

## Indigenous Technology as a Strategic Moat for India

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**ABSTRACT** Technology is vital to enabling accelerated socio-economic growth, effective governance, and relief delivery at scale. Many economies are adopting and developing technology-first frameworks to strengthen their population's social welfare net, and support economic growth. The COVID-19 pandemic has exposed both the challenges and opportunities in India that can be addressed and driven by multidimensional technology frameworks. With the rebalancing of the world order post-COVID-19, the Indian government must also relentlessly pursue the development of world-class indigenous technologies in multiple sectors as a native full-stack advantage for its citizens. India can more deterministically secure its digital and material interests with such a strategic moat in place.

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## INTRODUCTION

Technology has enabled India to respond to the COVID-19 pandemic in ways that were not even conceivable as recently as a decade ago. The country has pioneered the development of digital public goods (DPG) built as partnerships between the government and private industry.<sup>1</sup> Many of its DPGs are open-API<sup>a</sup> development exercises with significant volunteer participation<sup>2</sup> that are accelerating India's achievement of its Sustainable Development Goals.<sup>3</sup> They exemplify the Indian private sector's civism, its readiness to work with the government, especially in times like the current pandemic, to deliver world-class platforms for socio-economic growth. Increasingly, this model is defining India's governance and relief delivery.

India has spent a decade validating this novel public-private partnership (PPP) model. The value proposition of using leapfrog technology to eradicate poverty, nurture development via inclusive growth, and accelerate India's trajectory towards a middle-income economy is obvious. Further, the country faces a generational opportunity in the post-COVID-19 new normal to re-establish itself in a realigning global order.

The development of indigenous technological capabilities as a multidimensional moat is a reliable strategy that will yield dual-use dividends – both in a pandemic and in normal times. There are three objectives with which the country must prioritise technology: for governance and

relief response delivery; enhancing private sector capabilities; and unlocking future opportunities to deepen the moat.

## TECHNOLOGIES FOR GOVERNANCE AND RELIEF RESPONSE DELIVERY

### India Stack at Work

India Stack is one of the leapfrog-enablement technology platforms through which the country is accelerating its ease of doing business and financial inclusion goals.<sup>4</sup> Amidst the COVID-pandemic, personal interaction to transact and conduct business has become life-threatening, and further made difficult by the national and various regional lockdowns. However, life has had to go on – citizens had to pay power and water bills, pay for food, groceries, medicines and more, but could not risk transacting in person using cash. Through India Stack's Bill Pay, UPI, and other services, the entire country was ready to transact reliably over these national protocols and services.

With India Stack and the JAM trinity – Jan Dhan, Aadhar, Mobile – the country has built vast databases of Aadhar-verified beneficiaries for most large-scale government schemes. These programmes include the Pradhan Mantri Ujjwala Yojana (80 million beneficiaries being given free LPG cylinders for smoke-free cooking<sup>5</sup>); the Pradhan Mantri Kisan Samman Nidhi Yojana (minimum income support for 100 million registered farmers<sup>6</sup>); and the Mahatma Gandhi National Rural Employment Guarantee Act

a Open-APIs or Application Programming Interfaces are publicly published software interfaces that allow developers programmatic access to a proprietary application or software system. There are usually minimal and standard restrictions on the use of such interfaces, such as Fair Use compliances and enterprise verification requirements.

(MGNREGA – rural employment guarantee with 136 million registered and 81.7 million active<sup>7</sup>). Unlike during the first six decades of Independent India, there is now verifiable information owing to Aadhar and the Direct Benefit Transfer (DBT) digital logs. The DBT-databases framework could prove valuable in moving away from India’s legacy subsidy system, which was ridden with leakages and duplicate payments.<sup>8,9</sup>

During the COVID-19 lockdown in particular, when millions of Indians were suddenly cut off from their daily employment wages, these databases of ID-verified beneficiaries, combined with DBT enabled one of the world’s most substantial volumes of real-time relief delivery.<sup>10</sup>

### Direct Benefit Transfers

One of the most striking resultant programmes built on India Stack is the country’s national-scale DBT program. To date, INR 11.6 trillion worth of benefits have been disbursed through DBT, leading to savings of INR 1.7 trillion, by cutting out middlemen inefficiencies and leakages – which amounts to nearly one percent of the country’s Gross Domestic Product (GDP).<sup>11</sup> During the COVID-19 lockdown alone, INR 654.5 billion had been transferred to the accounts of 420 million ID-verified beneficiaries by June 19.<sup>12</sup> The ready availability of databases of families living below poverty line, women Jan Dhan account holders, farmers and rural workers, widows, people with disabilities, and other disadvantaged groups, built over the last six years, was a boon to India in these trying times. While countries like the US mailed millions of cheques that people had to cash in –

amounting to a minimum 15-day timeframe between the allocation of benefits and cash-in-bank – in India, it was near-instantaneous.

This is a paradigm shift in governmental programme delivery that brings radical transparency and accountability throughout the implementation stack. The tech-supported approach helps the administration ensure that the most deserving beneficiaries are supported, and reduces leakages and inefficiencies. Most importantly, it makes government programmes measurable and auditable, and removes the otherwise insurmountable physical friction in support delivery.

### Aarogya Sethu and the Government-Citizen Engagement Revolution

At a time when over a billion people in India felt unsafe leaving their homes, uncertain of where and when they could contract the virus, technology has made possible the world’s most massive organic exercise in contact tracing and syndromic mapping, thanks to Aarogya Sethu (AS). It is a comprehensive tool made available to Indian citizens to map their health status periodically and monitor the spread of the infection in their neighbourhoods. This shift in the attitude of Indian citizens, their willingness to use an app to help decide their daily routines is significant. It shows how friction-less citizen participation can support a government’s actions to secure the national health interest.

AS took only 13 days to reach 50 million downloads, breaking Pokémon Go’s world record of 19 days.<sup>13</sup> By June 7, AS had over 120 million downloads<sup>14</sup> – with the pandemic

running its course, more people are signing up every day. According to government officials, the app has already helped generate information about 700 potential hotspots and has alerted over 140,000 app users, via Bluetooth-enabled contact tracing, about possible risk of infection due to proximity to infected patients.<sup>15</sup> The World Bank has praised India's contact-tracing effort<sup>16</sup> and many countries are launching similar apps in their territories.<sup>17</sup> India must now build on this achievement and explore ways of making the AS framework a permanent part of the strategic moat.

It could, for example, help break 70 years of apathetic government-citizen engagement. Indeed, it is the most extensive population grouping and mass study that India has geo-mapped. As the pandemic passes and normalcy resumes, the government can explore using the AS framework to empower people to log other civic issues with a geo-tag on the platform. The many problems Indians face every day – potholes on roads, open drains without a utility hole cover, mismatch in bus and Metro coverage routes, breaks in broadband connectivity at the local panchayat, lack of primary care facilities within a 10-km radius – can be logged onto the framework, and maintenance/improvements can be prioritised based on the number of complaints on a particular issue. Accountability at all governance levels can be tracked dynamically and monitored by both the highest levels of the democratic system and by citizens via a centralised, transparent dashboard. This will assign entirely new meaning to citizens' voice and participation, and the world's largest democracy can also become its most involved one.

## **Bharat Health Stack (BHS)**

The proposed BHS operating on the India Stack engine can be a game changer for Indian healthcare delivery. The COVID-19 pandemic has made it apparent that India does not have a collaborative platform for inter-hospital and hospital-government information exchange. Real-time data on bed vacancies, number of COVID-19 patients, dynamic status updates, news on segments of patients (critical, severe, mild or asymptomatic), and data on vacant isolation wards is crucial to saving lives. BHS is proposed as a multi-layered public-goods infrastructure on which governments and health providers can deploy dedicated apps and platforms.<sup>18</sup> The architecture will enable information symmetry on aggregate dimensions such as bed vacancies, infection loads, ambulance and emergency response staff availability, critical medicines and devices availability, and more, without exposing identifiable patient information. Integrating BHS with Ayushman Bharat and other health schemes can accelerate the country's progress towards universal health coverage and distributed portability of services. This will be a high-effort intensive exercise, but one that can help the country leapfrog its healthcare infrastructure to the levels required to serve the population through an inclusive and efficient system.

## **OTHER VITAL TECHNOLOGY CONTRIBUTIONS BY THE PRIVATE SECTOR**

The Indian private sector has continuously contributed to national wellbeing, especially in times of crisis. During the COVID-19 lockdown, India Inc. found many new ways of

helping the government tackle the crisis. Like their counterparts in the US and other countries, automobile companies like Tata and Mahindra repurposed their production plants to augment ventilator and respiratory aid manufacturing. Garment manufacturers lent a hand in ramping up production of N95 masks and personal protective equipment (PPE) from nearly zero to such large volumes that within three months India had export surpluses. Several vaccine manufacturers are working with the Indian Council of Medical Research (ICMR) to accelerate early vaccine candidates into human trials. With these self-reliance oriented initiatives, India seems to have overcome its former unviable dependence on global supply chains. It is crucial to operationalise this further and make India self-reliant for critical materials.

There are many unique ways India Inc. and the growing start-up ecosystem complemented the public sector in the fight against COVID-19:

### **E-commerce**

At a time of pandemic-risk and restricted citizen movement, the utility of e-commerce has never been more apparent. People increasingly look to e-commerce for every need – food, groceries, medicines, body care and hygiene products, and even to send parcels across the city. India's decadal e-commerce boom had helped map out delivery routes and set up the required digital infrastructure at scale before the pandemic hit. When the contact restrictions were put in place, e-commerce giants moved to contactless delivery, standardised supply chains and maximised delivery routes through batched dispatches.<sup>19</sup>

### **Payment Gateways**

With the building of the underlying instantaneous payments architecture of Immediate Payment Service (IMPS) and United Payments Interface (UPI) through a PPP, Indian citizens can now pull out their phones to make six-second money transfers 24 hours a day using payments companies such as PayTM, PhonePe and others. Small and Medium Enterprise (SME)-focused banking platforms like Open have helped small business owners manage their financial operations remotely. These mobile apps designed by private enterprise have enabled people to make payments for essentials and utilities without stepping out of their home during the lockdown.

### **Healthcare Management and Telemedicine**

India's deficit in healthcare infrastructure and trained medical staff became all too apparent during the pandemic. By World Health Organization (WHO) estimates, India needs a minimum of 600,000 more doctors and 2 million more nurses to provide adequate medical care to its large population.<sup>20</sup> Particularly during COVID-19, when medical staff are catching the virus themselves and need time off to convalesce, healthcare management and digital platforms are often the only way to widen reach and monitor patients. Compelling value propositions have risen out of this trying situation.

For example, Dozee is a medical-grade contactless sensor that can be placed under any mattress to monitor the patient, including remotely, if required. With these technologies enabling step-down intensive care units (ICUs)

of the necessary fidelity and reliability at a fraction of the cost of a full ICU set-up, medical response efforts are expanding patient capacity into non-hospital environments and keeping medical staff safer by enabling no-contact monitoring.<sup>21</sup> It is imperative for India to quickly scale and integrate such emerging technologies into the mainstream to aid the fight against COVID-19.

Telemedicine, a nascent industry, found new energy during the lockdown.<sup>22</sup> Many hospitals are only serving COVID-19 patients, and there is also heightened risk from entering one. With increased mobile and data coverage, combined with the e-consultation trend, India can improve access to healthcare and use technology to leapfrog the physical limitations of inadequate built infrastructure. A tele-consultation can help quickly determine how severe a medical problem is. Simple cases like common cold or a muscle sprain can be dealt with through an online prescription and a follow-up e-consultation – decreasing the need for rural patients to travel unnecessarily. The government must also survey India's 718 districts to determine how many lack adequate medical facilities and staff to serve their communities. While there are plans to develop the physical infrastructure over four to five years, going digital will serve as an effective bridge.

### **Diagnostic Kit Design**

In mid-March, when the global demand for COVID-19 diagnostic kits surged, India realised how dependent it was on China and the global economy for them. The kits manufactured by US and German companies were also exorbitantly priced. Indian health

start-ups like MyLab, CoSara, Module Innovation and Huwel,<sup>23</sup> among others, quickly turned to developing high-quality yet low-cost COVID-19 diagnostic kits. Today, there are around 25 high-integrity kit designs made in India for India. With this, the value proposition for India's health innovation segment to play a dominant post-COVID-19 economic role is validated; it needs strategic investment and government aid to scale to its potential.

## **EXTRAORDINARY OPPORTUNITIES AHEAD**

India made such a significant leap in the use of technology platforms during the COVID-19 lockdown that the nation is yet to grasp its full extent. Many novel opportunities are presenting themselves to harness the exponential leap technologies make possible and thereby build strategic moats for sustainable growth. The following paragraphs describe some examples.

### **Urban Mobility**

The pandemic is forcing a relook at urban mobility systems. For instance, air pollution levels dropped dramatically during the lockdown, and many are rightly calling for immediate action to maintain the lowered levels. For this, urban areas require more mass-transit options such as the lengthening of Metro networks to service even the outskirts of big cities and a plan to achieve 100 percent electric bus fleets. With the flux in the global oil economy, this is an excellent time to plan for reducing dependence on fuel imports, and incentivise clean energy technology supply chains like electric vehicle (EV)

components, solar panels for charging infrastructure, batteries and new energy-dense materials. It is also opportune to consider leapfrogging the next set of Metro tracks into magnetic levitation vehicles that have a lower carbon footprint than currently used technology, and are ideal for deploying in congested spaces, as exemplified by Japan and South Korea.

In the near-term, however, mass transport like the Metro and buses are nuclei for pandemic spread. As India unlocks slowly, the call for safer and traceable transportation options is loud and clear. And this is where India's burgeoning two-wheeler last-mile transport start-ups like Yulu and Bounce are finding a new wave. To properly maintain social distancing without losing out on work productivity, their single-passenger on-demand two-wheelers serve up a unique proposition. City municipal corporations and local governments are working with these companies to install large fleets of such two-wheelers in big cities to provide alternatives to the Metro and buses, and even cars. Even post-COVID-19, these two-wheelers will continue to serve last-mile connectivity, a feature India needs more of to make the adoption of mass transit ubiquitous.<sup>24</sup> And by maintaining an EV-first approach here as well, India can leapfrog past fossil-fuels and start using more EV scooters.

### Agri-technology

A survey of per-capita gross value-add in the three major sectors – agriculture, industry and services – demonstrates that agricultural producers earn the least in the country; on average, approximately one-third of the

national average of INR 135,000<sup>25</sup> annually. Indian farmers must be empowered to formalise and raise their incomes. It is crucial to remove restrictions on what farmers can grow and how they utilise their land. Atma Nirbhar Bharat Abhiyaan (ANBA) is a transformational first step and can catalyse the mass deregulation of agriculture. Beyond ANBA, technology platforms can be used to connect farmers to markets and consumers directly so they can realise near-market prices.

Over 474 Indian agri-tech companies<sup>26</sup> are validating the value proposition with demand aggregation delivery models, post-harvest intervention and storage optimisation, price forecasting, direct-to-consumer models, data-backed crop-specific advisory services covering seeds, fertiliser and irrigation, minimisation of input costs, real-time market data intelligence, competitive insurance and financing schemes, and mass market linkages at a scale that reduces overall costs.<sup>27,28,29</sup>

Agri-tech start-ups estimate that participating farmers will see a substantial increase in income, productivity improvements and waste reduction, and a reduction in input costs.<sup>30,31</sup> They can receive near-instantaneous payments via UPI and Cash on Delivery.<sup>32</sup> Agri-tech platforms can also help farmers pursue differentiated agri-strategies that minimise one-crop risk and increase the number of income modes. Crucially, agricultural producers, and particularly their next generation, are becoming entrepreneurs driven by technology.<sup>33</sup> The access to highly customised information via digital agri-platforms is empowering them. With these force-multipliers, technology can help render the agriculture sector self-sufficient and India

100 percent food-secure. Along with the proposed deregulation measures announced under the ANBA, agri-technology could prove a vital enabler to fulfil Prime Minister Narendra Modi's promise to double farmer income by 2022.

### Cloud Infrastructure

Recent events have made it abundantly clear that India must protect its national security in the digital realm as actively as in the physical. A significant component of this virtual security net is the development of cloud infrastructure so Indian citizens' data can be localised and protected within national borders. Countries like the US understand that national security is inseparable from such a move and have mandated cloud infrastructure providers like Amazon, Microsoft and Google to provide exclusive and secure digital warehouses like GovCloud for government-grade data. The Indian government must incentivise indigenous cloud infrastructure developers to build and maintain both government and citizens' data. This will also answer the increasing calls for data residency and localisation of Indian citizen data on external platforms like Facebook and Google. That is the only way an Indian citizen can respond to a data leak legally in a court of law; a recourse that is unavailable if Indian data is in a foreign data centre like the US where Indian citizens are legally termed as non-resident aliens.

The need for native cloud infrastructure and data privacy regulations is even more urgent given the government's recent decision to ban Chinese apps in the country.<sup>34</sup> The gap left in the wake of such a ban is an opportunity

for Indian app alternatives across segments such as media, entertainment, social, mobile utilities, video, music, regional news content, messaging, and more, which should not be missed. It must be addressed by more Indian cloud infrastructure companies that should serve Indian app ecosystem's development. This opportunity must drive a full-stack shift to India-first technology solutions.

Through the lockdown, with the 'work from home' (WFH) trend picking up, it was evident that India's broadband and cloud facilities were running over-capacity. With the ever-strengthening case for moving any relevant business functions to remote, WFH and cloud, this is another clear value proposition for developing native cloud infrastructure. With many realising the benefits of staying out of traffic and increasing productivity in home offices,<sup>35</sup> it is necessary to support this encouraging trend with infrastructure development support. Given its large IT industry and tech start-up ecosystem, coupled with in-depth engineering knowledge on developing cloud infrastructure, India can quickly become the third-largest global cloud ecosystem after the US and China. It can even build partnerships with other emerging economies by providing them low-cost cloud infrastructure solutions at scale.

### Education-tech

For the first time in most Indians' lifetimes, going to school and college was not an option during COVID-19. There was a focused shift to digital; from dedicated teachers suspending their phones on makeshift tripods to produce videos, to utilising education-tech platforms to keep children at home engaged and learning



every day. Globally, there was an upsurge in digital offerings, certification programs, online graduations and virtual exam proctoring modalities.<sup>36</sup> This serves as a tremendous opportunity to drive up India's rates of education and skilling.<sup>37</sup>

Digital and mobile coverage has increased dramatically over the past decade. The average Indian now consumes 11 GB of cellular data per month.<sup>38</sup> Educational offerings have to find a way to piggyback on this trend. A study of India's higher education systems shows that regions with the largest young populations like Bihar and Rajasthan have the lowest college infrastructure coverage.<sup>39</sup> Technology and digital platforms are likely to make physical infrastructure expansion largely redundant, while virtual expansion becomes more vital. Digital offerings can enable all three pillars of a world-class education system – quality, affordability, and equity of access and opportunity.

India's fertility rates are falling pretty fast, especially in the southern states. While the country has a large demographic dividend now, India is moving towards a largely ageing society over the next five decades<sup>40</sup> with gradually shrinking workforce capabilities. It is imperative to work on human capital and skills development to maintain higher economic output even as workforce numbers reduce. Technology and digital platforms might be the only way to deliver education and skilling at the massive scale needed.

### **Skilling Revolution and the Migrant Crisis**

With the COVID-19 lockdown, systemic issues became abundantly apparent

–especially the long-brewing vulnerability of India's migrant populations. Vast inequalities in economic growth between the highly-populous low-skilled states of the north and the more developed states of the south have resulted in massive internal migration in search of employment. Due to the excess labour availability, skills development has unfortunately taken a backseat. The COVID-19 crisis has been a battering ram to this susceptibility, and there is a great need to solve this problem.

With premier large-scale digital successes like India Stack, DBT, and Aarogya Sethu under its belt, the government can now utilise digital platforms to manage the migrant crisis, allocating labour across the nation, and skilling and up-skilling. The National Skill Development Corporation already partners with several employment agencies and platforms such as Betterplace Solutions across the country. These platforms can be repurposed for the management of migrants' issues, as well as to designate and train workers. Union and state governments must maintain live maps of migration, employment availability, and labour distribution, and develop the capacity to coordinate and rebalance these levers in the interest of citizens and the economy.

### **Government-business Interfaces**

The government has digitally integrated with India's bottom-of-the-pyramid, as its distribution of subsidy to 800 million people under Prime Minister Garib Kalyan Yojana during the pandemic demonstrates.<sup>41</sup> The same focus can now include the remaining population – salaried taxpayers, small and

large business operators, investors, and so on – who provide the bulk of India’s economic growth and tax revenues. India needs a government-business interface that cohesively tracks these segments’ documentation and tax-paying history and can utilise this in a near-instantaneous tax refund system based on UPI and IMPS.

Further, with its commitment to improving ease of doing business in India, the government can utilise digital frameworks to simplify the country’s bloated compliance regime. An analysis by staffing company TeamLease shows that the central government alone has 25,537 compliances, 677 Acts and 2,282 regulatory requirements.<sup>42</sup> Adding in state government requirements, taxpaying citizens and companies have to track 69,233 compliance regimes, 1,536 Acts and 6,618 regulatory filings depending on geographical location, and the extent and nature of the business. This is a gross overload on our economic system and needs immediate deregulation.

Propelling India’s GDP to US\$5 trillion by 2026, and close to US\$10 trillion by 2031, will depend on the ability of all the above segments to grow their businesses and investments. Like the US<sup>43</sup> and other major economies, India too must make it easier for them to operate, and try to eliminate the existing friction with war-time resolve.

## CONCLUSION

Both the public and private sectors have leveraged technologies to achieve demonstrably effective results at scale for the benefit of India’s 1.38 billion people. The country can now leverage its technological prowess and the unique interplay between public and private participants to secure every aspect of Indian citizens’ lives through a technology-first strategy. Many economies are pursuing technology-backed frameworks to fortify their citizens’ welfare and drive economic growth. With a rebalancing of the world order post-COVID-19, the Indian government must also relentlessly pursue a national security net as a native full-stack advantage for citizens.

The suggestions in this brief are not easy to execute and will require the long-term engagement of multiple stakeholders. With the adoption of technology comes the ever-increasing need to fortify digital security and privacy norms, and maintain digital inclusion across all communities. Nonetheless, a multidimensional technological moat made zero-friction across all points of engagement and transaction is of national value. Technology is future-oriented and has the exponential advantage of low marginal costs and near-infinite scalability - by building and owning indigenous platforms, India fully secures its digital and material interests. ©RF

### ABOUT THE AUTHOR

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