PLAYBOOK ON NATIONWIDE DIGITAL INFRASTRUCTURE AT THE SERVICE OF PROSPERITY [1]

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❶ INTRODUCTION

This Playbook discusses how nationwide digital infrastructure, including digital identity and payment tools, have the potential to become development 'silver bullets' removing key obstacles to prosperity.

Not all countries have benefited equally from global economic growth, partly because many people lack secure property rights and access to credit, public services, information, and other critical economic infrastructure.

Exclusion from these key parts of the economy has affected social cohesion in some countries, particularly where political leaders focus on providing economic rents to their narrow groups of supporters.

This Playbook proposes that the innovative Indian approach of building population-level, nationwide digital infrastructure - for example, permitting universal identification, a unified payment system, and digital data that is owned by citizens – can empower all citizens by lowering the barriers to formal property rights and key modern economic institutions.

This nationwide digital infrastructure approach constitutes a developmental 'silver bullet' and is the best way to ensure that digital technologies benefit the entire population (through universal ID, payments, data, health, etc.) and not only narrow groups and vested interests.

These digital technologies have been made freely available to all countries and are in principle ready to be adopted, even by countries with relatively low resources and state capacity.

Different approaches to development can be grouped as "top-down" or "bottom-up". Top-down interventions focus on political development (democratisation/political leadership) and improving the quality of macroeconomic policies at the national level, with an emphasis on aggregate measures of success. Bottom-up approaches, on the other hand, focus on improvements at the level of individuals and firms – strengthening and formalising property rights, improving access to finance, increasing participation in the formal economy – with a focus on ease of doing business and improvements in microeconomic outcomes as measures of success.

The level of success of these approaches may differ in different contexts. Conventional top-down policies, however, have often proven insufficient to support development due to their inability to reach the informal sector, which is often very large in the poorest countries and falls outside the scope of those policies. It is this weakness of conventional approaches to development that

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nationwide digital infrastructure approaches seek to remedy by facilitating citizens' capability to exercise their rights. Bottom-up solutions are also potentially more attractive for some states because digital tools are not seen as challenging their authority directly and, in some cases, can offer other advantages, such as broadening the tax base.

The Indian experience shows a 'third way' of developing digital infrastructure, different from the more laissez-faire US approach or the more centralised, interventionist Chinese approach. In partnership with the private sector, the Indian government provided critical digital infrastructure to kick-start the digital economy (focused on micro-payments), ensured level competition, and provided tools to the poor and the informal sector to participate in the economy, strengthening property rights and access to markets for people who would otherwise be marginalised and disempowered.

This approach is successful because it creates incentives for people in the informal economy to join the formal sector. This is something that very few economies have managed to do and directly contributes to the social cohesion of a country.

Problems that the Nationwide Digital Infrastructure Approach Can Solve

- Chronic rent-seeking and economic cartelisation because of the political and economic power wielded by insiders, who can suppress competition and oppose pro-competitive reforms at the expense of outsiders.

- The resulting weak social cohesion and political instability.

- Low productivity in rural areas and the informal sector, limited access to infrastructure, finance, and knowledge.

- Lack of universally recognised documents for people to prove their identity and the property they hold, preventing capital accumulation and access to credit. Key for Peruvian economist Hernando de Soto.[1]

- Large informal economies with low productivity and low growth that do not contribute to the tax base, creating a vicious circle of higher taxes on the formal economy, low public investment, low growth, and diminished state.

- Inefficiency and leakages in the delivery of government services and welfare transfers.

- Frictions in markets related to transaction costs, limited information, limited competition, and non-instantaneous market adjustments.[2]

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[1] Without this documentation, economic agents find it more difficult to use their property as collateral to obtain loans, participate in investments, and trade in markets. De Soto notes that "the enterprises of the poor are very much like corporations that cannot issue shares or bonds to obtain new investment and finance. Without representations, their assets are dead capital." De Soto finds that the widespread protests of the 2010 Arab Spring were motivated precisely because of a lack of documents to allow the poor to buy or sell and raise capital. De Soto, NYT.

[2] These frictions limit the positive welfare impact of markets, as per the Arrow-Debreu General Equilibrium Model.

❷ NATIONWIDE DIGITAL INFRASTRUCTURE APPROACHES AS PART OF A BOTTOM-UP TOOLKIT TO SUPPORT CITIZENS' RIGHTS

Peruvian economist Hernando de Soto argues that giving people the ability to trade and own property is key to unleashing the power of markets to raise prosperity, and that many developing countries fail to grow because their citizens lack these basic rights.[2] De Soto argues that many poor people have de facto property for which they lack de jure ownership, preventing them from accumulating capital and using their existing property to, for example, access capital markets.

Work in this area has historically focused on giving de jure property rights to these de facto property owners. In this paper, we argue that control over and the ability to do business easily, using one's identity and finances, are similar forms of property rights that, while taken for granted by people in high-income countries, are out of reach for many in low and middle-income countries. We assert that, if people were given the ability to control these property rights, more economic opportunities would be available to them, particularly in the formal economy.

A nationwide digital infrastructure approach that brings the benefits of technology to all and facilitates citizens' access to their rights (for example, identity, banking, data, health, etc.) providing incentives to voluntarily join the formal economy- should be part of the 21st century developmental toolkit.

Another advantage of this approach is that it has the potential to address key developmental bottlenecks in many areas.

However, in this paper, we focus on the application of the nationwide digital infrastructure approach in relation to digital identity services and payments protocols. It draws primarily on India's success with the Aadhaar identification system and the Unified Payments Interface (UPI) system. These are government-sponsored initiatives that have given Indians a cheap, easy way to verify their identity and initiate payments to, and receive payments from, trusted third parties. At their core, digital identity and open payment processing interfaces (APIs) empower individuals by facilitating the establishment and protection of their property rights in an increasingly digital world. In contemporary economies, transactions and property titles are predominantly digital, making identity verification crucial for asserting and exercising property rights. For those in high-income countries with passports, pre-existing bank accounts, and extensive prior online activity, verification may be a simple process. However, for some individuals residing in low and middle-income countries, this task can be financially burdensome or altogether unattainable.

By implementing digital identity systems, low and middle-income countries can ensure that their citizens have access to the basic tools necessary to prove their identity and access critical services. This verification enables them not only to participate in the global digital economy, but also assert their rights to property, government services, and financial resources. Similarly, open payments processing interfaces (APIs)

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[2] Hernando de Soto found that the 2010 Arab Spring was largely motivated by the frustration of poor people at not being able to trade in the economy. Source "Unlikely Heroes of the Arab Spring", https://www.youtube.com/watch?v=K_CnTANr°YU

permit seamless transactions between various parties, fostering financial inclusion and promoting economic growth.

These two tools can allow citizens – particularly the poor – to:

○ Have universal ID, recording their existence in the country;

○ Access banking and finance where Know Your Customer (KYC) checks would previously have been too expensive and unreliable to allow them to do so;

○ Access mobile phones where KYC checks would previously have been too expensive;

○ Hold money in their own bank account and receive money directly;

○ Access public services directly, including cash benefits;

○ Make user-friendly, zero-cost micro-payments to citizens or other small businesses;

○ Participate actively in markets;

○ Join the formal economy, including paying taxes, since the benefits of doing so often outweigh the costs.

As well as these direct benefits, the tools may permit the development of additional products/services/technologies, such as:

○ Easier creditworthiness checks, facilitating access to credit (e.g., for the creation of a business);

○ The ability to demonstrate streams of income, even if small, thereby also facilitating access to credit;

○ Strengthening of the digital economy, including the penetration and cost of mobile phones since they also benefit from cheaper e-KYC.

Developing and implementing an effective digital ID and payments solution may have other benefits too. The solution can, for example, be rapidly scaled up internationally: while designing this digital infrastructure from scratch at the population level is technically very complex, it can, once designed and implemented in one country, be rolled out (with country-specific adaptations) to many other countries.

The introduction of digital tools may also face less political resistance than more large-scale, top-down attempts at reform. This is because digital tools may be perceived as linked to efficiency and higher tax revenues, without requiring destabilising political and structural changes that could be blocked by existing 'rentist' political and economic elites and other vested interests. We have seen this in the past in relation to other technological innovations. For example, the Green Revolution of the 1960s and 1970s increased crop yields and appeared benign to the states that adopted these technologies, but ultimately led to structural transformations as food costs and famine rates fell and the middle classes grew and demands more political and economic rights.

This may be especially true in the case of the nationwide digital infrastructure approach proposed in this Playbook. These tools make it easier for states to collect and maintain information about their citizens, and track transactions and financial flows which, in turn, facilitates a broadening of the tax base. Both may be appealing to governments, even if the resulting economic empowerment of citizens subsequently leads to demands for economic reforms.

The bottom-up interventions outlined here can provide citizens with greater control over their political and economic lives, empowering them to exercise their rights and responsibilities and enhancing their ability to participate in the market economy. Broad-based access to digitalisation may lead to greater social cohesion, stability, and economic inclusion by growing the 'outsider' share of the economy and tax base and eroding the positions of insider vested interests and their privileged position in policy-making. As such, this nationwide digital infrastructure approach may support more wide-ranging reforms in countries that suffer from rent-seeking.

This approach focuses on digital public infrastructure developed at population level, covering the entire country. The benefits of this approach are particularly striking in diverse countries where social cohesion and integration are central to the country's prosperity.

❸ INDIA – A TRAILBLAZER IN DIGITALISATION THAT CREATES BETTER MARKETS

In India, the government has successfully implemented a nationwide digital infrastructure approach in relation to two powerful digital tools - a minimalist and universally accessible identification system (Aadhaar) and a user-friendly payment system (UPI) - that have removed many of the obstacles faced by the informal sector and the economically disadvantaged when participating in trade and business.

In just 15 years, since the introduction of the first of these measures, India has transformed how it identifies its citizens, how peer-to-peer payments are made, and how the government operates in relation to citizens (for example, by making cash transfers directly to citizens' bank accounts). This success has been recognised by international organisations such as the IMF and the Bank for International Settlements (BIS), as well as business leaders, including Jack Ma of Alibaba, Sundar Pichai of Google, and others.[3] In March 2023, Bill Gates praised India for laying a strong digital infrastructure that has provided room for innovation and applications, asserting that "no country has built a more comprehensive digital infrastructure than India, and it can be an example for other countries."[4]

A 2019 Bank for International Settlements report on India's digital infrastructure concluded that its financial ecosystem has the potential to serve as a model for other countries seeking to promote financial inclusion through digital means.[5] International organisations have recognised that India's digital infrastructure has allowed it to reshape the geography of finance in a way that few countries have managed before,[6] making it a global pioneer in technological innovations in finance.[7]

Even developed countries have been urged to emulate India. In December 2019, Google recommended that the US Federal Reserve Board look at India for specific suggestions on how to build the new instant payment system FedNow. [8]

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[3] Key reports, see BIS Papers No 106 "The design of digital financial infrastructure: lessons from India" by Derryl D'Silva, et.al. BIS Monetary and Economic Department, December, 2019. Stacking Up the Benefits. Lessons from India's Digital Journey, Alonso, C, et al., IMF Working Paper/23/78, March 2023.

[4] CNBC TV18
https://www.cnbctv18.com/technology/bill-gates-ashwini-vaish-naw-no-country-has-built-a-more-comprehensive-digital-infra-than-india-16070431.htm

[5] Op. cit. BIS 2019.

[6] "You Should Do What India Does: Fintech ecosystems in India reshaping the geography of finance.x Julien Migozzi et al., Geoforum, March 3, 2023.

[7] How India's Central Bank Helped Spur a Digital Payments Boom", Jeff Kearns and Ashlin Mathew, October 27, 2022. IMF Country Focus.

[8] "Google wants US Federal Reserve to follow India's example and build Fed-Now", Mint, 14 December 2019.

India's digital transformation through the lens of a Tea Maker

We can gain insight into the social impact of nationwide digital infrastructure, especially universal identification and peer-to-peer payments, through the experiences of a young Chaiwala (tea maker), as told by Saurabh Mukherjea, founder of Marcellus Investment Management.[9]

The Chaiwala works outside Saurabh's offices in Mumbai. Some 18 months ago, he started making 500 cups of tea a day to sell to customers. Saurabh would pay him 50 rupees and get 25 rupees back in change. Today, the Chaiwala does not accept cash or credit cards, only the new payment system, Unified Payments Interface (UPI), which he uses through his mobile.

Because he no longer has to handle change, the Chaiwala has more time to make tea and serve customers. The risk of theft is also much lower because he does not carry cash. Furthermore, there are productivity gains for his milk supplier, who no longer has to spend time collecting payment and can receive it digitally at the end of every day.

In addition to making the Chaiwala's life easier, his use of UPI ensures that he willingly joins the formal sector and agrees to pay his due taxes. This is possible because UPI's advantages and convenience have become a strong pull factor for the formal economy. The Chaiwala now also has a bank account

– a requirement for operating with UPI – and his bank can see his 8,000 credits (for every tea) every day (at 25 rupees), enabling it to offer him working capital.

Countless similar stories have unfolded in India[10], to the point where the impact can be seen at the macro level through a large increase in unsecured working capital finance for small businesses. Moreover, UPI has resulted in a significant decline in the cost of capital for the Chaiwala, who is now able to borrow via UPI at 11%, rather than 25% on the informal lending market.

India's digital transformation has improved citizens' lives and created better markets

◯ National ID has been distributed to 1.3 billion people in India. Most of the population now has ID and the satisfaction rate reaches 90%. This provides individuals – including those who cannot read or write – with a trustworthy identity, independently of income, location, gender, and ethnicity, allowing them to be acknowledged in the country. In 2008, only 4% of the population had a passport, which was the only unique and multi-purpose form of identification available[11]. In Bill Gates's words, this ID helps the poorest people to become visible.[12]

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[9] Saurabh Mukherjea "On the BIG Changes in the Indian Economy Investors should know | Dhanam", You Tube video, April 2023. https://www.youtube.com/watch?v=YREw0OrRIys

[10] "When Digital Payments Even for a 10 -Cent Chai, Are Colossal in Scale", New York Times, March 1st, 2023. https://www.nytimes.com/2023/03/01/business/india-digital-payments-upi.html

[11] BIS 2019 Op. Cit.

[12] "Making the World's Invisible People, Visible", Bill Gates, January 29, 2019. Gates Notes, The Blog of Bill Gates. Video: Nandan Nilekani Heroes in the Field.

◯ UPI is used by 260 million people, accounting for 64% of all transactions. This radically different way of making payments has become part of the fabric of society and has democratised the payment system. It is an easy, seamless, free, and ubiquitous micro-payment system that can be used for any kind of electronic transaction. By establishing a central system that anyone can join and use, it avoids the creation of payment islands. UPI is offered as one of a variety of payment systems so that citizens have a greater choice.

◯ The Aadhaar-enabled payment system has helped to take bank services to remote villages and towns. This gives the elderly door-step banking access to their government benefits.

◯ People benefit from the ability to pay merchants easily through QR codes.

◯ Aadhaar has reduced the cost of Know Your Customer checks by a factor of 200.[13] This has directly contributed to making lower-income clients more attractive and to the expansion of cheap mobiles and data and a large increase in bank accounts (as both require KYC).

◯ Aadhaar has enabled almost 50% of people to open their first bank account and almost 40% to access mobile services.[14]

- The availability of cheap mobiles has expanded: Connections and data consumption increased to 0.5 GB a day (from 0.15 GB a month) and India now has one of the world's lowest data charges.[15]

- Access to bank accounts has increased, reaching: 80% of the population in six years (which would normally have taken 47 years).[16] This is one of the largest increases in account ownership in the world, according to the Global Findex 2021.[17]

The nationwide digital infrastructure approach improves government-citizens interactions

◯ Citizens benefit from improved targeting of government programmes.

◯ Citizens receive Direct Benefit Transfers in their Aadhaar-linked bank account, not only increasing speed and convenience, but also reducing leakages.[18] Benefits totalling $310 billion have been transferred so far, reducing the diversion of funds and corruption.

◯ The system facilitates citizens' monitoring of government expenditures, including the Public Distribution System (flagship food security programme) and the Mahatma Gandhi National Rural Employment Programme, (MGNREGA) (the largest in the world).

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[13] The use of e-KYC lowered the cost of compliance from $12 to $0.06. Also based on Hariharan, V. 2016: "A leapfrog moment for Indian banking", Indian Software Product Industry Roundtable – iSPIRT, December 28, and IMF WP 2023 Op. Cit.

[14] State of Aadhaar Report, 2019, quoted in IMF WP 2023 Op. Cit.

[15] Competition policies in the telecom market have also been key. "The entry of a new network operator in 2016 lowered the cost of mobile data by 90 percent leading to a jump in data usage from 154 MB/month in 2015 to 15.8 GB/month in 2021". A mobile data and voice basket (including 70 min + 20 SMS + 500 MB) costs $1.8 in India compared to a world median of $11.5 and $7.6 among lower middle-income peers. IMF WP 2023, Op. Cit.

[16] BIS 2019, Op. Cit.

[17] The Jan Dhan Yojana programme also contributed to this spectacular result. As of August 2022, 462.5 million bank accounts had been opened. IMF, WP 2023, Op. Cit.

[18] PM Rajiv Gandhi had stated in 1985 that beneficiaries only receive 15% of every rupee spent.

O Citizens can access documents issued by the state and central government through one platform (DigiLocker) without having to queue physically. This is especially useful for rural households.

O People obtain access to various digital services: e-Sign (to endorse any document with an e-signature), DigiLocker (secure depository for all digitally signed documents), the digital opening of bank accounts, electronic toll collection, and digital tax filing, etc.

Access to loans and accelerated growth of the innovation eco-system

O 4.5 million individuals and companies have benefited from more accessible loans, thanks to the streamlining of procedures and the lower costs of financial services due to the introduction of the "account aggregator" framework for data governance.

O The digital footprint of UPI provides informational collateral for expanding credit to some of India's 60 million small enterprises (potential expansion of 2 million jobs).

O Creation of entrepreneurial, innovation and employment opportunities. The digital tools do not only rely on international technology but also on technology specifically based on India's new digital infrastructure. There is an ecosystem of products that are built leveraging the digital ID and UPI. The number of start-ups increased from 445 in 2016 to 86,713 in 2022, including 27,000 active tech startups.[19]

O The innovation ecosystem is reflected in the EY Global Fintech Adoption Index 2019[20] in which India and China led the survey of 27 markets. Similarly, fintech investment doubled to $35 billion in 2022 and, doubling India's share of global fintech funding since 2016. Fintechs are expected to capture 15% of India's enterprise value by FY 2026 compared to 1.4% in 2021.[21]

O Micro-payments have provided the digital economy with the necessary dynamism (which could not be based on advertising).

Informal economy

O **Overall, citizens in the informal economy have gained in different ways** from these digital tools. As a result, the benefits of joining the formal economy have substantially increased. Individuals and micro-enterprises have joined the formal economy because it now offers them substantially greater benefits, not only hassle. This "grand bargain" has contributed to a substantial increase in the formal economy, resulting in a net gain for society, contributing to integration and social cohesion, and supporting the state's revenue-raising capacity. There are now 13.9 million taxpayers registered for the digital sales tax.

Better markets

O **Markets are more competitive and transaction costs lower** for all citizens.

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[19] The number of start ups in India grew to 72,993 in 2022 up from 471 in 2016. The Economic Times, Feb 15, 2023. "India now has nearly 27,000 active tech start ups, added 1,300 last year."

[20] EY Global Fin-Tech Adoption Index 2019.

[21] India Fintech Report 2022: "Sailing Through Turbulent Tides" Saurabh Trehan, Rakesh Pozhath, and Misha Pratap. October 19, 2022. Bain & Co.

More consumers have access to markets. Small companies have gained easy access to markets.

The nationwide digital infrastructure available today has the potential to address one of the central grievances of protesters during the 2010 Arab Spring: the inability to conduct business openly and freely, which was the catalyst for the original protests in Tunisia.[22]

By lowering the cost of credit and making it easier for people to set up businesses and transact, particularly in emerging markets where access to capital and resources has been historically restricted, these digital tools also increase overall economic growth.

These substantial improvements in the life of Indian citizens have been possible thanks to the adoption of an innovative and inclusive technological approach, nationwide digital infrastructure, rather than conventional high-level top-down political or economic interventions. Nandan Nilekani, co-founder of Infosys and one of the programme's architects, has argued that, by empowering the poor and the informal sector, the tools are helping to create a more inclusive and democratic society, one that offers greater opportunities and benefits to all its citizens.[23] It also helps to bring a diverse country together.

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[22] Hernando de Soto researched these protests thoroughly and found that the reason street sellers decided to self- immolate in such a dramatic way was simply because the state was denying them the opportunity to trade in markets. "The Economic Roots of the Arab Spring",

[23] Nilekani Building the India Stack, December 2022. Return of India, YouTube Video for Colossus. https://www.google.com/search?q=nilekani+interview+youtube+-building+the+india+stack&rlz=1C1GCEU_enGB1052GB1052&oq=nilekani+in&aqs=chrome.3.0i355i512j46i512j69i57j69i59j0i22i30l2j69i60j69i61.5226j0j7&sourceid=chrome&ie=UTF-8
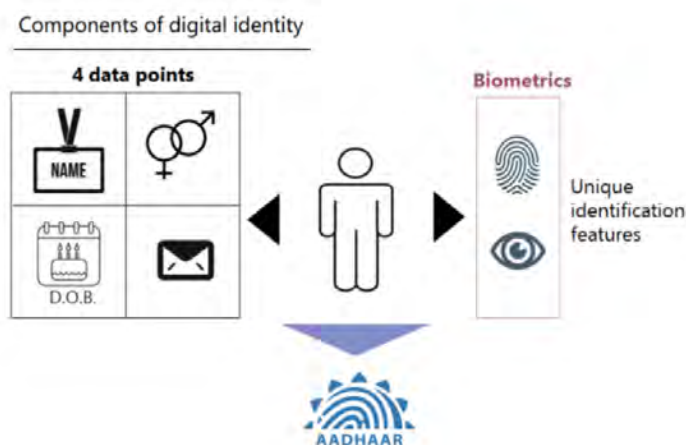
❹ DEPLOYING UNIVERSAL IDENTIFICATION AND A USER-FRIENDLY PAYMENT SYSTEM IN INDIA

Source: BIS Papers No 106 "The design of digital financial infrastructure: lessons from India" by Derryl D'Silva, et.al. BIS Monetary and Economic Department, December 2019.

As described above, a nationwide digital infrastructure approach - including the deployment of universal identification and a new digital payment system - has been the basis for the improvements detailed in the previous section. In addition, a third piece of India's nationwide digital infrastructure, a new model for data governance, is being introduced. In this section, we outline how these solutions have been introduced.

Unique Identification for All (Aadhaar)

The decision to deploy a universal identification system in India was made in 2006 to support welfare payments[24] and satisfy demand for identification for disadvantaged people, who could not otherwise access an official form of ID.

The Unique Identification Authority of India (UIDAI) was created in 2009 to issue a unique identification number (Aadhaar) to all Indian residents. This digital 12-digit number is issued after verifying their identity and taking a minimum of demographic[25] and biometric data (iris, fingerprints, and facial photograph). After a few weeks, resi-

dents receive their number, which corresponds to a record in a central database that contains their demographic and biometric information.

After five years under Nilekani's leadership, the UIDAI had already issued 900 million Aadhaars.[26] This was achieved not by creating a large bureaucratic organisation but by working through partners that were already dealing with people, such as state governments, banks, insurance companies, the oil company, etc. The UIDAI embedded enrolment in its partners' workflow and provided the technology. The total cost of the programme was less than $1 per identification document. [27]

The UIDAI was also key to the introduction of e-KYC, with support from the Bank of India, financial companies, and other service providers, including telecom

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[24] In a similar way to the deployment of Social Security Numbers in 1936 as part of the Social Security Act.

[25] The information requested includes full name, date of birth, gender, address and mobile/email (optional). There is also a channel available for residents without documents to verify their identity.

[26] Overshooting Nilekani's ambitious target of issuing 600 million Aadhaars in five years. Nilekani and Viral "Rebooting India, Realising a Billion Aspirations", Penguin Books, 2015.

[27] IMF WP 2023, Op. Cit.

operators. E-KYC enabled individuals to use their Aadhaar number and biometric data to authenticate their identity online for access to a range of services, including banking, telecom, and insurance.

The leverage of Aadhaar and e-KYC was also increased through the 2014 introduction of the Jan-Dhan Yojana programme, which promoted access to a basic savings bank deposit for unbanked individuals, providing remittance, credit, insurance, and pension services in an affordable manner.

The government of India developed several complementary digital services, including DigiLocker, which facilitates citizens' access to government-issued documents.

User-friendly and free digital payments (UPI)

The Aadhaar system permitted the roll-out of the second pillar of India's nationwide digital infrastructure approach, the Unified Payments Interface (UPI). Promoting digital micro-payments was seen as critical to the digital economy- because in a low-value, high-transaction economy, digital advertising revenues that often finance digital platforms in developed countries are small. It was key to be able to buy and sell low-value products and services at zero cost, both online and offline.

UPI was launched by the National Payments Corporation of India (NPCI) in 2016[28] as an instant real-time payment system. It can be used to transfer money between bank accounts instantaneously, without charge and in one simple step.[29] In addition, multiple bank accounts can be stored and managed in a single mobile app and payments are made using a simple virtual address for the payee (lastname@bankxyz), instead of requiring bank details. It is interoperable and can, therefore, be used by anyone with a bank account, regardless of their bank or mobile network operator. UPI's simplicity makes it accessible for people with different levels of digital literacy.

UPI also sought to adapt to the needs of all users. A capability, introduced in March 2022, to allow it to work with feature phones (older devices with buttons instead of touchscreens) means that it can potentially connect 400 million users in remote rural areas.[30]

UPI was designed as a thin solution, a protocol that can be layered on top of existing payment systems with minimal effort. It gives consumers the choice of using any bank and enables an ecosystem that provides opportunities for businesses and services to make the digital payments protocol reach all villages. UPI itself enables further follow-on innovation built on top of its protocol.

Around the world, one of the most challenging elements of developing open APIs for payments has been the authentication layer: allowing third-party services to confirm to a user's bank that the user is who they say they are and approve the payment.

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[28] The National Payments Corporation of India (NPCI), owned by banks and the RBI and founded as a non-profit organisation, ensured that the new payment system, UPI, was regulated through the RBI and that it would work.

[29] For more details on how it works, see this simple Forbes guide
https://www.forbes.com/advisor/in/personal-finance/what-is-upi-and-how-does-it-work/

[30] IMF Country Focus, 2022. Op. Cit.

Whereas in, say, the UK's Open Banking programme, each bank was required to develop its own authentication process, which led to a fragmented, complicated, and often off-putting system,[31] Aadhaar permitted a simple approach, built on a universal standard.

UPI has been incredibly successful because it is primarily a mobile-based service and focused on the innovations it provides to users. It was able to offer top-level customer service because the NPCI provided APIs to front-end consumer platforms (Google Pay, PhonePe, Paytm, Amazon) so they could design an optimal user experience as, for example, through the Bharat Interface for Money (BHIM) platform.

The government's demonetisation initiative to invalidate large currency notes significantly contributed to the accelerated adoption of UPI.
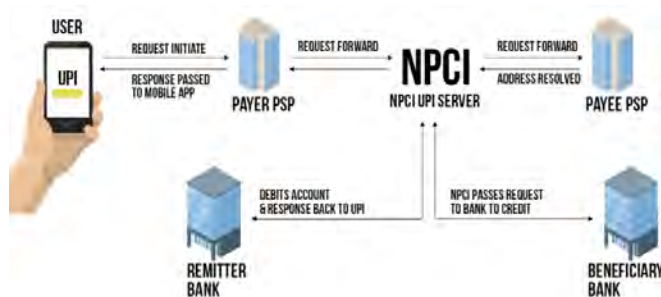
Source: *Stacking Up the Benefits. Lessons from India's Digital Journey, Alonso, C, et al., IMF Working Paper/23/78, April 2023*

More recently, and also following the nationwide digital infrastructure approach, the NPCI has worked on the development of a set of APIs and protocols to foster open interchange and connections between

shoppers, technology platforms, and retailers. The Open Network of Digital Commerce company was established as a non-profit in December 2021 to develop an inclusive ecosystem for e-commerce, with the aim of becoming the "world's first inclusive large-scale e-commerce system".

It seeks to dramatically increase e-commerce penetration, especially in small towns and rural areas, and to provide an alternative to the siloed approach of existing e-commerce platforms. Again, the nationwide digital infrastructure approach is critical in ensuring that the entire country, and not only narrow groups, benefits from the adoption of digital technologies. This approach substantially contributes to national cohesion.

User data: ownership and control by rightful owners

In addition to the unique identification and payment system discussed here, India's nationwide digital infrastructure approach includes: a model for data governance that aims to "restore ownership and control over user data to its rightful owners".[32] Citizens' ownership of their data is seen by the architects of these transformations as critical for all citizens to gain more political and economic power. This focus on data ownership is also India's response to the challenges of individual privacy and data ownership faced by high-income countries that have resulted in legislation such as the General Data Protection Regulation (GDPR) of the European Union and Open Banking in the UK.

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[31] "Why data interoperability is harder than it looks: the open banking experience", Sam Bowman, CPI Anti-Trust Chronicle, April 2021. Competition Policy International.

[32] See section on Data from the India Stack website: https://indiastack.org/data.html

India's Data Empowerment and Protection Architecture (DEPA) aims to help new bank account holders - possible because of Aadhaar and UPI - to "leverage the data trail they leave behind as they go about transacting and operating in the digital economy".[33] DEPA's key components include (a) the Data Protection Bill; (b) an electronic consent artefact; and (c) "consent managers" or regulated entities that, in financial services, will be known as "account aggregators".[34]

The Reserve Bank of India issued the account aggregator frameworks in September 2016[35] and eight banks went live on the Account Aggregator Network in September 2021. As of August 2022, 22 major banks had joined the framework, covering 1.1 billion accounts.

The Ministry of Finance has described the process as the "first step towards bringing open banking to India and empowering millions of customers to digitally access and share their financial data across institutions in a secure and efficient manner".[36]

The "account aggregators" are regulated intermediaries who will allow citizens to access their digital footprint as informational collateral when applying for financial loans. This means that citizens will control and be able to benefit from their own digital footprint, doing so via a centralised resource required to act in their interests, rather than through decentralised (and often costly and unwieldy) approaches such as those mandated by the GDPR.
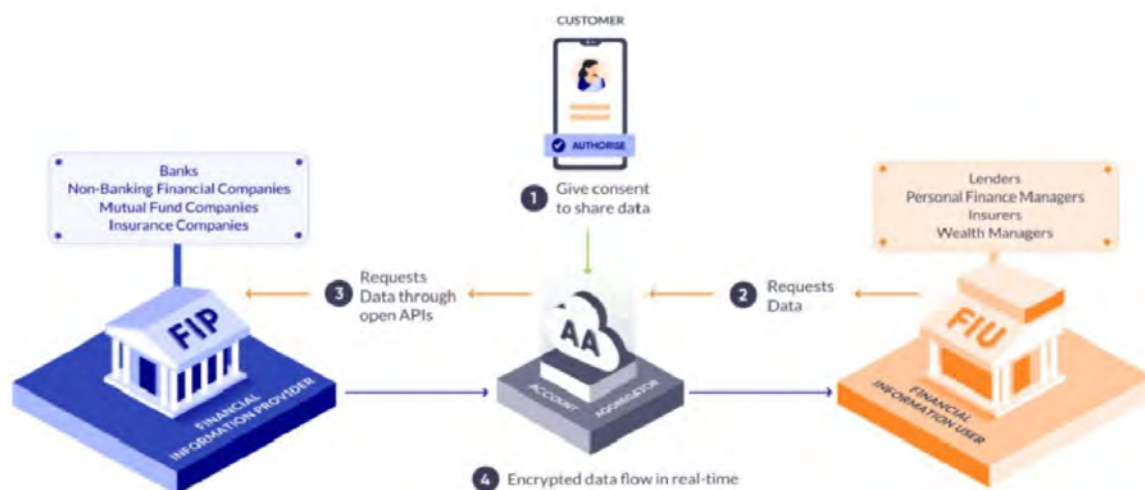
Source: *Stacking Up the Benefits. Lessons from India's Digital Journey, Alonso, C, et al., IMF Working Paper/23/78,April 2023.*

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[33] Ibid.

[34] On role of account aggregators, see BIS October 2022 "API Standards for Data Sharing -account aggregator." Report submitted by Consultative Group on Innovation and the Digital Economy.

[35] See BIS, Central Bank Hub, Rajeshwar Rao: Regulatory framework for account aggregators
Remarks by Rajeshwar Rao, Deputy Governor of the Reserve Bank of India, during a virtual event organised by iSpirt, September 2, 2021

[36] See Ministry of Finance, Know all about Account Aggregator Network- a financial data-sharing system. Press Release September 10, 2001, PIB Delhi. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1753713.

❺ FACTORS THAT PERMITTED INDIA'S DIGITAL SUCCESS

In 2008, political leaders and the private sector in India joined forces and turned their attention to the 'modernisation' of India following decades of state-led development with an emphasis on traditional socialist and pro-poor policies. Nandan Nilekani called for a "Reimagined India" or what Prime Minister Modi would later call a "New India".

Nilekani and other reformers focused on reducing the gap between India's booming economy and stable democracy and, on the other hand, chaotic conditions in the provision of even the most rudimentary services.[37] They sought to tackle the duality of the economy, with one of the largest informal sectors in the world,[38] a third of the population in poverty,[39] and a population with poor access to banking facilities and state services. Nilekani envisioned that these intractable challenges for the country's social and economic development could be addressed through a population-wide digital infrastructure approach, with interventions such as universal identification linked to a digital payment system.

Nilekani's vision was not only revolutionary; it was also breathtaking in scope. Yet, universal identification and a new peer-to-peer payment system were introduced surprisingly rapidly for an economy as large and complex as India's and soon delivered major results.

The universal identification and digital payment systems implemented in India are more sophisticated than those introduced in most high-income countries.[40] Uniquely, India's digital ecosystem combines government services (so well developed in Estonia) with digital payments infrastructure for the entire economy, including electronic toll collection on roads (through radio frequency identification technology), data management for the benefit of citizens, and digital tools to be developed in the health and agricultural sectors.[41] Critically, India's nationwide digital infrastructure approach is able to generate socially inclusive solutions for a number of the most important problems that the country may face.

How has a lower middle-income country, with a clientelist political system and a highly bureaucratic and hierarchical civil service, been able to design and implement world-class universal identification and payment systems so quickly?

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[37] Nilekani and Viral, "Rebooting India, Realising a Billion Aspirations", Penguin Books, 2015.

[38] "India Wage Report: Wage policies for decent work and inclusive growth" published by the International Labour Organization (ILO) in 2018. The report estimated that 80% of the Indian workforce was employed in the informal sector, making it one of the largest informal sectors in the world. In his book, Nilekani estimates that 90% of people are employed in the informal sector (page 50, footnote 4) and that the informal sector accounts for 90% of small businesses, etc.

[39] Press Information Bureau, Government of India, Planning Commission, Poverty Estimates, March 2012.

[40] Google recommended that the US Federal Reserve Board to look at India for specific suggestions on how to build the new instant payment system FedNow (expected to be deployed in 2023).

[41] In health, the Ayushman Bharat Digital Mission will connect disparate health systems through a unique health ID and registers of health professionals and health facilities, supporting an electronic medical record. Some 338 million unique IDs have been issued. IMF WP 2023, Op. Cit.

Firstly, there was strong commitment. **The need for a universal identification system and a versatile, low-cost digital payment system was far greater in India** than in high-income countries, most of which already have sophisticated payments and ID infrastructure in place. Due to the general lack of such infrastructure in India, these innovations have faced far less opposition from entrenched legacy technologies and incumbent companies. Moreover, a cheap and fast digital payment system for small transactions was imperative for the development of India's digital economy - because other revenue streams for online services, such as digital advertising, are too small.

Second, the nationwide digital infrastructure approach has produced positive results for citizens, and politicians want to be associated with this success. Moreover, there has been a **strong commitment from political leaders and private-sector entrepreneurs** to the vision of a "Reimagined India" and the "New India". Prime Minister Modi belives that India can reclaim its greatness by advancing economically - while drawing on the past Hindu civilisation for inspiration. This nationalism has given special impetus to ambitious government programmes for economic development.

This has also informed the **crucial collaboration** between a reform-seeking public sector with strong support from Prime Minister Modi, leadership by the Reserve Bank of India, RBI[42] and cutting-edge input from the private sector. The close public-private partnership was well coordinated by Nilekani with the leadership of the RBI and the non-profit National Payments Corporation of India (NPCI).

By providing universal ID and digital payments for all Indians, the project has been able to lay claim to genuine universality, making it a true grand national project in line with the vision of a "New India".

The project's success also offered India the potential to reap 'soft power' benefits by standing out as a global leader in digital innovations for development. This is particularly the case because the project took a lead in technology in a way that has been quite distinct from the US and Chinese models of digital infrastructure. This is consistent with India's non-aligned and independent tradition.

Third, the vision, ability to execute, and leadership of Nandan Nilekani have been central to the success of these initiatives. He envisaged the changes needed in his 2008 book, Imagining India: Ideas for the New Century. Moreover, setting and surpassing a target of issuing 600 million identification cards in the first five years was something only Nilekani could have done.[43] He joined the public sector to set up the Unique Identification Authority of India (UIDAI) to implement universal digital identification initially as a small start up with limited resources and staff. He brought not only his own managerial and technical talent, but also his unique ability to attract the best professionals from the private sector, the Silicon Valley diaspora, and the civil service. Nilekani's

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42 The role of the Reserve Bank of India has been critical to the success of UPI. See Annex 3 on the collaboration of the RBI and the private sector and on the regulatory challenges faced by the RBI.

43 As he narrates in his book, no adviser with knowledge of the sector thought this was a realistic target. Nilekani himself did not know what strategy to follow to reach the target. In the event, the UIDAI delivered 600 million Aadhaar documents in the first five years, above the initial ambitious target.

reputation meant that very few would refuse an offer to work with him. This unique ability to attract and manage the best talent in the public sector can be compared to that of Lee Kuan Yew in Singapore. (See Annex [1]) and technical assistance. India's high-level IT capabilities also permitted the in-house development of Aadhaar, avoiding vendor lock-in and lack of interoperability, something that will not be as easy to replicate in other countries.

In addition, Nilekani spent considerable time travelling around the country to socialise the idea with politicians, civil servants, financial and tech sector companies, and civil society and persuade them of the importance of Aadhaar for the vision of a New India. He made the effort to go to their regions and offices because he wanted to show that, "I am coming to you because I want your help in doing something nationally important." Nilekani broke with protocol because he visited not only senior officials, but also junior officials and telecom companies, oil companies, international organisations, and embassies. This approach created a powerful coalition in support of Aadhaar and for his ambitious nationwide digital infrastructure approach.

Finally, India was able to draw on the skills of many Indians, with a strong education in mathematics, engineering, and IT, including those who had been working in Silicon Valley businesses, both in the US and through work outsourced to India. This clearly illustrates the key role that diasporas can play in national development, far surpassing the contribution of foreign aid and technical assistance. India's high-level IT capabilities also permitted the in-house development of Aadhaar, avoiding vendor lock-in and lack of interoperability, something that will not be as easy to replicate in other countries.

❻ DESIGN PRINCIPLES THAT CONTRIBUTED TO DIGITAL SUCCESS

The universal identification programme was implemented through a public organisation, the Unique Identification Authority of India (UIDAI), that, under Nilekani, followed a start up model, focusing on being agile, resourceful, and innovative with small teams and resources. It also shared the IT culture of strong openness and collaboration and a commitment to a more open and inclusive society.

The digital infrastructure design teams have a very strong sense of "mission" and an IT culture of collaboration. Many work on a voluntary basis. The digital project is still strongly supported by mission-oriented non-profit organisations such as the Indian Software Product Industry Round Table (iSPIRT).

The nationwide digital infrastructure's public-private approach meant that all products had a focus on ensuring access for all citizens, especially the poor (although, access for the poorest is still limited). Nilekani explicitly referred to the need for the nationwide digital infrastructure approach to be able to mimic the competition of free markets and promote a self-evolving digital ecosystem. The digital architecture mimicked decentralised markets, being minimalistic, interoperable, modular, and based on APIs, and permitting the provision of open-ended solutions by the private sector.

The team faced the challenge of designing digital tools for a population of 1.3 billion, including people with limited education and access to different types of technologies. To overcome this challenge, the design team embraced market principles and focused on providing digital tools that were easy to use, cheap, and offered people as many benefits as possible. To understand the needs and constraints that people face, Nilekani and the team travelled extensively around the country.

Understanding the needs of ordinary people

One person was waiting patiently to receive his Aadhaar, despite already having three other forms of ID. When Nandan asked him why, he replied, "Idiot, if I have three buffaloes, and the government is giving me a fourth, won't I stand in line?"

Source: *Nilekani and Viral,"Rebooting India, Realising a Billion Aspirations", Penguin Books, 2015.*

The design team has consistently emphasised:

- strong benefits for users
- simplicity
- cheapness for the user
- interoperability
- open architecture
- a modular approach.

Interoperability has been central to this digital project, both in each digital layer and across layers. Interoperability and the use of open source ensure that this digital infrastructure promotes a competitive environment and provides access to the digital market for all market participants. The modular approach means that different components can easily be swapped in and out without requiring

significant changes in the overall architecture and that other solutions (often local solutions with local knowledge) can be built on top of the key digital platforms, mixing and matching tools through open interfaces. This approach permits flexibility and innovation.

IMF Characterisation of India's Digital Infrastructure

India Stack's development is guided by a foundational building-blocks approach and a focus on supporting innovation across the ecosystem. The building-block approach involves unbundling the solution's compnents to a set of problems and identifying a minimal common core. This modular approach fosters innovation, allowing solutions to be built for multiple problems based on the common core. For a large and diverse country such as India, a building-block approach provides those closer to the problem with the basic tools to create tailored solutions.

Source: IMF 2023, Op. Cit.

The open-source approach has permitted access to low-cost, off-the-shelf solutions, enabling the country to offer its citizens the identification and payment system at no charge. In other words, when a user makes a UPI payment for one US cent, the recipient receives exactly 1 US cent, with zero deductions.

The digital infrastructure is also ubiquitous, universal, and inclusive. It serves not only those with access to a smartphone, but also those with a feature phone or even no phone at all.[44]

These digital tools have the effect of enhancing the positive impact of markets by reducing transaction costs and entry barriers, disseminating information, increasing access to both consumers and producers, and supporting competition and innovation. In addition, they make it easier for governments to deliver services in a citizen-centric way and gain greater trust from citizens.

These design principles have nationwide digital infrastructure that follows market principles by being orderly (has structure and operates within certain parameters), openended, and with the ability to draw on knowledge and self-organise.[45] [46] As a result, these tools promote competition and innovation but without determining the outcomes.

Indian's nationwide digital infrastructure has, therefore, been able to support many digital innovations, resulting in a large digital ecosystem. For example, authentication APIs are now used by many different apps that provide different customer journeys.

This confirmed Nilekani's belief that, if you build population-scale infrastructure that is cheap and widely available and provide interfaces (APIs) that people can embed in their apps and workflow, you open the way for all kinds of innovation. [47]

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[44] For example, through the Aadhaar-Enabled Payment System using business correspondents.

[45] Market participants, through their interactions with one another, generate and utilise information that help to guide the allocation of resources- leading to efficient allocation without the need for centralised planning.

[46] Nilekani and Viral, 2015, Op. Cit. He refers to this as an hourglass system, where open and interoperable systems enable great innovation above (APIs) and below (wireless/wired networks). He also believes that this system has political advantages because the minimalist approach avoids stepping on too many departmental 'toes'.

[47] Nilekani and Viral, 2015, Op. Cit.

➐ POTENTIAL CHALLENGES AND RISKS

This report presents an overwhelmingly positive view of the achievements of India's nationwide digital infrastructure approach and its potential for adoption and adaptation in other countries. However, there are a number of factors that can potentially limit the positive impact of these digital tools:

Ⓐ Digital documentation is gaining primacy in India. This increases the risk and potential cost of large-scale data breaches, calling for greater emphasis on safeguards and security. Estonia is a global leader in the use of blockchain technologies to protect the integrity of digital identity, land registry, healthcare, and voting systems. It has achieved this despite a well-resourced, hostile neighbour that has attempted to hack its databases. Leveraging blockchain technology in a similar way may have the potential to improve data security.

Ⓑ As well as the risk of hacking by third parties, there is the risk of abuse by governments. Digital infrastructure in India is owned by the government. Data use and privacy need to be monitored by democratic checks and balances. The potential weakening of democracy in India could, in turn, also weaken these protections.

India's Supreme Court has demanded a robust data protection and privacy law to accompany Aadhaar. A recent IMF report concurs: "A robust data protection framework is essential to protect citizens' privacy, prevent companies and governments from indiscriminately collecting data, and holding companies and governments accountable for data breaches to incentivise appropriate data handling and adequate investments in cybersecurity.[48] However, India has not yet approved a Data Protection and Privacy Law.[49] See also Annex 2 on data protection and privacy.

Ⓒ As well as these risks, it must be noted that India's digital tools still have a long way to go to reach full coverage of the poorest citizens. Less than 15% of rural households have internet access, compared to 42% of urban households.[50] Moreover, in 2019, only 27% of Indian adults had a minimum level of financial literacy as defined by the Reserve Bank of India. Despite 1.3 billion people adopting a digital ID, the IMF review also notes that only 35% of persons aged 15 and over have made or received a digital payment, indicating that the use of UPI is concentrated in select segments of the population.[51] In Estonia, with a wealthier population, high levels of digital inclusion were achieved through large digital education programmes funded by banks and telecom companies. Ten percent of the adult Estonian population was educated on the use of digital

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[48] IMF WP, 2023, Op. Cit.

[49] Data Privacy Hub https://business.saymine.com/articles/the-state-of-data-privacy-in-india.

[50] IMF WP, 2023, Op. Cit.

[51] Ibid.

tools by the Look@World project.[52] In India, investment in financial and digital education is still limited and it is likely that full adoption across India's poorest citizens will take many years and require other advances out of the scope of this report, such as increased electrification in rural areas and greater penetration of smartphones in this segment of the population.

[52] Kristjan Vassil, 'Estonian E-Government Ecosystem: Foundation, Applications, Outcome. Background Paper: Digital Dividents.', World Development Report 2016, Institute of Government and Politics, University of Tartu, June 2015), The "Look@World" Project: An Initiative from Estonia's Private Sector to Boost Internet Use. Alar Ehandi, Baltic IT&T Review Issue 21.

⑧ CAN OTHER COUNTRIES BENEFIT FROM INDIA'S DIGITAL TOOLKIT?

India has accomplished a seemingly impossible task, obtaining significant rewards that are likely to grow as more and more people adopt the digital tools made available through its nationwide digital infrastructure approach. This raises the question of whether other countries can replicate India's success and enjoy similar benefits.

In many respects, India is not unlike other low- and middle-income countries. Its political regime- a democracy with several weaknesses and clientelism- is common among similar nations.[53] Additionally, India's civil service is well known for its excessive bureaucracy and hierarchical processes. However, even in this challenging context, strong political commitment and the leadership of an exceptional entrepreneur, Nilekani, permitted the successful implementation of the ambitious nationwide digital infrastructure approach.

India possessed certain advantages that set it somewhat apart from other countries. One such advantage is the government's strong commitment to modernisation, centred around its vision of a "New India". Furthermore, India boasts a robust technology sector and connections to the Silicon Valley diaspora.

Prime Minister Modi has expressed his willingness to share India's knowledge on building digital infrastructure with other low and middle-income countries. Thanks to the open architecture and minimalist approach of the Indian nationwide digital infrastructure approach, the technological demands of adapting its universal identification, digital payment systems and other key tools are not insurmountable. Consequently, entry barriers for countries seeking to emulate India's experience are relatively low. India has also offered all the technology for its digital transformation, the "India Stack" – (1) universal digital identification, (2) digital payments, and (3) data owned by citizens, not IT corporations – for free to other countries. In essence, India has transformed the "India Stack" into a "World Stack" (see https://indiastack.org/).

For countries to benefit from India's model of building nationwide digital public infrastructure, they will also have to display a strong national commitment to making their project successful and forming robust public-private partnerships. In the absence of these two factors, foreign aid wil not have a positive impact.

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[53] India ranks 103rd out of 167 countries in the Legatum Institute Prosperity Index 2023. India is classified as a "flawed democracy" by the Economist Intelligence Unit 2022, ranking 46th out of 167 countries, and 97th out of 179 countries in V-Dems Democracy Report 2023 where it is classified as an electoral autocracy with large declines in the last 10 years.

Bold: PLAYBOOK ON NATIONWIDE DIGITAL INFRASTRUCTURE AT THE SERVICE OF PROSPERITY

⑨ CONCLUSION: DEPLOYING DIGITAL INFRASTRUCTURE MAY BE THE MOST EFFECTIVE TOOLKIT FOR PROSPERITY

India's nationwide digital infrastructure approach and the effort to make these processes open-access, may become India's greatest contribution to the world in the years ahead.

Nationwide digital infrastructure, which amplifies the benefits of joining the formal economy, can bring substantial gains to the informal sector and society, contributing to the formalisation of the economy and societal inclusion. It does so by giving poor people the ability to trade and own property, as the protesters of the Arab Spring had demanded. The integration of people, supports social cohesion. The nationwide digital infrastructure approach is making markets more competitive, reducing transaction costs, and improving tax efficiency and collection.

The bottom-up digital innovations implemented in India can assist in the move towards a more democratic, open-access society, where participation in markets leads to greater benefits for all and fewer special privileges. This can help counteract wealth concentration and the exclusion of people from economic opportunities. The potential of a nationwide digital infrastructure approach to make digital technologies work for the benefit of all may be critical to support national social cohesion and the integration of the informal sector into the national economy.

This Playbook concludes that, for low and middle-income countries, adopting a nationwide digital infrastructure approach

like that developed in India may be the most effective way to enhance their political, economic, and social development. This unique opportunity should not be missed.

ANNEX 1:
Nilekani: Setting up teams to fix all the major problems facing India

We propose that a team of 100 carefully selected individuals can fix all the major problems that ail India. How would such a system work? Let's say the prime minister identifies ten grand challenges that India faces. Each idea can be the nucleus of a 'government start-up.' Ten enterprising leaders are given charge of each of these problems. They, in turn, form ten-member teams of the best brain within government and domain specialists from outside government to apply out-of-the-box thinking that can deliver innovative solutions. We give examples of such potential solutions throughout the book.

Any new government project should be treated, in essence, like a start-up that needs to stake a claim for itself. The officials in charge of such a project need to display a considerable amount of entrepreneurial savvy. A true entrepreneur will figure out all the government process and follow them to the letter. He will navigate the byways of the bureaucracy, keep his multiple masters happy, get his project mentioned in every important speech and every government document of relevance, get his bills tabled in Parliament and enacted as law, secure his budgets, cooperate with investigating agencies, respond to court orders, answer Parliament questions, tirelessly provide information sought in RTI requests, build general consensus with multiple interest groups within government as well as citizen groups outside, find allies who will support him when under attack, and do all this while staying focused on hiring the best team and building an organization that is dedicated towards achieving a well-defined goal.

Source: *Nilekani and Viral, "Rebooting India, Realising a Billion Aspirations", Penguin Books, 2015.*

ANNEX 2:
Aadhaar: Data protection and privacy regulation

The Bharatiya Janata Party has faced criticism for linking Aadhaar to various government services. The system has recently become mandatory for the delivery of a number of government services.[54] This has potential implications for citizens' privacy and security. In 2018, the Supreme Court of India upheld the validity of Aadhaar but also imposed restrictions on its use to ensure respect for the right to privacy and individual liberty. It demanded a strong data protection law. The Supreme Court generally tries to limit the risks of Aadhaar being used as a tool for surveillance and profiling. The Digital Personal Data Protection Bill has still not been approved.

Potential data privacy and security issues:

○ **Identity theft:** Aadhaar numbers are linked to personal information that includes biometric data, bank accounts, and mobile phone numbers. Unauthorised access to this information could result in identity theft.

○ **Profiling:** Aadhaar data, despite its minimalist approach to collecting data, could potentially be used to profile individuals based on their demographic information, such as religion, caste, or ethnicity. This could, in turn, be used to discriminate against certain individuals or communities.

○ **Surveillance:** The system could allow the government to track individuals' activities and movements.

○ **Data security:** Data could be stolen or misused due to inadequate security measures, leaving individuals' personal information vulnerable to hackers and cybercriminals.

○ **Data sharing:** There are concerns about the sharing of Aadhaar data between government agencies and other service providers and a lack of transparency in this process, for example, in relation to health digitalisation.[55] There is a potential risk of misuse of Aadhaar data by third parties. While the government has mandated strict guidelines for the use of Aadhaar data by service providers, there is a risk of its unauthorised use for commercial purposes.

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[54] Economic Times, August 16, 2022, "Aadhaar number mandatory to get government benefits and subsidies, UIDAI says."

[55] "Privacy concerns as India pushes digital health plan, ID" Reuters, September 22, 2020.

ANNEX 3:
UPI, RBI, and private sector cooperation

In 2009, the RBI quickly realised that Aadhaar would help to scale up digital payment solutions. At a meeting in December 2009, the UIDAI, the RBI, the NPCI, and major banks discussed how the RBI's business correspondents could be integrated into Aadhaar biometrics, creating a blueprint for the interoperable system. Moreover, Aadhaar would provide the financial address for bank payments.

The NPCI was set up as a non-profit company by the RBI and the Indian Banks' Association (IBA) and is owned by a group of public and private banks, of which there are now over 400, up from an initial group of 21. The NPCI was established to provide cost-effective, secure, and efficient payment solutions for banks and other financial institutions. It operates under RBI supervision and supports government initiatives to foster financial inclusion.

One of the NPCI's key successes was to identify the agents committed to the national challenge of making digital payments faster, more ubiquitous, and accessible to everyone. Banks, financial institutions, fintech companies, and the government worked together to make this possible.

The RBI's full commitment, capabilities, and openness to innovation allowed the project to overcome many regulatory challenges. Technical challenges resulted in innovations such as the use of QR codes and the development of a secure authentication system, with the RBI pioneering the use of biometrics and business correspondents. The UIDAI and the NPCI also worked to extend the reach of digital payments by widening regulation on who could work as a business correspondent.

The NPCI ensured that the system was user-friendly and feature-rich (payment by QR, Aadhaar number, mobile number, Virtual Payment Address, and bank account number; functions for paying bills, recharging a mobile phone, and making donations; use of different payment methods). This has permitted its widespread adoption by popular payment apps (Google Pay, PhonePe, Paytm, and Amazon Pay) and banks.

UPI and regulatory challenges

○ Interoperability: The challenge is to ensure seamless integration between different banks.
The NPCI played a key role in creating a common protocol and setting up guidelines to ensure interoperability.

○ Regulatory framework: The RBI played a central role in establishing the necessary regulatory framework for this new payment system.

○ Security: UPI transactions involve the transfer of sensitive information. To address this challenge, the NPCI established strict security protocols and guidelines.

○ Competition: UPI faced competition from other digital payment systems and it was necessary to ensure a level playing field. This was provided by the regulatory authorities which promoted competition and innovation.
Customer grievance redressal for UPI transactions: The NPCI set up a customer grievance redressal mechanism to ensure that customer complaints were resolved in a timely and efficient manner.