Grant Thornton, 2nd September. Available from https://www.grantthornton.in/insights/articles/indias-digital-sovereignty-the-promise-the-peril-and-the-path-ahead/ Accessed 6th April 2026.

GLOSSARY

ANRF: Anusandhan National Research Foundation
C-DOT: Centre for Development of Telematics
CSIR: Council of Scientific and Industrial Research
DPI: Digital Public Infrastructure
ISM: India Semiconductor Mission
MEITY: The Ministry of Electronics and Information Technology
MoHUA: Ministry of Housing and Urban Affairs
ONDC: Open Network for Digital Commerce
UPI: Unified Payments Interface

Co-funded by the European Union
Project funded by Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER State Secretariat for Education, Research and Innovation SERI