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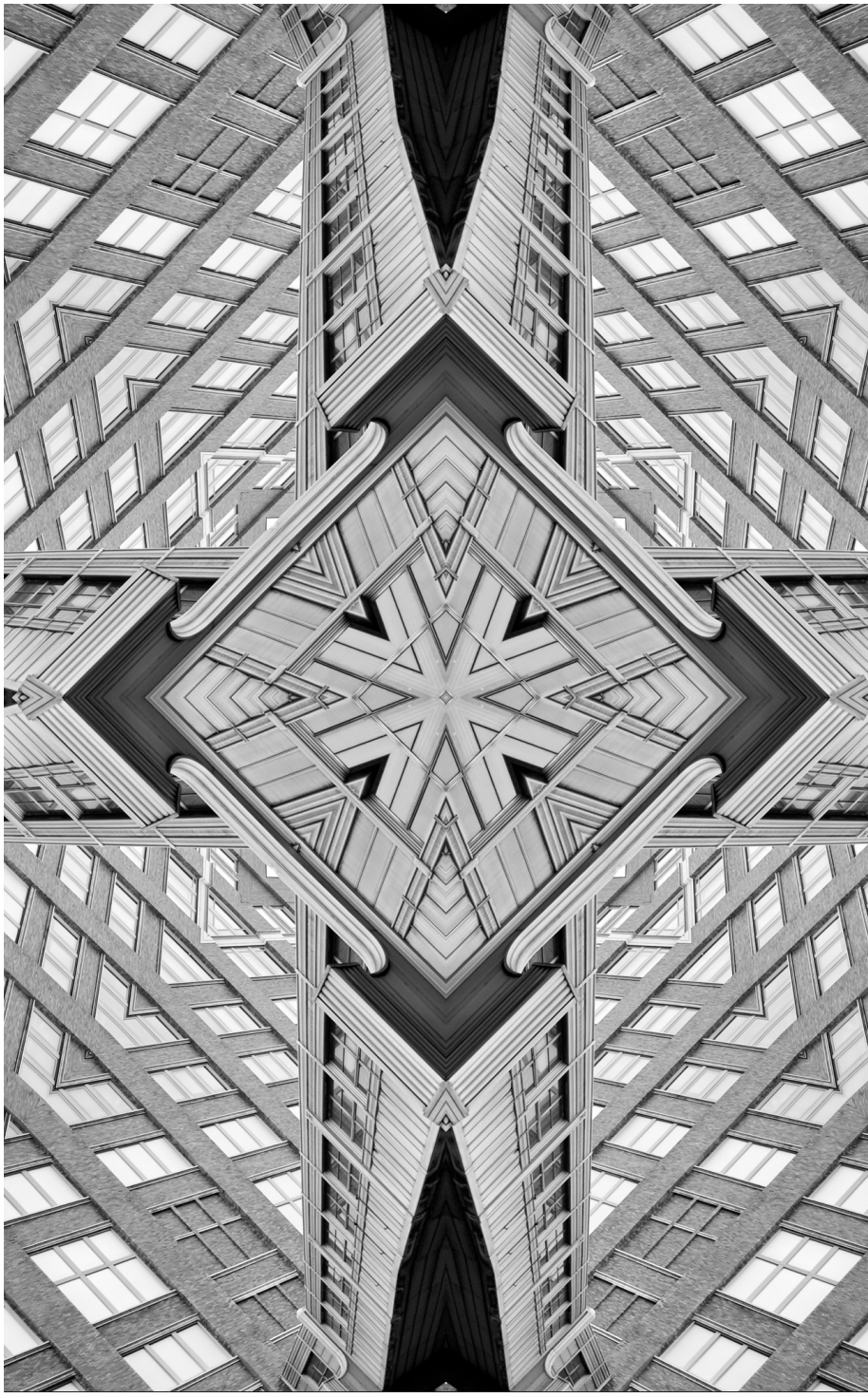

Democratising Technology for the Next Six Billion: India's 'Digital Public Goods' Innovation

Nisha Holla

Abstract

Access to, and development of indigenous digital platforms and cutting-edge technologies is imperative for robust socio-economic development and national security. In turn, such process needs to be democratised, and undertaken in a sustainable manner. India is a first mover in this novel idea of democratising technology and developing Digital Public Goods. Operationalised in the digital infrastructure called India Stack, India's strategy aims to unlock digital and financial inclusion for its billion-plus population. The multiplatform system forms the basis for reforms and improved productivity in many sectors including health, education, technologies, and labour management in manufacturing and construction. As nations contemplate techno-sovereignty amidst the COVID-19 pandemic, India's unique model serves as a case study for democratising technology.

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Introduction

Beginning in early 2020, the COVID-19 pandemic—and the lockdowns implemented by governments across the world as a response—accelerated emerging trends of digitalisation, mobile and internet penetration, and technology adoption. In 2000, barely 413 million people were internet users;[1] today, that number exceeds 4.9 billion.[2] Social media was almost unheard of at the turn of the century; at the time of writing this brief, 4.5 billion people were active users. With key services such as education and health, relief delivery, government communications, and citizens' transactions like bill payments being increasingly disseminated digitally in many countries, techno-citizenship[a] has become an inevitable attribute of the future.

Establishing universal access to the internet, digital platforms, and other vital technology has become a necessity in every economy. Accordingly, there is a need to make digital rights sacrosanct and inviolable: among them, data privacy, personal safety, security, and self-determination via opt-in consent loops.[3] Yet, access to and development of digital platforms and technologies is a necessity not only for the individual; rather, as the principle of techno-sovereignty dictates, it is essential for national security. Countries must build a technological moat to secure their citizens' interests.[4] The events over 2020 and 2021—the outbreak of the COVID-19 pandemic and its global economic fallout, set against a backdrop of multiple border disputes, technology disputes, and a flight to innovation—bring up a fundamental question: How should states democratise the development of technology and ensure digital equity and protection for all?

The process of democratising the development and access to vital technologies must be sustainably undertaken, much in the same manner that public goods or commons are built for society. Leaving it in the hands of private companies like Google or Facebook brings myriad risks, both known and unknown—these include digital monopolisation, monetisation of private data, and financial and privacy losses due to international security breaches with no recourse to local laws. At the same time, overreliance on other states, such as China, for technology development has negative consequences, primarily national security risks. Instead, digital commons must be developed and deployed as a "shared [national] resource in which each stakeholder has an equal interest."[5]

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a Citizenship refers to the implicit social contract between an individual and a state to which the individual owes allegiance and, in turn, is entitled to the state's protection. In this technology era, three new relationships emerge which entail new social contracts: one, the state's duty to protect the digital personas of citizens. Two, protection of digital data that resides with other states. For example, Indian citizens' data in the US via Facebook or China via PubG. Three, citizens now interact with other global citizens on decentralised platforms (like blockchain-based systems like cryptocurrency). The term 'techno-citizenship' re-formulates citizenship contracts and relationships in today's globalised and digitalised era.

Introduction

A democratised digital commons has the following foundational attributes:

1. Universal and equitable access at scale, with no community left behind.

2. Active policy of inclusion with a built-in philosophy to reduce costs and friction.

3. Sacrosanct rights like privacy (right to private digital communications with encryption), personal safety and security (protection from leaks and abuse of personal data), self-determination (to opt-out of terms and conditions, to control and consent to the use of one's data, portability), and not to be profiled (to opt-out of automated profiling and bulk surveillance).

4. Recourse to the law: In case digital rights have been abused, one needs recourse to the law. This is only possible if a citizen's data is within the same borders where they are a citizen or resident. Data localisation and sovereignty is invariably the only way to provide every citizen rightful recourse to the law.

5. Supports continuous innovation: The nature of technology's rapid evolution necessitates continuous updates and innovation. Interoperability is also essential for digital commons to serve as platforms that can support new systems being built on top of them.

India is one of the few large economies that has built digital public goods (DPG) or commons at scale, with the potential to incorporate these five necessary attributes in a practical manner, to benefit its citizens.

A Unique 'Digital Public Goods' Model

Private industry has traditionally led the development of technology and digital platforms; much of current cutting-edge intellectual property development is still primarily owned by American for-profit companies such as Alphabet, Amazon, IBM, Facebook, Microsoft, and Qualcomm.[6] These corporations receive ample support from the US government, which actively encourages and collaborates with its private sector in the development of dual-use technologies—i.e., utilised by the private sector for their capitalistic endeavours but also by the government to protect the sovereign interests of the United States. For example, customised services are provided by Google Cloud and Google Maps, Amazon GovCloud AWS services, Azure Government by Microsoft, and Palantir, which the US government uses for intelligence and national security purposes.

The US, with its first-mover advantage, has successfully exported its digital technologies and architectures to the world via the globalisation of private companies. As a result, a significant proportion of the world population use some form of American digital tech every day—whether an iPhone or Android smartphone, a social media network like Facebook and Twitter; and other services such as WhatsApp, Google, and Amazon.

The proliferation of American technology is accompanied by the US security status having unimpeded access to the data of citizens of other countries. People's data flows through the data centres of these companies and is methodically collected, analysed and monetised[7,8] –often facilitated by obscure user-service agreements that encourage these infringements. On the strength of their vast data banks, these companies have grown into monopolistic digital and data conglomerates over the years.[9]

This monopoly is facing pushback in certain regions, such as Europe. In 2016, the European Union (EU) adopted the General Data Protection Regulation (GDPR) to curb the collection, storage and monetisation of its citizens' data.[10] GDPR mandates that data collectors cannot sell to third parties any personal information including names, racial and religious details, contact information, and location tags. It directs that users have to be kept informed of how their data is utilised, be allowed to opt-out of automated profiling, access what information of theirs has been recorded, and erase or restrict processing of their data.

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Before the GDPR was issued, a user in the EU signed off rights over their data to these companies by default, and were enrolled into their standard terms, conditions, and privacy agreements; the GDPR hands back agency to the user. It places the onus on the data collector to demonstrate that they have a verifiable reason to collect the data, and not just to bundle and sell off to third parties for targeted advertising and associated services. In the event of a database hack, GDPR mandates, users must be notified within three days. GDPR thus lays out a framework that takes the transparency of digital systems closer to the necessary attributes of digital commons. It is a comprehensive template that other countries can utilise to enforce techno-sovereignty.

The largest counterweight to the technological expansion of US companies is the hegemonic global deployment of Chinese technology.[11] China has rapidly developed not only digital platforms and architectures but also the underlying hardware systems that many smartphones and other devices comprise of. China's share of global exports in computers, electronics, and optical products rose from 15 percent in 2003-07 to 28 percent in 2013-17, now accounting for more than one-fourth of global movement.[12] As it takes on more of the characteristics of a surveillance state where privacy and self-determination are suppressed,[13] China is also attempting to gather data of citizens of other countries.[14] Indeed, Chinese apps and platforms are enjoying tremendous growth outside its territory: among them, TikTok, owned by parent company ByteDance; UC Browser owned by e-commerce behemoth Alibaba; and WeChat of the multiplatform giant Tencent.

In part, this owes to their design and manufacturing stranglehold on Android phones and devices: after Samsung at number one, the four largest Android device manufacturers are Chinese.[15] The intelligence arms of several countries, including India and the US, have flagged Chinese apps for their spyware and malware components.[16] In June 2020, amidst suspicions of data proliferation and the use of data against national security, the Indian government first banned 59, and then an additional 118 apps by Chinese companies.[17] The US government followed suit and banned several Chinese apps, citing similar security reasons.[18]

A Unique 'Digital Public Goods' Model

Unlike in the American model, the Chinese government is intimately linked with the technology development of its companies and deploys them as part of its expansionist strategy.[19] Apart from apps, Chinese companies frequently provide low-cost telecommunication and other equipment to other countries. This gives it a vice-like grip on the most important communication channels, including the 5G architecture of the future.[20] The US had previously restricted Huawei and ZTE from bidding for 5G telecom networks in the US. Australia, New Zealand and Japan have also blocked Huawei from its 5G network market.[21]

It is clear that both the US and China models, by their very nature cannot contain the five attributes required for democratised architectures. Left to themselves, technology built by for-profit companies in the American model will likely prioritise monetisation and advertising revenues over rights such as user privacy and self-determination. For citizens of other countries, equity and recourse to the law in situations of a breach are unavailable locally. Implementing strict data sovereignty and localisation norms like the EU's GDPR can address some of these concerns. However, for critical services such as financial inclusion, health access, and education, one cannot depend on providers that are external to their state. For these same reasons, relying on Chinese technologies and platforms is also untenable.

This is where India has designed an unusual model that fits the requirements of Digital Public Goods (DPG). In India, DPGs are developed neither solely by private companies with a profit motive nor with a government stranglehold on surveillance-orientation. The India Stack has risen as an exemplar of public-private partnership (PPP)—a series of volunteer-driven software platforms that form the backbone of the government's 'Digital India' and financial inclusion policies.

> "Left to themselves, for-profit companies in the American model will prioritise monetisation and advertising revenues over rights like user privacy and self-determination."

The Evolution of 'India Stack'

India Stack was started to solve a fundamental issue impeding financial inclusion: the lack of a comprehensive identifier. Launching the Unique Identification Authority of India (UIDAI) in 2009, the Indian government then put in motion the world's largest one-sweep identification system, Aadhar—a unique, 12-digit identifier for every Indian resident linked to demographic, residential, and biometric data.

Before Aadhar, India faced extensive problems with identifying its then population of more than 1.2 billion. Various available ID systems such as the driver's license, voter ID, permanent account number, and ration card lacked interoperability. The country required a systematic nation-wide ID that will identify the ordinary Indian resident, many of whom perhaps did not have a bank account or a vehicle to avail the existing types of IDs. As of June 2021, 99 percent of India's adult population had an Aadhar card issued to them.[22] India has built the world's most extensive biometric ID system and is recognised worldwide for its comprehensive coverage, ingenuity, and flexibility. Nobel Prize Winner for Economics and former World Bank Chief Economist Paul Romer once remarked, "The system in India [Aadhar] is the most sophisticated that I've seen."[23] He said it "could be good for the world if this became widely adopted."

With the heavy involvement of industry pioneers like Nandan Nilekani, the UIDAI system's architecture was designed from the start as a multi-platform public utility with application programming interfaces (APIs) that can be utilised to develop products, services, and platforms on top of the system. This decision proved crucial to the development of the India Stack and the DPG model by allowing for interoperable modular design. Aadhar first unlocked new banking and payments modes. The National Payments Corporation of India (NPCI) launched APBS (Aadhar Payment Bridge System) and AEPS (Aadhar Enabled Payments System) which residents with an Aadhar and bank account could access.[24] The APBS-AEPS network enabled a direct-to-beneficiary-transaction system, which forms the bedrock of India's massive Direct-Beneficiary-Transfer (DBT) system. To date, INR 19.3 trillion has been disbursed by the Indian government via DBT directly to identified beneficiaries as relief and income support.[25]

The Evolution of 'India Stack'

On the heels of Aadhar arrived e-KYC (Know Your Customer) in 2012. It solved the earlier problem of lack of identification in banking as businesses and banks could now perform KYC verification digitally using biometrics or the mobile OTP linked to Aadhar.[26] With mobile-phone penetration skyrocketing in India, the move to link the mobile phone and Aadhar was another skillful act of the system. In 2014, the final component of the JAM (Jan Dhan – Aadhar – Mobile) triad, Jan Dhan, was implemented; it remains one of the largest financial inclusion initiatives in the world. It has so far provided more than 430 million Indians with a digitally accessible bank account.[27]

The Pradhan Mantri Jan Dhan Yojana (PMJDY) launched a platform for universal access to banking, built on the unique identification system that Aadhar made possible. The crucial features of PMJDY include the provision of a basic zero-balance banking account for every household, a RuPay debit card for online transactions, access to credit, as well as insurance, remittance, and pension facilities.[28] Mobile banking became available on even the basic feature phones. More than 55 percent of Jan Dhan account holders are women, and more than 67 percent reside in rural districts.[29]

The JAM architecture democratised access to financial services, and India made the leap beyond financial *inclusion* to financial *integration*. JAM enabled different government ministries and departments to launch essential services including the following: e-Sign, enabling Aadhar holders to sign documents digitally;[30] DigiLocker, which eliminates the need to carry physical documents and instead use verified digital copies on registered mobile phones;[31] the MUDRA scheme for providing small business loans for greenfield enterprises;[32] central-KYC to build a centralised repository of KYC records for business;[33] and Aadhar Pay for merchants to receive customer payments via the Aadhar biometric system.[34]

Another breakthrough by NPCI was the launch of UPI (United Payments Interface), a novel interface using the Immediate Payment Service protocol to operate accounts in any participating bank at any time of the day.[35] With UPI, for the first time in the world, money could be sent in a few steps on the mobile phone, from one bank account to another in under six seconds. UPI pioneered the actual movement of money from account-to-account as opposed to the ledger entry and delayed reconciliation system that Visa and other protocols use. It revolutionised digital payments in India by merging various banking facilities, routing funds between banks, and enabling merchant payments on the same platform.

The Evolution of 'India Stack'

The system brought numerous advantages to customers, banks and merchants like cost reduction, simplified opt-in procedures, and standardisation of protocol. It also paved the way for the Bharat Bill Pay System. The BHIM app was introduced as an example of what UPI could enable as an end-to-end use-case. Apps like PayTM, PhonePe, and MobiKwik followed up on BHIM by integrating UPI and Bill Pay with the railway ticketing system and various e-commerce networks to create digital one-stop solutions. The UPI transaction volume has been steadily increasing, recording its highest ever in September 2021 at 3.7 billion transactions with value reaching INR 6.5 trillion.[36]

The evolution of India Stack—from solving the problem of identification with Aadhar, to the continual addition of interoperable modules for transactions, banking, bill payments, and relief delivery via DBT—demonstrates its value in democratising access to digital platforms. Modules for data privacy and regulatory frameworks can also be similarly assimilated, as the government has initiated with Account Aggregator,[37] and the Data Privacy Bill, among others. These DPGs are not owned by private players but managed by the government via independent technical consultants. Citizens are stakeholders with recourse to the law in Indian courts in case their rights are violated. In this manner, all five necessary attributes for digital commons can be implemented and enforced within such a system.

> "With 'India Stack', India is making the leap from financial *inclusion* to financial *integration*."

Utility of the DPG Architecture

In a country as large and diverse as India, financial integration was made possible through the use of publicly owned, regulated technology frameworks that are accessible to private developers in an organised fashion with the open-API frameworks. These frameworks are generally developed in consultation with the private sector and treated as public goods, accessible to all players. Open-access has encouraged competition, and spurred innovation and investments, thus delivering greater value to the end-users. The open licensing format prevents monopolies and levels the playing field.

India Stack received further validation during the initial outbreak of the COVID-19 pandemic and the series of national lockdowns implemented as a response. The Indian government sent relief support instantly and directly to over 420 million beneficiaries via DBT,[38] including farmers, women Jan Dhan account holders, rural workers, the disabled, widows, and other poor and marginalised groups. Bill Pay enabled citizens to digitally pay for continuity of utilities. The UPI protocol allowed peer-to-peer transfers at a time when people could not transact in person. E-Sign, DigiLocker, and other facilities allowed some businesses to continue operations while in lockdown.

This DPG architecture, managed in a PPP model, could have immense feedforward effects for the economy, especially in the post-COVID-19 recovery period. McKinsey Global Institute has noted: "Financial-sector reforms and streamlining resources can deliver $2.4 trillion in investment while boosting entrepreneurship by lowering the cost of capital for enterprises by about 3.5 percentage points".[39] Next-generation financial services engines have also been pegged as a growth driver for the country. India Stack has already delivered multidimensional financial-sector reforms and streamlining of resources with DBT, real estate flow management, digital payments, and bill payments. With this strong track record, it is conceivable that this architecture will be crucial to delivering the USD2.4-trillion in investments and the lowering of cost of capital as projected by McKinsey.

Beyond India, the DPG architecture could solve problems other countries are also facing; challenges which the global pandemic and its massive economic fallout have sharply revealed. Finch Capital, in a report, surveyed the macroeconomic impact of the COVID-19 pandemic on multiple regions and

Utility of the DPG Architecture

estimated the financial technology enablers crucial to economic recovery.[40] It concluded that across the world, digital-only has become the new industry norm for financial services like banking, insurance, wealth management, and payments. Moving an entire country's incumbent paper-based financial system to digital necessitates a massive, interoperable, open architecture like India Stack. Finch Capital identifies e-KYC as a vital system due to an "increased need for safe digital ID given [increasing] volume of digital business transacted and robust solutions required for protection of client assets"—a problem that India's Aadhar system has addressed over the last decade. The report also identifies tech-driven toolkits for customer support, account opening procedures, loan processing and automation, developer collaboration and confidentiality requirements as critical components—again, something the JAM architecture with its multiple, interoperable, open-API toolkits has solved. Finch Capital also pegs the crucial role of artificial intelligence (AI) in achieving these objectives; a focused deployment of AI and Big Data analytics requires clean sets of data collated around uniform variables, such as an Aadhar identification number.

With this novel and validated DPG architecture, India could be ushering in a new dawn of the 'tech by all' and 'tech for all' paradigm for the whole world. Interoperability and modular architectures are the key components. These pave the way for greater financial integration with vernacular language offerings of services, flow-based lending, different assistance paradigms including 'vernacular voice assistants', introduction and bundling in of advanced services like demat accounts and insurance schemes, new risk capital vehicles, and the ultimate goal: customisation of services for the individual.

The first wave of innovation of the DPG architecture was in financial inclusion and integration, and rightly so. The interoperable, modular and multiplatform system design forms the basis for reforms and improved productivity in many sectors: health, education, technologies, and labour management in manufacturing and construction. The second- and third-order benefits of the system are tremendous, and limited only by the ingenuity of those who will implement it.

Next DPG Frontier: Health and Rapid Pandemic Response

The pandemic has revealed the faultlines in Indian healthcare. World-class healthcare is available only in the few urban agglomerates, and infrastructure is sparse in between. The country faces an acute shortage of trained medical personnel, of about 600,000 doctors and 2 million nurses according to World Health Organization estimates.[41] The pandemic has also demonstrated the need for a real-time information and collaboration system that can provide up-to-date data on the number of infected patients, what condition they are in (asymptomatic, mild, severe, critical), and the number of bed vacancies by segment (isolation rooms, wards, ICUs, ventilator-equipped). This is exacerbated by the fact that many Indian hospitals are still dependent on manual paperwork. It is a situation reminiscent of the state of India's financial sector a decade ago—undigitised and fragmented, lacking a unified core to build a reliable multiplatform system around which all stakeholders can plug into, build their own system on top of, and customise to their needs.

The difference this time is that India has already spent a decade validating the DPG architecture that can now be deployed in the health sector. India Stack forms the basis for the National Health Stack (NHS)[42] envisaging various layers seamlessly linking to support national health electronic registries, a claims and coverage insurance platform, a centralised personal health records framework, a national health analytics platform, and increased coverage under the flagship Ayushman Bharat initiative, as India works toward universal healthcare.

The NHS too, will have open-API toolkits that various governments and health providers can utilise to build their own customised system on top of the public domain system. The private-public multilayer architecture will enable two-way information flow on critical parameters such as bed vacancies, ventilator usage, infection loads, availability and capacity of emergency response, anonymised patient information in an epidemic situation to gauge risk profiles, and real-time information on availability of essential medicines and devices. It is crucial that the firewall between the private and public layers be designed to protect personal information while allowing for the flow of anonymised information.

Next DPG Frontier: Health and Rapid Pandemic Response

In the same vein, DPGs can be developed for rapid pandemic assessment and response. The country's experience with COVID-19 must be recorded and analysed, and systems developed based on such analysis. Aarogya Setu has already set this in motion. With contact tracing, Aarogya Setu app had indicated 700 potential hotspots in the country and alerted 140,000 app users about proximity to infected patients, in the midst of the first wave in May 2020.[43] The World Bank has praised India's contact-tracing effort using Bluetooth and location data on the app.[44] The data collected on Aarogya Sethu is valuable in preparing for another pandemic or emergency situation post-COVID-19.

> "India has already spent a decade validating the 'Digital Public Goods' architecture that can now be deployed in the health sector."

Maintaining Momentum

Indian innovation on DPG architecture can serve as a case study on democratising technology for the next six billion, without commercial or expansionist interests. Indian DPGs are already deployed on a PPP basis without the expectation or design for profit. Rather, it is intentionally designed as an inclusive, accessible, and low-friction platform for innovation. Many countries, especially in the emerging world, can benefit from this approach. DPGs can be designed to be interoperable and modular structures on top of which customised interfaces and databases can operate using APIs, and each country and entity can customise these architectures according to their needs. Alphabet's recommendation that the US Federal Reserve utilise the India Stack-UPI protocol to upgrade the outdated American banking system[45] demonstrates that it is not just the developing world that might benefit but even the wealthier countries as well.

Democratising technology with the five foundational attributes of universal access, bias towards inclusion, sacrosanct rights, direct recourse to the law, and continuous innovation, is essential to uphold techno-citizenship. The pandemic has only served to accelerate the world toward this inevitable conclusion. India is a first mover in this novel idea of democratising technology and developing digital public goods. The world must come together with forward momentum on these five attributes to usher in an era of "tech for all" and "tech by all".

This brief is an expanded version of an essay first published in ORF's Digital Debates: CyFy Journal 2020*, October 2020.*

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