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Vijaya Sunder M | Siddhartha Modukuri | Rajendra Srivastava

AADHAAR: THE DIGITAL MULTIPLIER OF THE INDIAN ECONOMY

> "The Aadhaar system in India is the most sophisticated [ID system] that I've seen. It's the basis for all kinds of connections that involve things like financial transactions. It could be good for the world if this became widely adopted."
>
> *- Paul Romer, Nobel Laureate and former Chief Economist of the World Bank*

In early 2022, Jathindra Kumar, the Chief Executive Officer of the Unique Identification Authority of India (UIDAI), was delighted to see as many as 175 innovative ideas emerging from a first-of-its-kind hackathon event. UIDAI organized the event in October 2021, and 3,000 enthusiastic teams from top educational institutions nationwide participated.[1] The themes were designed to attract innovative ideas for upgrading the Aadhaar system, which issued a unique digital identity to every Indian resident.

It was evident to Kumar that India was gearing up to leapfrog toward the next level of digital transformation, which required a comprehensive strategy and a new policy framework. At this juncture, he brought together all the key stakeholders from corporate, legal, academic, and political institutions across public and private sectors for a workshop on Aadhaar 2.0 to think afresh and usher in the new era of digital identity, smart governance, and fast, efficient digital services.

[1] Press Information Bureau. (2021, October 29). *UIDAI's Aadhaar Hackathon 2021 draws enthusiastic response from young innovators.* [Press Release]. Ministry of Electronics & IT. https://pib.gov.in/PressReleasePage.aspx?PRID=1767524.

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The seed for digitalization in India was planted a decade earlier, in 2009, when the Indian government envisioned creating a digital infrastructure for its 1.3 billion people. Consequently, by 2019, the government had issued a 12-digit unique ID called the Aadhaar (which means "foundation") to nearly every adult resident in India. Aadhaar was designed for simplicity; as Nandan Nilekani, the first chairman of UIDAI, said, "Its only function was to say that person X is X, nothing more and nothing less."[2] However, its long-term impact was phenomenal as it triggered a multiplier effect, with the volume of digitally enabled services increasing exponentially.

THE MULTIPLIER EFFECT

Aadhaar saved about US$66 billion by 2021, with about 313 government schemes depending on it. The savings were generated primarily because the pilfering and siphoning away of Public Distribution System (PDS) funds that had plagued the government in the pre-Aadhaar era were eliminated. Specifically, Aadhaar efficiently eliminated fake and duplicate accounts from the system. The resulting savings covered the cost of developing and implementing the system. Aadhaar was a unique kind of government program, one that paid for itself.

Aadhaar grabbed international attention and praise. The World Bank said, "A digital identification system such as India's Aadhaar, by overcoming complex information problems, helps willing governments promote the inclusion of disadvantaged groups." During the COVID-19 pandemic in India, the government relied on Aadhaar to distribute resources. Although the pandemic inflicted immense suffering in the nation, it advanced the adoption of and reliance on Aadhaar-based digital-based services for India's public and private sectors. Whereas in several other countries the pandemic damaged the financial infrastructure and thereby challenged their systems of emergency fund allocation, India distributed about US$5 billion worth of benefits entirely through payments made via digital platforms.[3] This digital distribution was enabled by linking Aadhaar with bank accounts (under a financial inclusion scheme called *Jan Dhan*) and cell phones, also called JAM,[4] much before the COVID-19 pandemic in 2019 (see **Exhibit 1**).

The scale and reach of Aadhaar stimulated the private sector to wrap innovation around it. Consequently, UIDAI envisioned and created an India Stack, which was a set of open APIs[5] and digital public goods that aimed to unlock the economic primitives of identity, data, and payments at the population scale (see **Exhibit 2**). The possibilities were manifold, and developers were encouraged to develop novel ways of using this public digital infrastructure.[6] Consequently, by 2021, over four billion transactions occurred over Aadhaar payment systems, and residents presented Aadhaar 14 billion times to obtain services under

[2] Sharma, R. S. (2020). *The making of Aadhaar: World's largest identity platform*. New Delhi: Rupa.
[3] Sharma, A., & Sengupta, H. (2020, August 5). COVID-19 has accelerated India's digital reset. *World Economic Forum*. https://www.weforum.org/agenda/2020/08/covid-19-has-accelerated-india-s-digital-reset/
[4] JAM is an abbreviation for **J**an Dhan (public fund), **A**adhaar, and **M**obile.
[5] Open API is an application programming interface that is published on the Internet and shared freely. It allows the owner of a network-accessible service to give universal access to consumers.
[6] India Stack. (n.d.). https://indiastack.org/

various schemes.[7] Further, in the same year, 44 start-ups, the majority of them empowered by digital platforms, turned into unicorns with a total valuation of US$94.77 billion,[8] a 75% growth from the previous year.[9]

At this juncture, Kumar, who had a proven track record as an IAS (Indian Administrative Service) officer, was appointed CEO of UIDAI in March 2021 to steer and shape the digital transformation of India by using the Aadhaar platform. As a first step, Kumar met Sandeep Mishra, the deputy director-general at UIDAI, who had championed the first ten years of the genesis and success of Aadhaar. Kumar listened with keen interest as Mishra recounted the journey of Aadhaar, from the various implementation challenges to the successful outcomes.

THE JOURNEY OF AADHAAR

Other countries had personal identification systems such as the Social Security Number (SSN) in the United States of America, but India had no unique, universally accepted identifying document before Aadhaar. Consequently, services suffered from slow lead times as most of the customer's time was spent in proving their identity to the service provider. For instance, opening a bank account could take days, if not weeks, given the ambiguity of various customer authentication documents that captured different information about the same customer.

Multiple identity documents were issued, but none were comprehensive. In 2010, 40% of the population was not registered at birth, 30% could not read or write their names, and 60% were unbanked. Just 3% of Indians paid income taxes, and only 60 million had passports.[10] The low number was because only those who traveled abroad would acquire a passport. Those who voted would enroll for a Voter ID card, and those who paid taxes would need a Permanent Account Number (PAN) card. Also, none of these documents were relevant for approximately 270 million people, representing some 20% of the population who lived on less than US$2 daily.[11] Moreover, because there was no universally recognized identity system, resources that the government provided to the poor and marginalized sections of society were siphoned away through ghost/fake and duplicate identities. For instance, the Independent Evaluation Office[12] pointed out that 57% of the subsidized foodgrains did not reach the intended beneficiaries, and

[7] UIDAI (Unique Identification Authority of India). (2021). Aadhaar 2.0: Ushering the next era of digital identity and smart governance. [Press Release]. Ministry of Electronics & IT. https://uidai.gov.in//images/pressrelease/Press_Release_English_3_Nov_2021.pdf

[8] *Unicorn* is a term used in the venture capital industry to describe a privately held start-up company with a value of over US$1 billion.

[9] Invest India. (n.d.). *The Indian unicorn landscape: Startups, growth, FDI, investors*. https://www.investindia.gov.in/indian-unicorn-landscape

[10] Sudhir, K., & Sunder, S. (2020, March 27). What happens when a billion identities are digitized? *Yale Insights*. https://insights.som.yale.edu/insights/what-happens-when-billion-identities-are-digitized

[11] Mahajan, N. (2018, August 9). *The making of India's biometric Aadhaar ID program: How Nandan Nilekani rolled out the authentication process that gave India its first standardized ID card.* https://www.rolandberger.com/en/Insights/Publications/The-making-of-India%E2%80%99s-biometric-Aadhaar-ID-program.html

[12] The Independent Evaluation Office (IEO) was established in 2001 to conduct independent and objective evaluations of fund policies and activities (https://ieo.imf.org/).

37% was siphoned away in the supply chain, raising serious concerns about the PDS.[13] Likewise, essential services such as banking remained out of reach for a considerable section of the population because they could not prove their identity to the bank.

Consequently, there was a rise in the number of usury microfinance dealers,[14] who exploited marginalized communities that collateralized mainstream finance. The disbursed healthcare benefits were not reaching the target groups as they lacked a singular identifying document. Identification was a tedious process, with each provider requiring different sets of identification. Access to basic services such as public food allocation (ration), banking, healthcare, and traveling abroad was cumbersome and time-consuming.

To effectively address these challenges, on March 3, 2006, the Department of Information Technology, Ministry of Communications and Information Technology, Government of India, approved the project called "Unique Identification for BPL (Below Poverty Line) Families." A Processes Committee was set up on July 3, 2006, to suggest the process for updating, modifying, adding, and deleting data and fields from the core database to be created under the Unique Identification (UID) for this project. UIDAI was constituted on January 28, 2009, as an attached office under the aegis of the Planning Commission. The UIDAI was responsible for formulating plans and policies to implement a unique identification scheme (later named Aadhaar) and for operating, updating, and maintaining the database.

It was conceived primarily to be robust enough to eliminate duplicate and fake identities by capturing two iris scans and ten fingerprints, making it more foolproof. Furthermore, de-duplication, which compares each identity with other identities, minimized the possibility of duplicate and fake identities. This created a massive enterprise where each record containing 10 fingerprints and 2 irises had to be verified against 1.3 billion other records in the database and authenticated quickly and cost-effectively.

On June 25, 2009, Nandan Nilekani was invited by the Prime Minister to take charge as the Chairperson of the UIDAI with the rank of cabinet minister. Previously, Nilekani had cofounded India's tech giant, Infosys, and was regarded as one of India's top thought leaders. He promoted digital culture from day one at the office, built a digitally savvy team that envisioned a unique, universal, inexpensive, digital, portable, and, most importantly, foolproof identification number. Nilekani told his team members, "Only if we can create a single identity platform that is both digital and online and portable across the country will people be able to quickly advance their lives."[15]

"A corporate honcho like Nilekani leading a flagship government project was not a common sight in India," remarked Mishra. The scale and novelty of the project demanded a radically innovative approach. The project involved two focal aspects: first, technology was going to undergird the project, and second, there was a need for significant resources in communication, demand generation, standardization, documentation, processes, enrollments, and other areas. Thus, a vibrant team from both the government

[13] Singh, M. K. (2014, February 27). Govt spends Rs 3.65 to deliver Re 1-worth food; 57% of subsidized food doesn't reach beneficiaries." *Times of India*. https://timesofindia.indiatimes.com/india/govt-spends-rs-3-65-to-deliver-re-1-worth-food-57-of-subsidized-food-doesnt-reach-beneficiaries/articleshow/31063717.cms

[14] Usurious microfinance dealers lend money at unreasonably high rates of interest.

[15] Sharma, R. S. (2020). *The making of Aadhaar: World's largest identity platform*. New Delhi: Rupa.

and private sector came together in a unique alliance. Furthermore, UIDAI became a melting pot where distinct streams from the government, the private sector, civil society, academia, and start-ups converged. Moreover, people at UIDAI were selected as volunteers contributing to the nation-building exercise; their motivations were not power, prestige, or the rewards of being in an administrative public sector role. [16]

Kumar said:

> "I have been following the project very closely as it equally caught the attention of both public and private players. Being a unique model and the first of its kind, we all waited to see how the project would unfold. It was interesting to see how public servants would collaborate with professionals from the private sector, who have a radically different approach to work."

Mishra continued:

> "UIDAI could not have thrived except as a learning organization. Everyone was there: the private sector, the government, and others because they had volunteered. This self-selection approach was reflected in people's attitude to learning and their desire for new experiences and a strong motivation to serve the country by contributing to this transformational project. The power of ideas and the innate curiosity the team brought to the project were the critical drivers of its success. However, an ecosystem with people from diverse backgrounds and exposure came with several management challenges. These challenges were overseen with understanding and sensitivity without sacrificing the principles of rigor and accountability, and thus it delivered the desired results."

DESIGN AND IMPLEMENTATION

The uniqueness of Aadhaar compared to other national identification projects worldwide was based primarily on two attributes of the system. First, Aadhaar was just a number that conferred a digital identity on a person, not a smart card. Identities had always been embodied in ID cards, and because the concept of an online identity system was novel, it was criticized. Many claimed that a card was appropriate for India because poor connectivity would render an online system inoperable. However, the decision to make Aadhaar just a number contributed significantly to cost reduction goals. A unique number was printed on an inexpensive plastic card and could be downloaded on any type of paper, in contrast to an expensive smart card with a chip. This unique feature of Aadhaar helped with the inclusion of the poor. That is, if they lost the card, it could become too cumbersome to get it back, but Aadhaar could be downloaded easily from any nearby Internet center. Moreover, Aadhaar could easily be seeded into other databases to cleanse and enrich the data. Furthermore, to safeguard the privacy concerns of individuals, Aadhaar was designed as a random 12-digit number with no built-in intelligence or profiling information.

[16] Sharma, R. S. (2020). *The making of Aadhaar: World's largest identity platform*. New Delhi: Rupa.

Second, Aadhaar was designed to establish an identity based on minimal but essential demographic data such as the name, date of birth, address, gender, and biometrics, which included ten fingerprints, an iris scan of both eyes, and a photograph (the cell phone number and email address were optional fields). The initial idea of utilizing existing databases related to voter IDs, the PDS, BPL families, etc., was abandoned because of the great nonuniformity in how names and addresses were recorded in different databases; the same individual could not be identified and related in these databases. Although several consultants produced reports advocating the above idea, UIDAI concluded that this would be a futile exercise.

Thus, Aadhaar was designed as a unique random number tagged to demographic information, and this enabled it to serve as a foundational document based on which other eligibility documents could be issued. For instance, it could work as a single verifiable identity platform on which other eligibility applications such as income tax identification, PAN, and ration cards could be built. Moreover, its availability as an online verifiable digital identity platform had made it applicable to various domains.

For this, Aadhaar needed to be an eternal non-repudiable identity. Therefore, Aadhaar was issued only after complete de-duplication of biometrics, which involved comparing everyone's demographic and biometric attributes against the entire database at the time of enrollment. Hence, the duplicates, ghosts, and fakes that earlier used to show up in most government programs and welfare schemes were weeded out, and it was almost impossible for them to re-enter the system. For instance, during a specific voting season for the presidential elections in the United States, many news outlets reported claims that "dead people" cast votes in the elections.[17] This was a classic case of identity misuse, as deceased people's identities were misused. However, such misuse is unlikely with a unique identifying system such as Aadhaar, as every number was de-duplicated against every other number in the system. Subsequently, it was envisioned that each person would be uniquely identified on an electronic voting machine that used fingerprints to authorize votes.

The first UID (Aadhaar) number was issued on September 29, 2010, to a resident of Nandurbar, Maharashtra. However, enrolling 1.3 billion residents across the country was a monumental task. UIDAI thus signed a Memorandum of Understanding with state governments and banks to partner with them and made them work as registrars to enroll residents. Registrars were paid on successful generation of Aadhaar after enrollment. This incentive-cum-output-driven model proved phenomenally successful in ramping up enrollment work. This model was described as a "scalable linear model" by Nilekani, and it grew to an ecosystem of registrars encompassing over 100,000 persons across India. A team at UIDAI headquarters coordinated the effort.

Exhibit 3 shows the yearly trend of Aadhaar enrollments, which peaked in 2014, with daily enrollments reaching 1.5 million per day. UIDAI developed a highly secure enrollment system capable of capturing demographic and biometric details and storing them securely in a 2,048-bit encrypted format both at rest and in transit. Enrollment operators and supervisors were certified by the testing and certification agency

[17] Fessler, P. (2012, February 14). Study: 1.8 million dead people still registered to vote. *NPR*. https://www.npr.org/2012/02/14/146827471/study-1-8-million-dead-people-still-registered-to-vote

engaged by UIDAI. By 2019, 1.2 billion Indians had Aadhaar cards; 39% of those with Aadhaar used it to receive daily rations, 50% of householders used Aadhaar for LPG subsidy, over 9 million people were drawing pensions based on Aadhaar, 90% of farmers used Aadhaar for fertilizer subsidy, and 102 million workers received wages based on Aadhaar, testifying to the implementation success of Aadhaar.[18] Further, as enrollment gained momentum and interventions by sectors such as banking and transportation increased awareness of authentication via Aadhaar, the number of authentications of financial transactions increased consistently (**Exhibit 4**).

PRIVACY CONCERNS

Although he was impressed by Mishra's inside story and detailed presentation, Kumar decided to raise the tangential subject of privacy concerns: "Although the implementation has seen success from its inception, I have been closely following the concerns raised on data security, with people claiming that Aadhaar was a surveillance instrument."

Mishra immediately cleared the air as he continued the narrative,

> "Privacy was included in the design elements by using a 'federated architecture.' UIDAI would not know the information required by the service provider to whom Aadhaar is issued. The system will only authenticate the request by giving a simple yes or no to the question of whether the person is the person he or she claims to be."

To address the concerns and bring Aadhaar under a governing policy, the Aadhaar (Targeted Delivery of Financial and other Subsidies, Benefits and Services) Act, 2016, was notified on March 25, 2016, and was introduced in the Parliament of India.[19] After the bill was passed in Parliament, the Supreme Court took up the proceedings and upheld the Aadhaar Act, 2016, as constitutionally valid. It ruled that the Act empowers disenfranchised sections of society by providing them better access to fundamental entitlements, such as state subsidies. [20] The Act strictly delineated several sections for the applicability of Aadhaar and the judgment played vital role in increasing the authentications to almost three times after 2016 (**Exhibit 4**).

However, there were a few instances where the authentication using Aadhaar was received with skepticism and led to misuse. For example, it created avenues for usurious lenders to exploit people's inability to access formal financial channels. In one such instance, when banks refused to issue loans, a usurious lender collected a staggering 43% interest on the principal in a week from a digital platform.[21]

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[18] Totapally, S., Sonderegger, P., Rao, P., Gosselt, J., & Gupta, G. (2019). *State of Aadhaar report 2019*. New York: Dalberg. https://stateofaadhaar.in/assets/download/SoA_2019_Report_web.pdf

[19] The Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016. https://uidai.gov.in/images/Aadhaar_Act_2016_as_amended.pdf

[20] Supreme Court Observer. (n.d.). Constitutionality of Aadhaar Act. *Supreme Court Observer*. https://www.scobserver.in/cases/puttaswamy-v-union-of-india-constitutionality-of-aadhaar-act-case-background/#:~:text=A%204%3A1%20majority%20upheld,of%20the%20Act%20as%20unconstitutional.

[21] https://www.moneylife.in/article/how-app-based-lenders-are-harassing-sucking-borrowers-dry/60621.html

Further, information on individuals was a valuable prize for various entities, and security breaches of confidentiality and mass surveillance were potential threats. Some security personnel accepted Aadhaar as a proof of identity at railway stations and airports without following the mandate to authenticate only using biometrics and a cell-phone-based one-time-password. UIDAI later addressed this concern by issuing a hologram-embedded card at a nominal fee. Despite a few such instances, the advantages of the judgment outweighed the disadvantages as Aadhaar had a significant impact in digitally boosting the growth of the economy in both the private and public sectors.

IMPACT OF AADHAAR ON THE PUBLIC SECTOR

Before Aadhaar solved the identification problem, first, there was no tracking system to check whether the benefits from the government reached the intended beneficiaries. Second, many intermediaries were involved in transferring benefits, with funds being siphoned away at each layer. Third, fake or duplicate IDs were used to misuse benefits intended to uplift the marginalized sectors.

With the Supreme Court issuing a mandate to use Aadhaar for public welfare schemes in its verdict on September 26, 2018, Aadhaar-based direct benefit transfer (DBT) grew significantly and covered 313 public schemes. Consequently, DBT saved a substantial amount of government funds (**Exhibit 5**).

One of the most important schemes for the rural unemployed population was the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).[22] It aimed to enhance livelihood security in rural areas by providing at least 100 days of wage employment in a fiscal year to at least one adult member of every household who volunteered to do unskilled manual work. Women were guaranteed one-third of the jobs made available under the MGNREGA. The Government of India allocated funds to the MGNREGA project every year, and they were distributed through Aadhaar (**Exhibit 6**).

Another scheme, the Direct Benefit Transfer of LPG (DBTL)[23] or PAHAL (*Pratyaksh Hanstantrit Labh*) scheme, was launched by the government on June 1, 2013. Once the scheme was linked to Aadhaar, the government benefited immensely. In 2016, the then finance minister of India testified that "targeted subsidy through Aadhaar cards of LPG consumers had resulted in savings of over US$2.2 billion."[24]

The country's PDS facilitated the supply of food grains, with a network of more than 0.4 million fair price shops (FPSs). The PDS had historically suffered from high leakage rates (often exceeding 50%) as grains were diverted to the open market.[25] In 2015, the government rolled out electronic point-of-sale (ePOS) devices at FPSs. It required that beneficiaries use Aadhaar-Based Biometric Authentication to collect their

[22] Earlier known as The National Rural Employment Guarantee Act 2005 or NREGA.
[23] Liquid petroleum gas, which is used for cooking.
[24] Clarke, K. (2016, March 16). Estimating the impact of India's Aadhaar scheme on LPG subsidy expenditure. *Subsidy Watch Blog, Global Subsidies Initiative*. https://www.iisd.org/
[25] Gulati, A., & Saini, S. (2015). *Leakages from public distribution system (PDS) and the way forward.* Working Paper No. 294. New Delhi: Indian Council for Research on International Economic Relations (ICRIER).

benefits. Subsequently, all states used the historical authenticated transaction data from ePOS devices to determine monthly grain disbursals, which led to transparency in distribution and reduced leakages.[26]

Distributing benefits through Aadhaar proved to be successful and efficient. Until March 2021, multiple large central schemes, such as PAHAL and MGNREGA, had paid over US$5 billion through over 101 million successful transactions.[27] In addition, people residing in rural areas gained access to banking services using micro-ATMs, even when bank branches were unavailable in their areas. These micro-ATMs used simple fingerprints to authorize transactions. Subsequently, in 2020, over four billion transactions were conducted by 2.9 million micro-ATMs.[28]

The government was implementing new schemes in the healthcare sector, such as *Ayushman Bharat*, which was launched in September 2021 using Aadhaar. It covered more than 100 million poor and vulnerable beneficiary families, who were provided cashless secondary and tertiary care treatment at empaneled public and private hospitals. It was intended to create a seamless online platform that would promote the digital health ecosystem in India.[29]

THE INDIA STACK, AADHAAR, AND THE PRIVATE SECTOR

In addition to benefiting the public sector in numerous ways, Aadhaar also boosted innovation among private players. By 2021, India had become the third-largest start-up ecosystem in the world after the United States and China, and about 90% of the new unicorns were powered by Aadhaar.[30]

The private sector, start-up ecosystem, and partnerships thrived on the features of the India Stack. The greatest and most evident impacts could be observed in the banking and financial services industry (BFSI), with India leading the financial technologies adoption rate at 87%, the highest globally.[31] A new breed of digital natives was created with the entry of technology-driven companies into the BFSI segment (Tech-Fin).[32] These companies offered mobile applications that simplified customers' daily transactions. Triggered by a simple scan of a QR (quick response) code on mobile applications, transactions occurred within seconds, with the United Payments Interface (UPI)[33] serving as the backbone. There was a

[26] Muralidharan, K., Niehaus, P., & Sukhtankar, S. (2020, February 16). Evaluating the Aadhaar-PDS link. *Hindustan Times*. https://www.hindustantimes.com/

[27] UIDAI (Unique Identification Authority of India). (2021). *Annual report 2020-21*. New Delhi: UIDAI. https://uidai.gov.in/images/UIDAI%20Annual%20Report%202020-21_English_final.pdf

[28] Benu, P. (2022, August 7). Micro ATMs usage tripled during pandemic. *The Hindu BusinessLine*. https://www.thehindubusinessline.com/data-stories/data-focus/micro-atms-usage-tripled-during-pandemic/article65296019.ece

[29] Ayushman Bharat Digital Mission. (2021, December 23). *Prime Minister of India launches countrywide Ayushman Bharat Digital Mission*. https://pmjay.gov.in/

[30] Sarkar, J. (2021, September 3). India becomes third largest startup ecosystem in the world. *The Times of India*. https://timesofindia.indiatimes.com/business/india-business/india-becomes-third-largest-startup-ecosystem-in-the-world/articleshow/85871428.cms

[31] Nilekani, N., & Nageswaran, V. A. (2022, June 7). Open network for e-commerce: It's an idea whose time has come. *Mint*. Retrieved from: https://www.livemint.com/opinion/online-views/open-network-for-e-commerce-it-s-an-idea-whose-time-has-come-11654535625443.html

[32] Tech-Fin: A technology-based company that provides financial services (Paytm, Google Pay, etc.).

[33] UPI made sending money as easy as sending an email or text message.

significant multiplier effect as Tech-Fin's total volume of transactions was substantially higher than that of traditional banks (Fin-Tech)[34] (**Exhibit 7**). Consequently, the number of UPI payments significantly increased with transaction values in 2021 and grew by 103%. In 2020–21, UPI recorded more than 38 billion transactions that amounted to almost US$9 trillion.[35]

Transactions using the e-KYC[36] facility, which enabled customers to open new bank accounts within a few minutes, increased significantly (**Exhibit 8**). For instance, the State Bank of India, an Indian multinational public sector bank, introduced a digital service called YONO: You Only Need One. This integrated digital banking online platform was also available as a mobile application. The interesting aspect of this app was that it was touted as the most successful start-up by a legacy bank (YONO was valued at US$40 billion), a first for a banking application in India.[37] Customers could instantly open a bank account, conduct paperless transactions, invest, book railway tickets, withdraw cash from ATMs, and transfer funds in seconds by UPI-powered YONO. The annual report observed that in 2021, YONO had seen 111.74 million downloads and opened 26,000 digital savings bank accounts per day with 48.35 million registered users.[38]

In addition to benefiting the BFSI sector, Aadhaar benefited healthcare in multiple ways. As a part of the Ayushman Bharat mission, it was proposed to provide digital health IDs to all Indian residents to help hospitals, insurance firms, and residents, access and retrieve health records electronically when required. The digital health ID, which depended on Aadhaar for enrollment, would allow users, hospitals, and companies to digitally access health records. For instance, upon presentation of the health ID, the healthcare provider enabled users to digitally receive prescriptions, diagnoses, and laboratory reports from verified health service providers.

In transportation, Aadhaar was instrumental in electronic payments for tolls on roads and highways using a Radio Frequency Identification (RFID)[39] tag called FASTag. These tags not only eased congestion at toll plazas but made the process of determining payments to the concessionaires at toll plazas transparent. FASTag expanded its applicability to payments at airports, fuel stations, motor insurance, parking lots, and traffic violations, among others. However, in 2022, given the digital infrastructure, the Government of India was planning to implement Global Positioning System (GPS)-based toll collection to eliminate the need for toll plazas and reap a host of other benefits.[40]

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[34] Fin-Tech: A financial-services-based company that leverages technology for its services (e.g., banks such as DBS and ICICI).
[35] Panda, S. (2022, April 13). UPI signs off 2021 on a high: Dec transaction value crosses Rs 8 trillion. *Business Standard*.
[36] e-KYC stands for electronic-Know Your Customer and comprises basic demographic details that are available on the cloud.
[37] PTI (Press Trust of India). (2020, September 9). SBI YONO has a valuation of over $40 billion. *BQPrime*. https://www.bqprime.com/business/sbi-yono-has-a-valuation-of-over-dollar40-billion-chairman-rajnish-kumar-says#:~:text=Add%20to%20Watchlist-,SBI%20YONO%2C%20the%20digital%20banking%20platform%20of%20India's%20largest%20lender,startup%20by%20a%20legacy%20bank.
[38] Ghosh, S. (2022, June 2). SBI aims to accelerate digital agenda, says chairman Khara. *Mint*. https://www.livemint.com/industry/banking/sbi-aims-to-accelerate-digital-agenda-says-chairman-khara-11654107530806.html
[39] RFID stands for Radio Frequency Identification.
[40] *The Federal*. (2022, May 4). How GPS toll collection will replace FASTags, end toll plazas. https://thefederal.com/explainers-2/how-gps-toll-collection-will-replace-indias-fastags-end-toll-plazas/

Aadhaar thus propelled India to the position of the second-fastest digitalizing economy in the world by 2019. Naturally, parallels were drawn between Aadhaar and identification systems used across the globe. Aadhaar was distinct from the identification systems used in other countries. For instance, although Aadhaar and SSNs were unique numbers issued to residents by their federal government, SSNs differed from Aadhaar in multiple ways (see **Exhibit 9**).

Further, the abuse of SSNs by the private sector in the United States was identified as a crucial factor in the rising number of identity thefts in that country.[41] Between the first and second quarters of 2020, the Federal Trade Commission saw an approximately 2,217% increase in identity theft/fraud reports.[42] Once such theft occurs, in most cases, it is a time-consuming and arduous process to retrieve the stolen identity. In contrast, these issues were eliminated in the case of Aadhaar owing to, one, the de-duplication process for enrollment of unique random numbers to everyone, which ensured uniqueness, and two, a central governing agency (UIDAI) that addressed such concerns immediately.

KUMAR'S REFLECTIONS

After listening to Mishra's narration of the Aadhaar journey and looking at the records of Aadhaar implementation, Kumar aspired to take the initiative to the next level. Considering the further progressive aspects of Aadhaar 2.0, Kumar reflected:

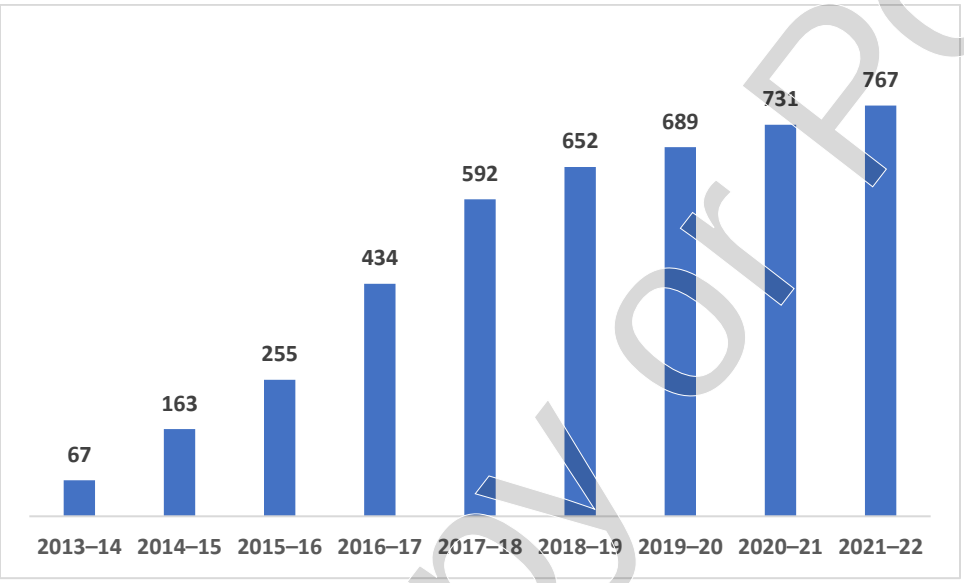
> "I am aware that Aadhaar is the backbone of digitalizing India. Since the Supreme Court verdict of 2016, Aadhaar has been mostly instrumental in the disbursement of public welfare schemes. However, the contribution of such schemes to the gross domestic product [GDP] is around 20%. Although it is great that the public is now accessing government welfare schemes smoothly, it is important to leverage Aadhaar to boost the economy by enabling its applicability to the private sector, because its contribution to the GDP increased from about 66% in the 1990s to over 80% in the 2000s. Aadhaar is a platform, and I envision the private sector as a layer that effectively adds innovation around it. Financial systems have developed radical innovations in flow-based lending, personal finance, investments, and trading. Most of the start-ups are coming from this space. The recent hackathon that was conducted shows that we need to extend inclusiveness and leverage innovation in every sector to foster growth. But how?"

[41] Acquisti, A., & Gross, R. (2009). Predicting social security numbers from public data. *Proceedings of the National academy of sciences, 106*(27), 10975–10980.

[42] Klosowski, T. (2020, October 23). Most people shouldn't pay for identity theft protection. *New York Times*, Wirecutter. https://www.nytimes.com/wirecutter/guides/identity-theft-protection/

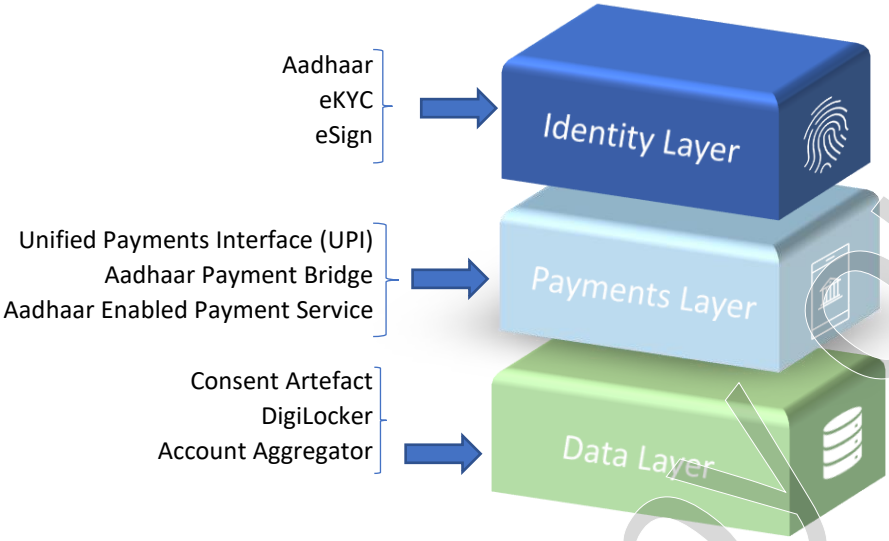
Exhibit 1

Count of Aadhaar Numbers Uniquely Linked with Bank Accounts (in millions)



Source: Provided by Unique Identification Authority of India (UIDAI).

Exhibit 2
India Stack Overview



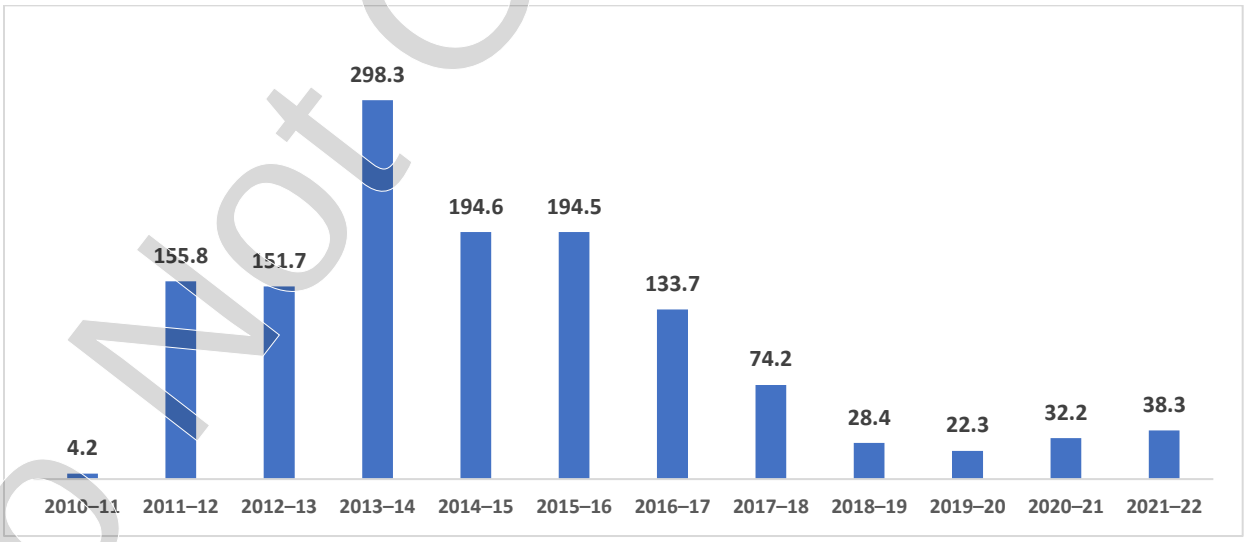
Identity Layer
Gives every resident a Unique ID and enables him or her to prove "I am who I claim to be"

Payments Layer
Allows anyone to pay anyone else! Interoperable, fast, cheap—and not just for smartphone owners

Data Empowerment
Enables secure sharing of data

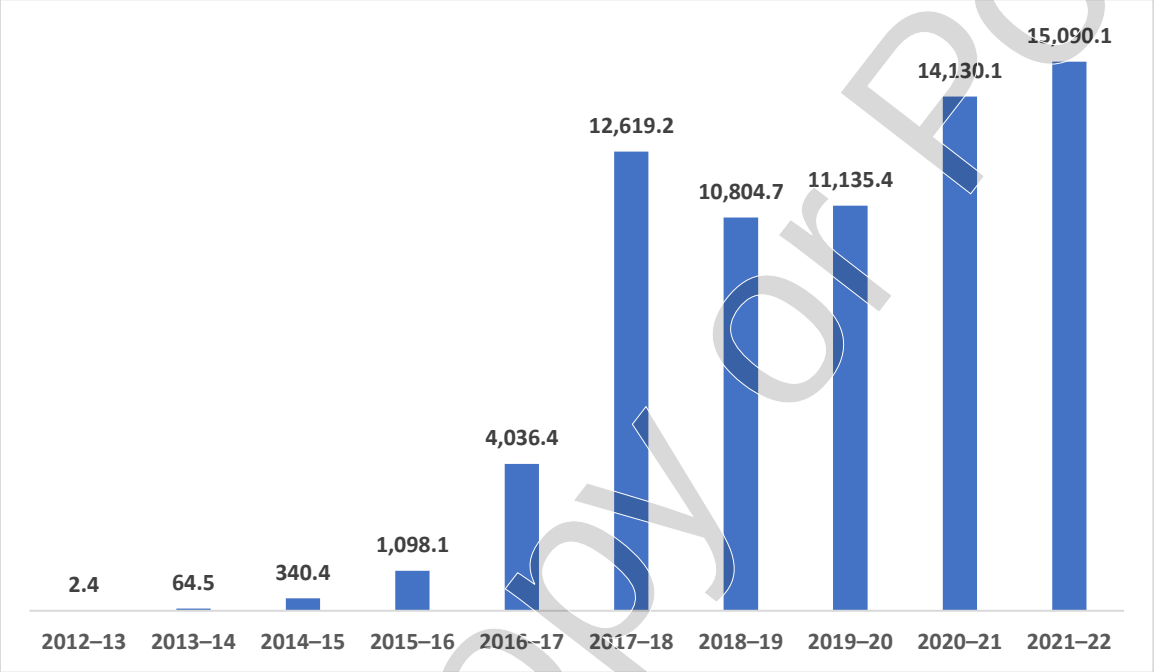
Source: Ramnath, N. S. (2020). Lessons from India's tortuous path to make tech work for the people. *Founding Fuel.* https://www.foundingfuel.com/article/lessons-from-indias-tortuous-path-to-make-tech-work-for-the-people/

Exhibit 3
Year-wise Aadhaar Generation (in millions)



Source: Provided by Unique Identification Authority of India (UIDAI).

Exhibit 4
Authentications Using Aadhaar (in millions)



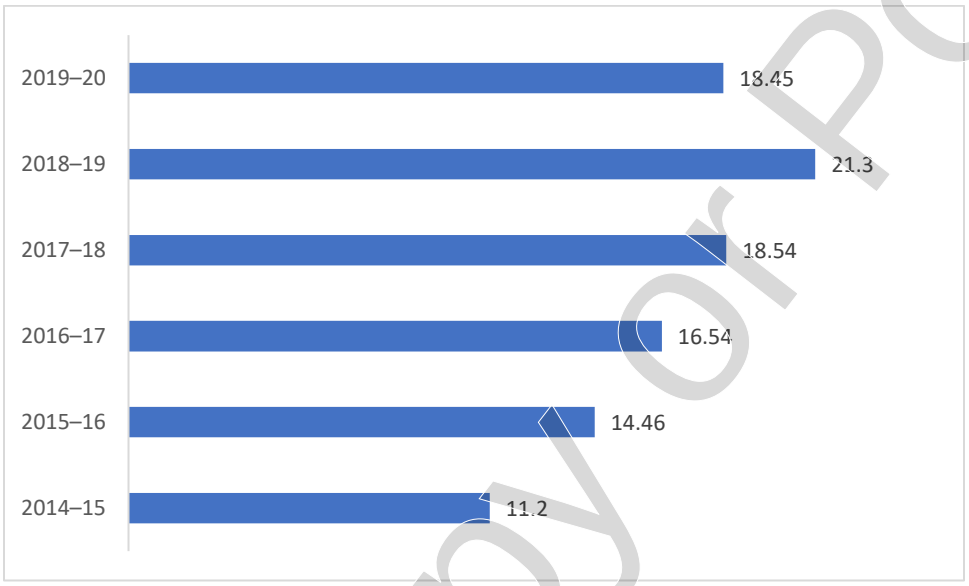
Source: Provided by Unique Identification Authority of India (UIDAI).

Exhibit 5
Estimated Savings Created by Using Aadhaar for Direct Benefit Transfer

Sl. No.	Ministry/Department	Scheme	Cumulative Estimated Savings/Benefits (in Billion US$), up to March 2021
1	Department of Fertilizers	Fertilizer scheme	3.00
2	Department of Rural Development	MGNREGA	10.04
3	Department of Rural Development	NSAP	0.16
4	Ministry of Women and Child Development	OTHERS	0.46
5	OTHERS	OTHERS	0.35
6	Ministry of Petroleum and Natural Gas	PAHAL	21.87
7	Department of Food and Public Distribution	PDS	30.48
8	Ministry of Minority Affairs	SCHOLARSHIP SCHEME	0.43
9	Department of Social Justice and Empowerment	SCHOLARSHIP SCHEME	0.10
Total			66.9

Note: MGNREGA = Mahatma Gandhi National Rural Employment Guarantee Act; NSAP = National Social Assistance Programme; PAHAL = Pratyaksh Hanstantrit Labh; PDS = public distribution system.
Source: Direct Benefit Transfer (Government of India). (n.d.). Estimated gains. https://dbtbharat.gov.in/estimatedgain

Exhibit 6
MGNREGA Government Budget Allocation (in US$ billion)



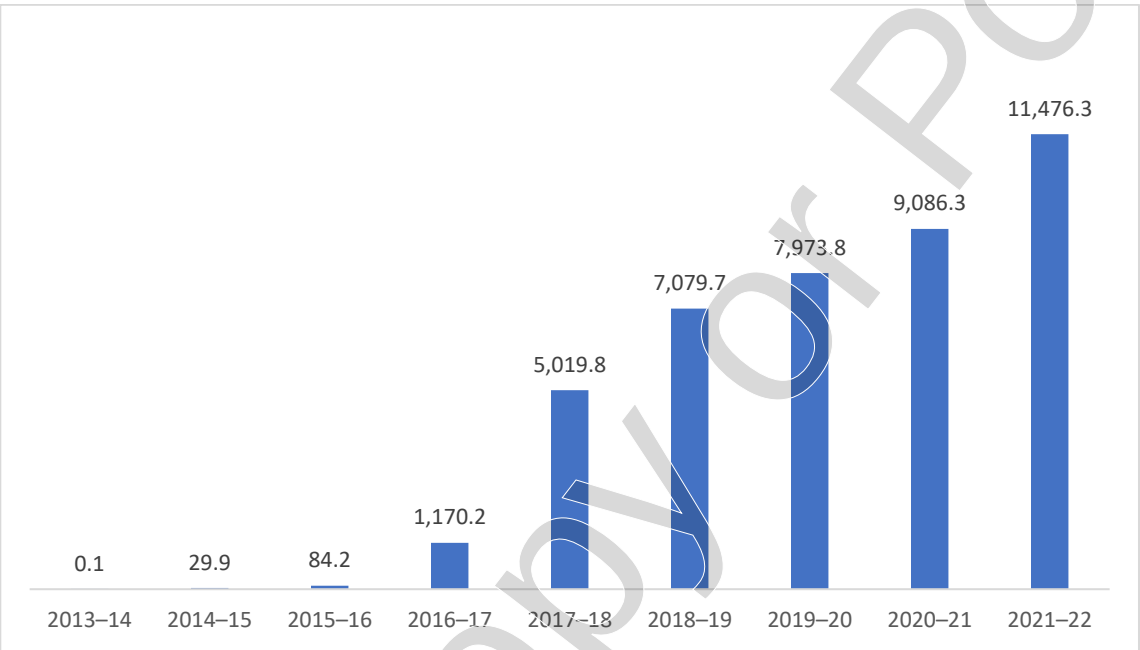
Note: MGNREGA = Mahatma Gandhi National Rural Employment Guarantee Act
Source: Kiran, N. (2020, February 2). Budget 2020: Govt reduces spending on MGNREGA, allocates Rs 60,000 crore for FY21. *Business Today*. https://www.businesstoday.in/business/decoding-the-budget/story/budget-2020-govt-reduces-spending-on-mgnrega-allocates-rs-60000-crore-for-fy21-249302-2020-02-02

Exhibit 7
Tech-Fin Versus Fin-Tech

Type	*Application Name*	*Volume (millions)*	*Market Share (%)*
Tech-Fin	PhonePe	1,653	44.3
Tech-Fin	Google Pay	1,295	34.7
Tech-Fin	Paytm Payments Bank App	544	14.6
Tech-Fin	Cred	8	0.2
Tech-Fin	BHIM	25	0.7
Tech-Fin	Amazon Pay	63	1.7
Tech-Fin	Airtel Payments Bank Apps	12	0.3
Tech-Fin	MobiKwik	3	0.1
Tech-Fin	Samsung Pay	2	0.1
Fin-Tech	Yes Bank Apps	23	0.6
Fin-Tech	State Bank of India Apps	4	0.1
Fin-Tech	Axis Bank Apps	59	1.6
Fin-Tech	HDFC Bank Apps	3	0.1
Fin-Tech	Kotak Mahindra Bank Apps	4	0.1

Source: Numbers as of 2021, compiled by case authors.

Exhibit 8
Cumulative e-KYC Transactions in Millions



Source: Provided by Unique Identification Authority of India (UIDAI).

Exhibit 9
Aadhaar Versus Social Security Number

Aadhaar	Social Security Number
Unique proof of national identity	Record keeper of services
Governed by the Aadhaar Act, 2016, and under the aegis of UIDAI	Governed by Federal legislation
Used to link databases	Data are stored in a centralized database
Collects biometric data along with minimum demographic details	Collects elaborate demographic data and does not collect biometric data
Authenticates by matching biometrics with database for all welfare schemes	Matches a name with associated Social Security Number in limited circumstances
Issued to anyone who has lived in India for 182 days	Issued only to citizens and those with work permits

Note: UIDAI = Unique Identification Authority of India.
Source: Prepared by the case authors.