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REPORT

Aadhaar – An Indian Megatrend

Leveraging the Potential

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Executive Summary

An important and unmet need exists in India for a nationally accepted and verified identity number that both service providers and consumers can use with ease and confidence. This need is accentuated in the case of the poor, where the lack of identity is denying them the ability to avail of basic products and services. It is this need that Aadhaar caters to, by providing a unique identity number that meets three criteria — ensures universality, avoids duplication and provides biometric authentication.

Aadhaar's importance lies in the fact that it is concurrent with many other trends, such as ubiquitous connectivity and content availability, urbanization, rising income, and consumerism, among others. This convergence sets the platform for business innovation and opens up many opportunities. The report focuses on a few key opportunities — such as setting up basic infrastructure, developing initial applications for social welfare delivery, enabling mainstream applications for fostering national development, and facilitating next generation applications for improving productivity and reducing costs.

However, as Aadhaar rolls out further and Aadhaar–based applications evolve, many other opportunities will emerge.

Aadhaar can help reduce leakages in social welfare schemes by ensuring accurate identification of beneficiaries and controlling false reporting and payments. Aadhaar–based interventions could improve effectiveness in the delivery of social welfare schemes by shifting to direct benefits and verifying if the intended beneficiaries actually receive subsidies. It can help in bringing down transaction costs for poor and can ensure delivery of social welfare programs is more effective. Besides the tremendous economic benefits, intangible benefits such as facilitating faster integration of beneficiaries will also emerge. Putting this in place will require a well–planned and coordinated effort that will include revamping and customising existing systems and processes used for schemes. However, the recurring benefits involved in such a venture will far outweigh the one–time cost.

Aadhaar has the potential to enable several mainstream applications that are essential for the social and economic development of the country. Several common challenges that these sectors face are infrastructure shortages and stretched resources. Aadhaar can help alleviate some of these challenges by providing a platform for information capturing and identification.

- In the health–care sector, Aadhaar can facilitate creation of digitized medical records. This can, in turn, facilitate electronic/mobile health applications that can cater to the needs of different segments of the population: improve accessibility and affordability of health care for the 'un–served', provide convenience and affordability for the 'under–served' and provide value–added services that will increase compliance and convenience for the 'quasi–served'.

- In the education and skilling sector, Aadhaar–based records on educational and vocational courses that an individual takes has the potential to impact the entire value chain: smoothening the enrolment process by digitizing certificates and reducing frauds due to duplication, enhancing service provision by monitoring the attendance of students and teachers, and increasing post–education employment opportunities by creating

a soft–employment exchange with nationwide reach. Specifically in vocational training, an Aadhaar–based skills database can fill an existing void by providing a qualification basis to recruit, up–skill, and train resources.

- In the energy sector, Aadhaar can be used to create and foster 'energy consciousness' in individuals. By tracking energy consumption across time at the individual / household level, systems and processes can be developed to incentivize 'energy conscious' behaviour. Another benefit is controlling leakage of subsidies in this sector, by enabling direct subsidies and right identification of beneficiaries.

Further, Aadhaar can also facilitate development of some next generation applications to enhance productivity of operations and reduce transaction costs for organizations. Aadhaar, in these cases, could aid in the ease and speed with which these applications are put in place. These include, but are not limited to, improving supply chain infrastructure and enabling e–commerce and m–commerce payments.

- Aadhaar can fundamentally improve the supply chain infrastructure, especially for small– and medium–sized firms with fragmented sourcing and distribution chains, by identification and tracking of its supplier and distributor network.

- On electronic and mobile payments, Aadhaar can influence rural distribution infrastructure by providing alternate business models as well as enhance the e/m–commerce experience and provide an impetus to the already growing urban e/m–commerce story.

Handling individual privacy needs appropriately is paramount across these different applications. Hence, depending on the category of use, data sharing norms will need to be defined:

- Areas such as social welfare delivery where the application becomes the norm and the benefits are realized post individual authentication

- Areas where the enrolment is registry based and is maintained with high levels of privacy and will need individual authentication to release each time over and above the registry

- Areas where the usage is completely voluntary, where people make the trade–offs at each occasion of use based on benefits that can be realized.

As India stands poised to be an economic force, it is important to understand and leverage the full potential of Aadhaar. It can be a very critical part of building the enabling digital infrastructure and it can be the harbinger of new things. The applications, that it spurs, have the potential to influence every facet in a consumer's life. They can also foster significant entrepreneurial and cross–sector collaboration opportunities. However, all this would be possible only if all stakeholders and enablers, including the government, corporates, institutions and consumers, among others, incorporate Aadhaar into their strategic agenda and start acting on it.

Aadhaar can, in a way, be equated to the emergence of the Internet. As we stand at the point of its evolution, it is very difficult to predict how wide and diverse its usage will be. However, what we can be sure of is that it will change the social and business infrastructure of this nation — affecting government–to–resident, business–to–business, and business–to–consumer interactions in a revolutionary manner.

Introduction to Aadhaar

"There is nothing more powerful than an idea whose time has come"

— Victor Hugo

Need for Aadhaar

India has never had a unique and universal identity number that both residents and agencies could use. In our daily lives, and every time we try to access a benefit or service, we need to undertake a full cycle of identity verification. Different service providers also often have different requirements in the documents they demand, the forms that require filling out, and the information they collect about the individual.

This lack of identity is best understood when we look at the significantly high number of unregistered births in the country. According to the last UNICEF estimates, out of an estimated 26 million children born every year in India, about 10 million go unregistered. The current registration level of births in the country is about 58 percent. The low–performing states (Uttar Pradesh, Bihar, Rajasthan, Andhra Pradesh, and Madhya Pradesh) report registration rates as low as 11 percent. Ironically, these states also account for approximately 25 percent of all children born every year in India.

This lack of identity becomes all the more relevant when we consider the dramatic increase in population and the mobility of people during the last 10 years, due to the opening up of new frontiers of employment and opportunity. The movement of people from rural to urban areas within states, and across states, has grown substantially. More than 30 million people in India are seasonal migrant labourers. In such a scenario, the need for a mobile and nationally recognized identity becomes even more imperative.

Be it opening a bank account, getting a mobile connection or applying for a government food subsidy program, millions of Indians are unable to avail of services from the government and financial services sectors because they lack proper identification. This is a vicious cycle, as their inability to avail of these services adds to their impoverishment and makes it more difficult for them to avail of these services.

To add to this, fraud and duplication is rife in existing forms of identification. For example, in the past few years, the Below Poverty Line (BPL) card has been the primary basis of all social welfare programmes in India. However, these cards are hardly an authentic form of identity as they have been subject to heightened levels of fraud and mis–targeting. A study by the Planning Commission in 2009 concluded that there are 23 million more BPL cards than households. The study also estimated that in all the major states, save four, more than 40 percent of households have the wrong kind of card [BPL households with Above Poverty Line (APL) cards and the other way round].

This results in low effectiveness of public expenditure on the poor, who depend most on public assistance, being the ones who pay for it directly. In fact, some studies estimate total 'social leakages' to be over 40 percent of targeted government spending. This problem is exacerbated by the increasing urbanization, which is triggering an exodus of people from rural to urban areas.

Aadhaar — backed by biometric de–duplication — is a Government of India venture that seeks to fill this gap by providing a secure and robust identification infrastructure

that provides every single Indian resident with a unique identity, while overcoming two shortcomings in the current identity databases: fraud and duplication.

Many other countries use a national unique identifier to effectively deliver government and private services. Perhaps the best known among them is the Social Security Number (SSN), which is the de–facto national identification in the United States, and has significant applications in the public and private sector. Agencies at all levels of government frequently collect and use SSNs to administer their programs, verify applicants' eligibility for services and benefits, and conduct research and evaluations of their programs. Today, SSNs are used, in part, as identity verification tools for services such as child support collections, law enforcement enhancements, and issuing credit to individuals. Certain private sector entities, such as information resellers, Credit–Reporting Agencies (CRAs) and health–care organizations, also routinely obtain and use SSNs for purposes such as verifying an individual's identity or matching records from various sources.

China, too, makes identity cards mandatory for all citizens above 16. Information stored in the database for biometric identity cards includes work history, educational background, religion, ethnicity, police record, and medical insurance status, among others. The identity card is also the only acceptable legal document to obtain residence permit, employment, open bank accounts, passport, driver license, and application for tertiary education and technical colleges.

Similarly, the INSEE code in France, the personal identity code in Finland and National Identity Document in Argentina are all examples of national identity programs. Each has its own specifics and nuances but the underlying theme, of providing a unique identity to each resident and thereby improving efficacy and efficiency in delivery of government and private sector services, remains the same.

The Unique Identification Authority of India (UIDAI) was established in January 2009, as an attached office to the Planning Commission whose mandate is:

a. To provide a unique identification number to all residents
b. Collect basic biometric, demographic information
c. Guarantee non–duplication
d. Offer online authentication services.

This is a very ambitious venture to be executed at a never–before–imagined scale, making this one of the largest resident databases and among the first national biometric identification systems in the world.

Characteristics of Aadhaar and the Enrolment Process[1]

Aadhaar will be a numeric that is unique across all residents in India. The uniqueness is ensured through the process of de–duplication that guarantees that no person can enrol twice in this system. This, along with providing ubiquitous (anytime and anywhere) authentication services, is Aadhaar's most unique and impactful feature.

The UIDAI requires following data and biometrics for issuing an Aadhaar number:

- Name
- Date of birth
- Gender
- Introducer's name and Aadhaar number (in case of lack of documents)
- Address
- Impressions of all ten fingers, photograph and both iris scans

The Aadhaar number will be a number, not a card, and will be randomly generated. Also, all residents of the country can be issued an Aadhaar number. It will serve only as a proof of identity and does not guarantee citizenship rights, and entitlements. Overall, the key characteristic of Aadhaar is that it is unique, enables ubiquitous authentication, allows de–novo creation of a database, and ensures security and privacy of information.

Enrolment is not mandated. The UIDAI approach is demand–driven, where benefits and services linked to Aadhaar will ensure demand. The UIDAI manages the Central Identities Data Repository (CIDR). It collaborates with agencies such as central and state departments and private agencies that will be 'Registrars'. Registrars process UID applications and connect with CIDR to receive Aadhaar numbers. The registrars can be enrollers, or will appoint enrollers, who will interface with people seeking Aadhaar.

1. UIDAI Strategy Review — Creating a unique identity number for every resident in India.

The information submitted by the resident to the enrolling agency is verified and submitted through the registrar to the CIDR. The CIDR then runs a de–duplication check to ensure that the resident is not already enrolled. The Aadhaar number is a lifetime number, but the biometric information contained in the database will have to be updated and enrolling agencies and registrars serve as updation points. The UIDAI also offers a strong form of authentication, where agencies can compare demographic, biometric data of the resident with the central records. In addition to biometric authentication, the UIDAI also advocates and supports other types of authentication — such as debit cards / cell phone / OTP to cell phone or alternatively a password, PIN, etc.

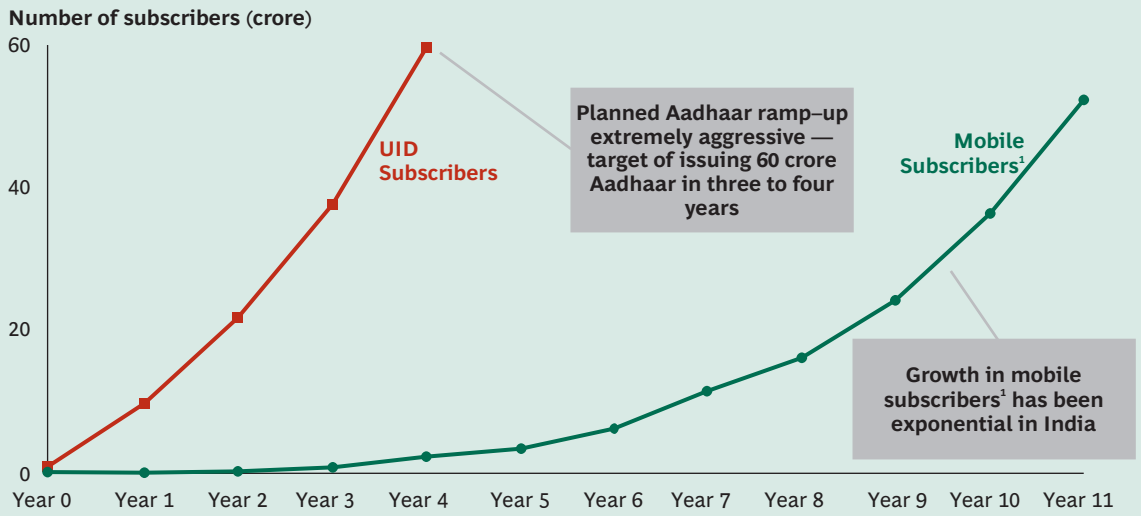
Roll–out and Ramp–up Plan

Aadhaar was launched on September 29th 2010 in Nandurbar district in Maharashtra covering >1,500 people in Tembhali village. It is a robust system moving at a fast pace with about 12 crore numbers issued by January 2012 and a present rate of enrolment of 7 lakh per day, moving towards 10 lakh per day. Current enrolment statistics indicate that more than 50 percent of those enrolled are below 30 years of age and about 50 percent are female.

A recent ruling by the Union cabinet has allowed UIDAI to enrol an additional 40 crore residents in 16 states and give them 'Aadhaar' cards beyond the 20 crore already recommended by the Expenditure Finance Committee. The Registrar General of India (RGI), part of the home ministry, will collect similar data from the remaining population in sensitive, border states and in districts affected by extremist violence for its National Population Register (NPR). Both the UIDAI and the RGI will share biometric data collected in their respective areas to reduce duplication. The system will ensure that if anybody has been covered in the NPR, he will automatically get an Aadhaar number and vice versa.

The UIDAI and NPR exercise hopes to cover the entire country by June 2013. The expected ramp–up of Aadhaar is thus, much faster than the internet growth or even the much more exponential mobile subscriber revolution (as shown in Exhibit 1).

Exhibit 1. Potential ramp–up of Aadhaar much faster than mobile subscribers



Sources: Literature search, BCG analysis, International Telecommunications Union (ITU).
[1]Number of unique subscribers calculated by estimating 70 percent of total subscriptions to be unique.

Convergence with Other Key Indian Megatrends

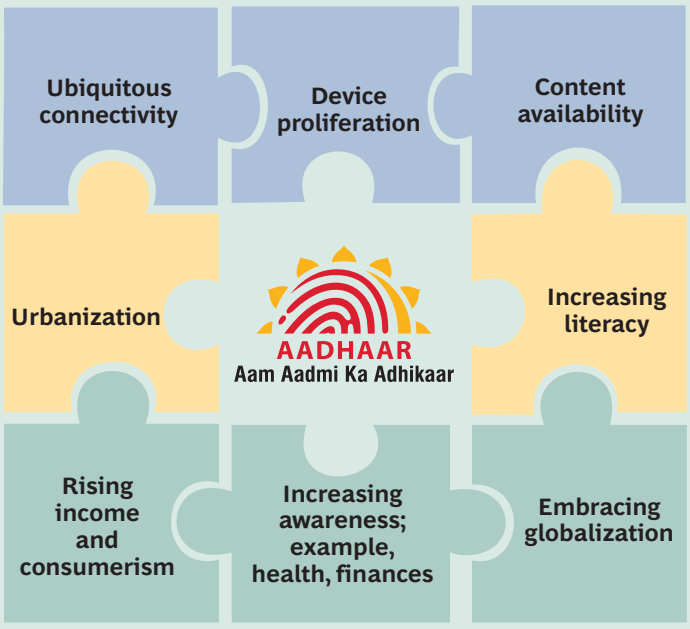
Globally, megatrends such as globalization and, more recently, social networking, have transformed the way industries are organized. Current major megatrends in India could be broadly classified into three buckets (as shown in Exhibit 2):

- Digital trends such as ubiquitous connectivity, device proliferation — including smart phones with multifaceted capabilities and content availability. All of these facilitate creation of an ecosystem where people can access and transact anytime anywhere
- Demographic trends such as urbanization, which is leading to a significant increase in communication, mobility, and requirement for shelter and utilities as well as increasing literacy especially in rural areas leading to increased job opportunities, among other things.
- Socio–economic trends such as rising income and consumerism, increasing awareness — for example health, finances — and embracing globalization. These trends are leading to a more self–aware and knowledgeable Indian consumer seeking a better class of products and services

The importance of Aadhaar lies in the fact that it is occurring concurrently with all the above–mentioned megatrends in India. It is this convergence that sets the platform for business innovation, provides the ability to revolutionise social welfare delivery, and enables the transformation of business models and market space for organizations.

In particular, Aadhaar's convergence with digital trends is of great interest and importance. India's physical infrastructure is growing at a slow pace and is still not comparable with those in advanced countries. However, Indians have been quick in their adoption of digital devices, leading to rapidly growing digital infrastructure. For example, according to a recent survey conducted globally, Indians are among the top 10 users of mobile internet. Some data sources indicate that India has witnessed a 233 percent year–on–year growth rate in mobile internet usage. Widespread digital connectivity

Exhibit 2. Convergence of Aadhaar with many other current trends



Sources: BCG analysis.

will in its own right ensure that institutions, consumers, companies, and the government are interlinked, multiplying the information generating utility of Aadhaar manifold.

The time is opportune for India to make its transition to the knowledge economy — an economy that creates, disseminates, and uses knowledge to enhance its growth and development. Aadhaar can be one of the key elements which will enable it do so by playing an important role in the way the Indian economy will use new and existing knowledge to improve productivity of agriculture, industry and services, and increase overall welfare.

Lever to Transformational Opportunities

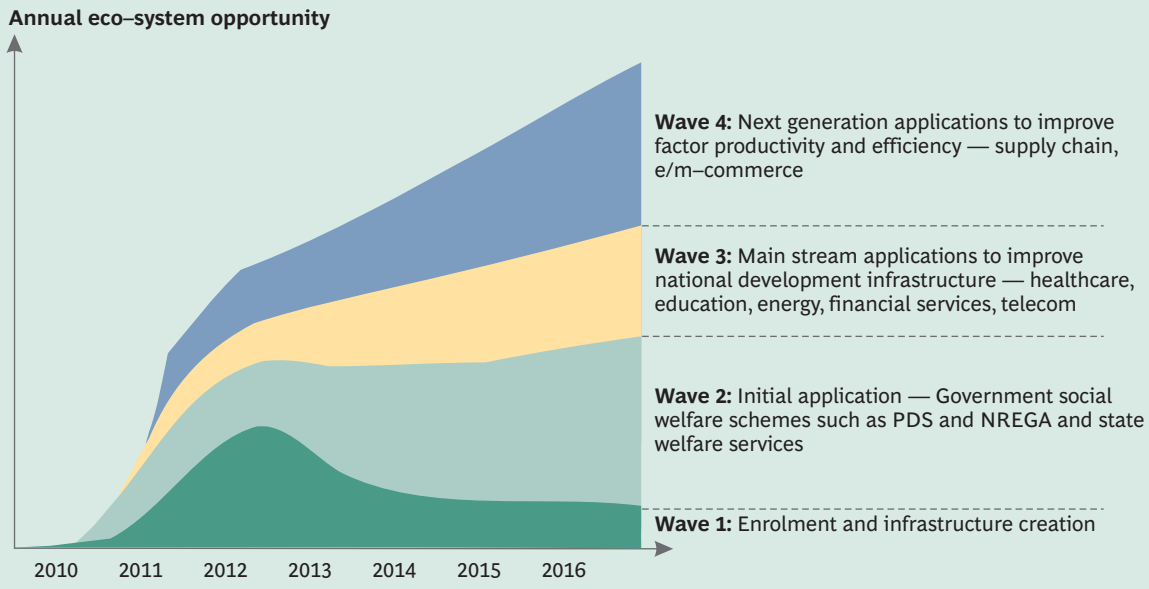
Aadhaar seeks to be a flexible national infrastructure that will provide a universal unique ID for every Indian resident that is valid all over India. The realization of the vision is being closely tracked by many other emerging economies to study, conceptualize, and potentially replicate within their own economies.

As biometric devices become ubiquitous and hence inexpensive all over the world, the vision is that mobile devices, small desktop devices, and online media will all be able to provide easy–to–use links to the Aadhaar database. Hence, its potential applications are unlimited and only constrained by the vision and innovativeness of its users.

Over time, as Aadhaar becomes more widespread and its applications more diverse, we see the Aadhaar application evolution occurring in four waves (as shown in Exhibit 3):

- Wave 1 — Setting up basic infrastructure for enrolment of residents. This is already in progress and will continue to ramp up
- Wave 2 — Developing initial applications for the Public Distribution Scheme (PDS), Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA) and state welfare services. This has begun, with Aadhaar beginning to be tested and incorporated across welfare schemes

Exhibit 3. Aadhaar ecosystem opportunity in four waves



Sources: BCG analysis.

- Wave 3 — Developing mainstream applications across major sectors such as health care, education, finance, utilities, telecommunications, etc. These applications could fundamentally improve the development infrastructure of the country and have far–reaching socio–economic implications

- Wave 4 — Developing next generation applications, which are perhaps multi–sectoral or multi–dimensional in nature. These applications could lead to a significant improvement in productivity and efficiency at a firm level and consequently at a national level

This report will focus on Wave 2, Wave 3 and Wave 4 applications and how Aadhaar can be leveraged to formulate implications for social benefit, in mainstream applications to improve the national development infrastructure, and in next generation applications that can improve efficiency and productivity in business operations.

Increasing Effectiveness of Social Welfare Delivery

"Never before in history has innovation offered promise of so much to so many in so short a time"

— Bill Gates

The Government of India has a significant outlay on social welfare schemes aimed at providing essential services or products like health care, education, fuel, and food grain at subsidized rates. The scale of most of these schemes is gigantic, and accordingly, the size of subsidy payment is enormous. The Targeted Public Distribution System (TPDS), with its network of approximately five lakh fair price shops serving close to ten crore BPL families and 13 crore APL families and an annual budget (in 2011–12) of approximately INR 60,500 crores, is one of the largest interventions by a state in the food market across the globe. Other examples of large–scale schemes are Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA), aimed at guaranteeing rural employment with a budget in 2011–12 of INR 40,000 crores and the Sarva Shiksha Abhiyaan aimed at universalizing primary education, with a budget in 2011–12 of INR 21,000 crores. In addition, fertilizer and fuel subsidies are the government's other major social welfare initiatives.

Existing Issues in Social Welfare Delivery

Most of these schemes suffer from significant leakages when it comes to their implementation. With a large network of intermediaries required to deliver these services to the widely dispersed poor or backward population, a lot of the subsidy is diverted along the way. There are several ways in which the subsidies are leaked:

- **Ghost beneficiaries:** In most cases, the budget is allocated or subsidy passed on to intermediaries against a list of recipients that it tenders. For example, under the MGNREGA, wages are released against the number of person–days reported by the Gram Panchayat. This creates incentives to create non–existent beneficiaries in whose name the benefit can be availed

- **Multiple cards:** In some schemes like the TPDS, it has been found that a few households possess duplicate cards. This allows them to withdraw twice the benefit they are entitled to, depriving other beneficiaries of their fair share

- **Shadow ownership:** Shadow ownership refers to wrongfully possessing and availing of the benefit entitled to someone else. For example, one of the major leakages in the implementation of the TPDS scheme has been found to be possession and usage of Below Poverty Line (BPL) cards by someone other than the actual BPL family in whose name the card has been issued

- **Misidentification:** Erroneous identification of a person due to lack of adequate verification while registering is called misidentification. For example, an APL family that is wrongly identified as BPL, and hence being able to avail of the Indira Awaas Yojana, which is meant only for BPL families

- **Misreporting:** In some cases, due to the lack of a verification mechanism, the amount of benefit availed by target beneficiaries (for example the salaries due to MGNREGA workers, based on the number of person–days they have worked) is reported in an inflated

fashion by intermediaries. The difference between the actual figure and reported figure is then diverted

- **Underpayment:** In many cases, when a direct payment has to be made to a beneficiary, the full amount is not transferred to them. For example, only part of the cash payment required to be given to a pregnant woman under the Janani Surakshana Yojana, might be given by the health center, that then illegally retains the rest.

- **Physical leakage of goods:** Poor safeguards result in the theft of food, kerosene, medicines, etc., being supplied under these schemes.

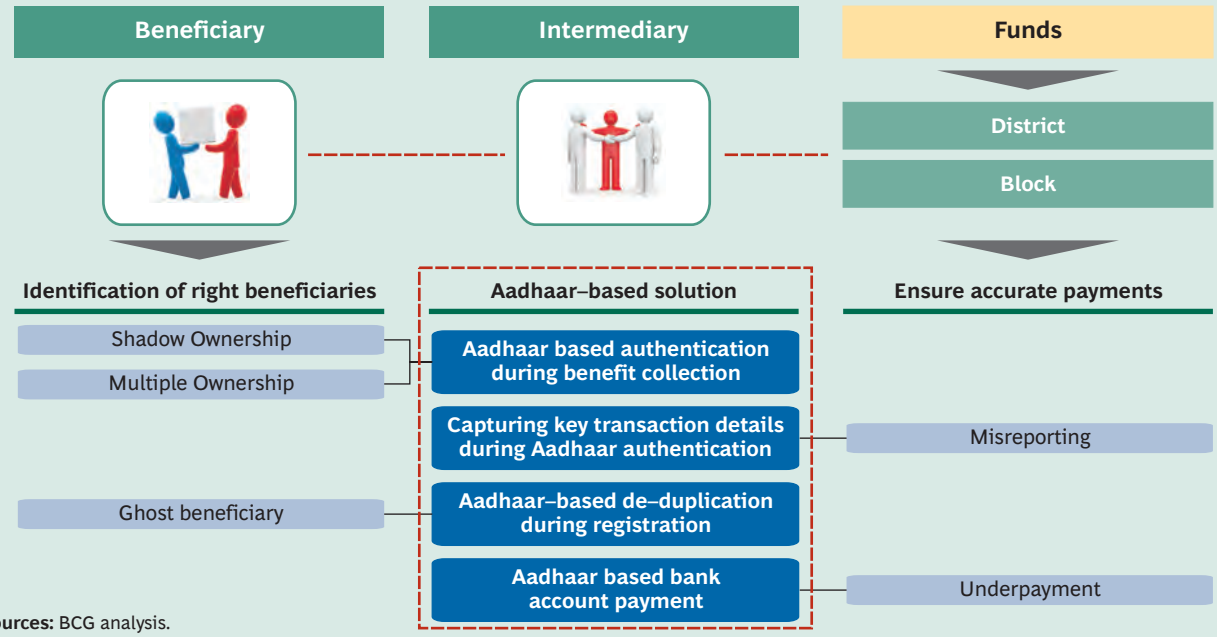
Interventions to Control Social Leakages

A common cause of leakage is because an incorrect or a non–existent user avails of the service offered by the scheme in question. Aadhaar, with its biometric authentication platform, can help strengthen delivery and enable a solution to some of the problems discussed above (as shown in Exhibit 4):

- **Eliminating ghost beneficiaries:** Most of these schemes require beneficiaries to register themselves for the service, usually by applying to the Gram Panchayat. Under the current system, there is no check in place to ensure that the list of people being passed by the Panchayat is genuine. If, at the time of application, beneficiaries are required to authenticate their Aadhaar numbers through a biometric device, the problem of ghost beneficiaries can be eliminated. For example, in the case of the Indira Awaas Yojana, the Gram Panchayats that usually pass on the lists of beneficiaries to the block officer can be required to submit the list of Aadhaar numbers instead. The funds can then be allocated against those that are verified by the UIDAI database as being valid. This can also apply to BPL Aadhaar numbers

- **Reducing shadow ownership leakage:** If the beneficiary of the scheme is required to authenticate the transfer of benefit to him / her, the problem of shadow ownership can be eliminated. For example, in the case of TPDS, if the household purchasing goods from a ration shop at discounted prices is required to verify its BPL status by biometric authentication, through a device installed in the shop, no one else can claim its food or kerosene quota even by stealing the family's ration cards

Exhibit 4. Aadhaar–based interventions can control many sources of leakage



Sources: BCG analysis.

- **Checking misreporting:** If the amount of benefit delivered to the beneficiary is captured by the authentication device, this problem can also be reduced. For example, efforts are on to devise a biometric–enabled MGNREGA system that rides on the Aadhaar platform. Under this system, the workers at the job site will have to register their attendance as well as working hours via a biometric device that is also GPS–enabled. In this way, the exact number of hours worked by the genuine beneficiary will be recorded and stored, on a cloud, against his Aadhaar number, limiting the possibility of manual fudging of attendance rolls. The GPS will ensure that the attendance is recorded on–site. The wage due to the worker can then be computed by the system and the funds released directly into his / her Aadhaar–based account

- **Reducing underpayment:** If a payment is credited directly to the beneficiary's Aadhaar–enabled bank account, the chances of an underpayment happening when the benefit is either directly handed out in cash or made through post offices would be reduced

It is, however, not possible to resolve the issues of misidentification using Aadhaar as it is caused by a family being erroneously classified.

Potential Benefits in the Delivery of Social Welfare Schemes

Even if Aadhaar is used merely to cleanse ghost beneficiaries and safeguard against shadow beneficiaries, the scale of these schemes is such that a tremendous economic benefit can be availed in the process. For example, even if 10 percent[2] of ration cards under TPDS are assumed to be fake, an annual savings of approximately INR 6,000 crores purely on food subsidy can be realized based on the 2011–12 budget by the elimination of these cards. Similarly, for the MGNREGA scheme, even if 10 percent[3] of the reported person–days are assumed to be 'ghost' person–days, annual savings of approximately INR 2,800 crores can be realized by putting an Aadhaar–based scheme in place.

In addition to reducing leakage in social delivery schemes as discussed above, Aadhaar–based systems can be used for a host of other benefits linked to delivery of various social schemes:

- **Facilitating faster integration of beneficiaries:** In some cases, deserving individuals or households face significant difficulty in registering for these schemes. For example, it may be tough to get a new ration card because there is no way to verify whether one already possesses a card or not. In schemes like the Indira Awaas Yojana or MGNREGA, where the Gram Panchayat decides the list of beneficiaries from those who apply, monitoring authorities do not have much visibility and hence some households might be excluded. Aadhaar will enable biometric enrolment, identification, and creation of an accurate database of beneficiaries, enabling faster and more inclusive registration

- **Facilitating faster audit processes:** With Aadhaar–based systems facilitating real–time and accurate information on the delivery of these schemes, audit processes can be made more effective. For example, teacher and pupil attendance in government schools can be monitored biometrically and pupil–teacher ratios monitored real time so that prompt action can be taken. This can help in delivery of the Sarva Shiksha Abhiyan

- **Permitting mobility of beneficiaries:** Beneficiaries who migrate face hassles in availing benefits under many of these schemes, because they are registered against a particular panchayat, ration shop, etc. In an Aadhaar–based implementation, some of these barriers can be overcome. For example, in an Aadhaar–based TPDS, centralized and online authentication of the household will potentially allow it to withdraw from a different fair price shop than the one 'allotted' to it. Similarly, an Aadhaar–linked job card can potentially enable a household to seek MGNREGA employment without having to undergo re–registration even if it migrates to another location

- **Easing payment management:** Aadhaar–enabled bank accounts, apart from reducing the underpayment leakage discussed above, also enable cashless payments to individuals. Apart from reducing the costs associated with carrying cash, they can allow more timely payments to individuals

2. Estimates of fake ration cards point to a figure of about 15–16 percent on the whole, for India, while in a few states like Madhya Pradesh as many as 20 percent of the cards could be bogus.

3. Social audit findings from Orissa point to a figure of about 23 percent.

- **Reducing other bogus payments:** Another major payment that the government makes to the people for social security, though not necessarily to poorer or backward families, is pension payments to government servants. The budget earmarked for these in 2011–12 is approximately INR 55,520 crores. However, there have been instances of ghost employees even in these rolls. For example, a recent biometric verification of Municipal Corporation of Delhi's employees revealed approximately 15 percent employees (mostly at the 'karamchari' level) to be bogus. An Aadhaar–based solution can also help control the leakage of payment in this scheme

Ecosystem Required to Leverage Aadhaar

While there is clear merit in integrating Aadhaar into the delivery of social welfare schemes in India, the process to do so would require careful orchestration and planning. Many of these schemes are old, well–entrenched systems that would require some time and effort to change. In addition, what would make the task even more challenging is the widespread geographical reach. Thus, a coordinated and planned effort would be needed. A few of the elements of this plan and ecosystem would be:

- **Enrolment:** A prerequisite to having an Aadhaar–based solution to these schemes would be to have a significant portion of the beneficiary database enrolled for Aadhaar. Accordingly, enrolment centers targeting scheme beneficiaries would need to be set up at Gram Panchayats, and scheme–specific registration linked to it

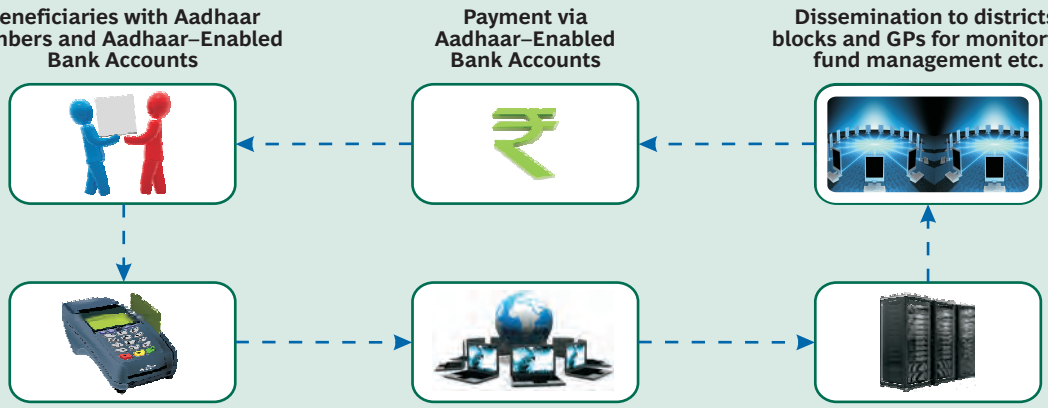
- **Process redesign:** In some cases, Aadhaar–based interventions could imply redesigning processes in the scheme. For example, under an Aadhaar–enabled TPDS model, the fair price shop needs to no longer purchase food or kerosene at subsidized rates, but instead could be credited with an amount equivalent to the subsidy when a ration–card holder purchases these goods from him / her at the subsidized price

- **Training:** Implementers at the ground level, for example panchayat members, fair price shop owners, public health centres, etc., need to be made aware of changes in basic processes as well as usage of devices involved in the scheme. Since many changes will directly impact the beneficiary (for example, permitting mobility, tracking attendance, etc.), it would be important to hold awareness programmes at the village level for beneficiaries

- **ICT:** In order to create Aadhaar–based interventions of this nature, ICT–enabled systems will need to be customized and merged with existing processes for implementation. A typical system might consist of a device that captures Aadhaar authentication data and stores it on a cloud. A state–level server will talk to the device through this cloud. This server would in turn be connected to the block, district, and state level ICT machinery for monitoring the scheme and for transferring funds into Aadhaar–enabled accounts of the beneficiaries (as shown in Exhibit 5). However, while the design of such systems will cause the government to incur a one–time set–up cost (apart from a minimal running cost), benefits would be realized for each subsequent year

Aadhaar–based interventions could thus enable the government to improve its effectiveness in the delivery of social welfare schemes by shifting to direct benefits and verifying if the intended beneficiaries actually receive subsidies. This was one of the main rationale for the Government of India behind such a unique verifiable identity number — to use it as a lever for social transformation by bringing down transaction costs for poor and transforming delivery of social welfare programs by making them inclusive. There has been a lot of positive dialogue in this direction and the intent should be to expeditiously implement this.

Exhibit 5. Design of an Aadhaar–based system for social welfare



Sources: BCG analysis.

Revolutionizing the Development Infrastructure

"To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance"

— Albert Einstein

Sectors such as education, health care, and energy are essential for the economic and social development of the country. There are several common challenges that these sectors face — such as stretched resources, infrastructure shortage, etc. It is important to foster development in these sectors by incentivizing the right behavior and establishing the required infrastructure to ensure that limited resources are gainfully employed and the required services reach all the intended beneficiaries. It is possible to leverage Aadhaar as an information capturing and identification platform to fundamentally enable the same.

This has already started happening in financial services and telecom through initiatives on financial inclusion and use of Aadhaar number as KYC / KYR for new mobile connections. Aadhaar can also enhance the quality and availability of 'credit information' through a credit registry or bureau. This could be registration–based and people can be given the choice to register.

If the customer volunteers to do so, there is significant potential and implications for Aadhaar–based registries in many other sectors. This chapter will focus on the significant socio–economic implications in developing such registries in the education, health, and energy sectors. It should be noted that many of these applications assume a world in which the Aadhaar–based platform develops in parallel with enabling trends currently being witnessed in India, like ubiquitous connectivity and an expanding use of digital devices even in the rural parts of the country.

Education and Skills Platform

Existing state of education and training system in India

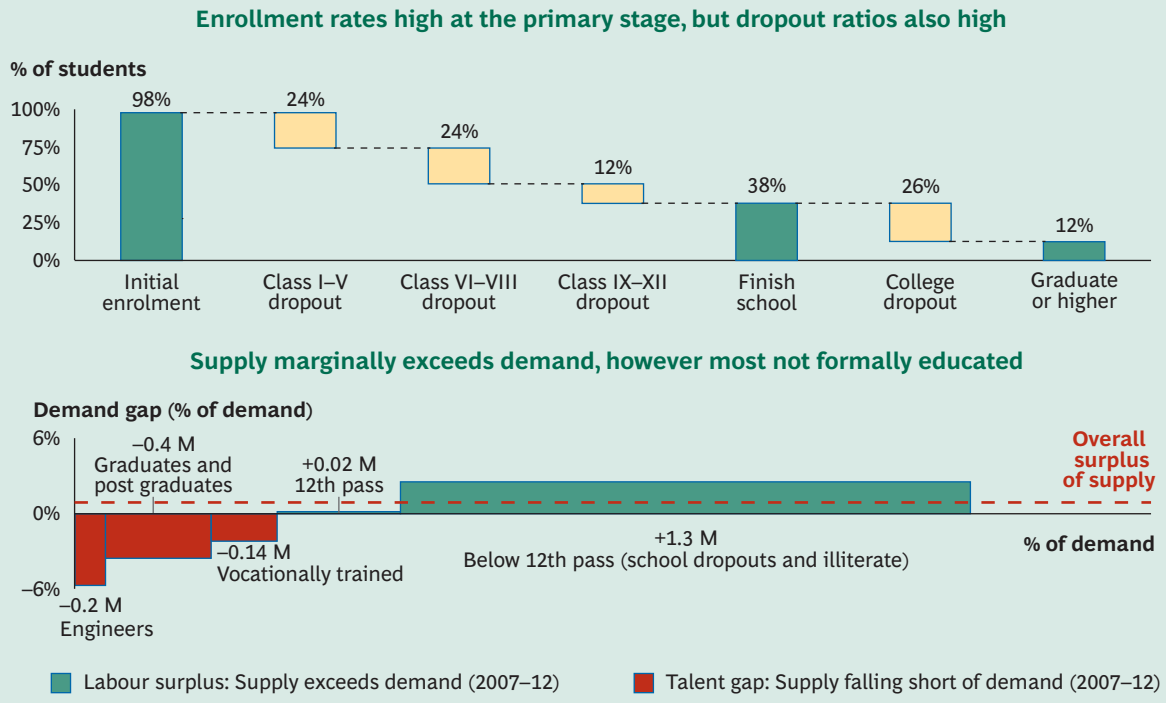
There is a huge demand–supply gap in the education sector in India. Enrolment rates are high at the primary stage, but dropout ratios are also high. While 98 percent of children enrol for primary school, only 38 percent ultimately graduate from class XII. Finally, only 12 percent of students in India are able to achieve a graduation degree or anything higher. (Refer to Exhibit 6 for details). Hence, of the approximately 15–20 million people in India who enter the workforce every year, most are not formally educated.

The problem lies not only in shortage of infrastructure but also in its quality. Teacher absenteeism is a major issue in government schools. With a large majority of government funding spent on teachers' salaries in these schools, basic infrastructure like books and stationery is neglected. The government spends about INR 1,000–1,500 crores[4] in scholarships for the minority students, but these funds are found to be prone to leakage. In addition, quality of education is very poor in a majority of Indian universities, leading to a sub–skilled workforce that is unable to find employment despite jobs being available on the market[5].

4. Web sites of Ministry of Minority Affairs Ministry of Tribal Affairs.

5. Ministry of Labour — National Skill Policy.

Exhibit 6. India's demographic dilemma — Large workforce, but most not formally educated



Sources: NSSO data; market research; paper on educational sector (P. Agarwal); BCG estimates.

The issue is not helped by the inability of institutions to provide vocational training. India needs to train 70 million people in vocational skills over the next five years. According to government estimates, India needs 500 million vocationally skilled people by 2022.

This is not aided by the fact that the current vocational training structure in the country is informal and apprenticeship–driven, and is proving to be woefully inadequate in terms of quality as well. There is no standardized accreditation or certification framework, nor any method to measure the level of vocational skills of an individual. For example, a carpenter with 20 years' experience has no way of formally differentiating himself from one with limited experience. This fundamental lack of skill–related information leads to the following problems:

- **Low compensation to semi–skilled labor:** Workers get underpaid because they have no way of proving their skills or experience
- **A demand–supply mismatch of skills in the labor market:** Employers have no way of identifying and targeting trained and capable shop floor–level workers for recruitment or of differentiating between two workers, as neither possess any certificate of training, apprenticeship or work experience
- **Lack of up–skilling opportunity:** Vocational training courses in the country are set up assuming that the entire target population possesses zero or basic skills.

  If identification and targeting of people with different skill–sets were to be made possible, vocational courses could be structured according to the up–skilling required. For example, one would not have just one course for painters in vocation schools but multiple courses — level I, II, III or basic, intermediate, advanced, and specialized — if one was able to identify and target people with different skill levels.

Using Aadhaar as an Identification and Information capturing Platform

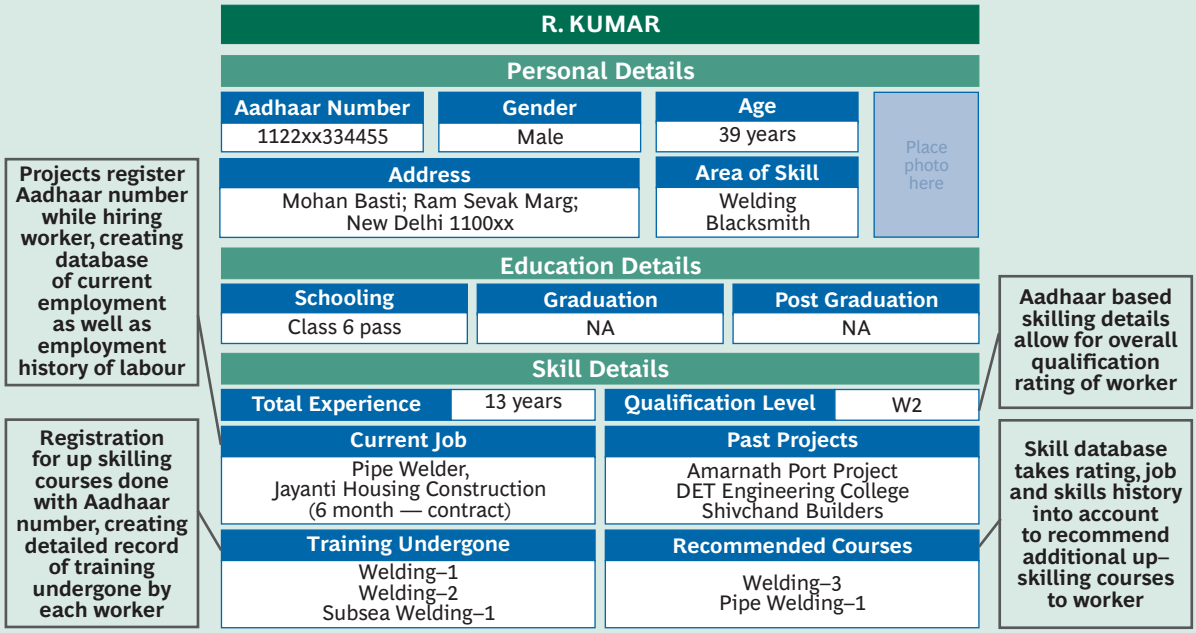
Aadhaar can be leveraged to capture information about the various educational or vocational courses that an individual takes, if he / she volunteers to do so. With authorization from the individual, this information can be digitized, linked to his / her Aadhaar number and shared across institutions, creating a comprehensive 'Electronic Education Record'. A database of these records can be used to fundamentally impact the education and employment sector. In addition, identification and authentication services offered by Aadhaar can be used by educational and vocational training institutions. Applications for this platform can be visualized at several points of the education and skilling system:

- **Increasing enrolment rates and smoothing the enrolment process:**
  - Educational institutions (schools, universities, vocational training programs, etc.) can capture the Aadhaar number of the child or the person at the time of admission and can compare these records against the larger universe of Aadhaar holders to identify people left out
  - Creating an e–certificate at the time of clearing each stage of education and tagging it to Aadhaar can help smooth the admission process in educational institutions, since the proof required would be accessible online. This will also reduce duplicate certificates, not only among students but also among teachers who submit fake qualifications
  - Aadhaar as an identification platform can help children of migrant labor enrol in schools, as they would not need to produce additional verification documents at the time of admission
- **Enhancing service provision in government schools and monitoring government schemes:**
  - If students volunteer to get their performance records tagged to Aadhaar (they can be incentivized in various ways to do so) in addition to other education–linked data like scholarships, biometric attendance data, etc., and their progress can be tracked, and the success of education schemes like the Sarva Shiksha Abhiyan comprehensively monitored
  - The educational record database discussed above can be monitored to control the level of school or university dropouts. If even 20 percent of college dropouts can be controlled, India would add approximately 1.0–1.5 million educated people to its workforce every year
  - If schools are required to register Aadhaar numbers of their students, they will be prevented from creating 'fake' students, a practice prevalent to show base enrolment levels to be eligible for state funding. For example, in a recent expose in Maharashtra, as many as 140,000 fake students were found on school rolls. In one district itself, non–existent students were supposed to have used up about INR 48 crore of scholarships meant for minorities[6]
  - Aadhaar can also enable resolution of the problem of low level of attendance of teachers. Low–cost biometric terminals installed in schools could capture this data and feed it to the central database and identify the problematic schools or regions
- **Enhancing post–education employment opportunities:**
  - In the case of vocational training, a database capturing information on the jobs and skill–sets the workers have been trained in, at different junctures, could be created for those who volunteer information (as shown in Exhibit 7). This could be leveraged to create a qualification framework, on the basis of which the workforce could be trained and up–skilled as required

Also all the educational and vocational qualifications of an individual could be collated in a National Skills Register. This would in effect create a soft–employment exchange or an employment marketplace with a potentially nation–wide reach. It could be utilized at a local basis in matching demand–supply issues and even be utilized to export skills from India to countries with labor shortage.

6. Literature Search.

Exhibit 7. An Aadhaar–based skills database (futuristic)



Sources: BCG analysis.

Health–care Applications

Existing state of health care in India

Health care needs in India are substantial and on the rise, as health indicators remain poor compared with the rest of the world. For example, it has among the highest maternal mortality rates — at 230 per one lakh live births — and infant mortality rates of approximately 50 per 1000 live births, with only 47 percent of women delivering in institutions[7]. India also has the highest number of diabetics, about 40 million, in the world. The number is expected to rise to about 70 million by 2025[8]. Also, WHO estimates suggest that deaths due to chronic diseases are expected to rise by about 18 percent between 2005–2015. However, there is a huge shortage of health–care infrastructure. Most primary and community health centres in the country lack beds, doctors, or equipment. The result is a significant and widening demand–supply mismatch (as shown in Exhibit 8).

Moreover, the overall issue for health care in India, including the fundamental issue of demand–supply mismatch, varies hugely across the Indian population on account of the stark differences in socio–economic status in the country. Hence, health needs to be looked at differently for various sections of the population.

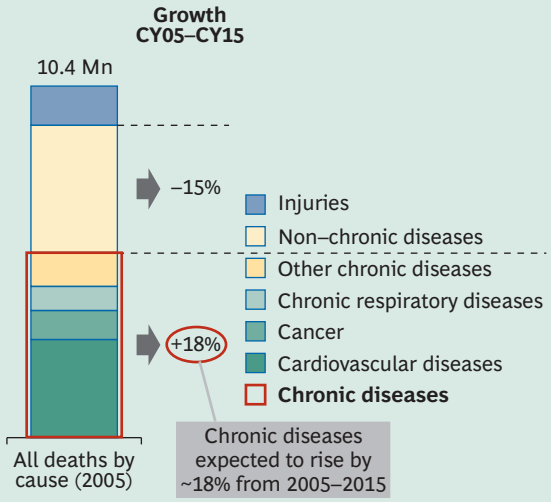
- **The un–served:** This section comprises the bottom 25–30 percent of the households by income. They do not have access to even basic health–care facilities due to their remote location or due to the crippling shortage of infrastructure in the existing public health centres. Private spending is not an option since they cannot afford it. The only form of insurance they are covered by is Rashtriya Swasthya Bima Yojna (RSBY), a government sponsored insurance scheme for BPL families. Though this scheme has made headway and issued about 27 million smart cards and administered to about 3 million hospitalization cases thus far, there is still a long way to go on improving access and affordability of health care for this section.

- **The under–served:** This comprises approximately the middle 60 percent, who might have access to different options of health care, including private clinics.

7. UNICEF India Stats (latest reviewed and adjusted figures (2009)).
8. Report from the International Diabetes Federation, 2007 estimates.

Exhibit 8. Significant demand supply mismatch exists in health care

Healthcare needs in India are substantial and on the rise ...



... however there is significant shortage of healthcare infrastructure

	USA	India
Population	310 Mn	1,173 Mn
Doctors / 1K	2.7	0.6
Government expenditure / GDP	~7.5%	~1%

Sources: WHO; Human Development Report, 2007; United Nations; NHE Fact Sheet; National Health Expenditure.

However, in many situations, affordability of treatment becomes an issue for them as well. Even though they have access to health care, its quality might not be very high. In addition, there also exists a lack of awareness about diseases, prevention, etc., which results in a lack of compliance to treatment

- **The quasi–served:** This comprises the top 10–15 percent of the households who have access to, and can afford quality health–care services. While even they display a lack of awareness and compliance, their additional need is to have value–added customized services that cater to their general health and well–being

However, there are certain problems that are pertinent to all the three sections. Firstly, across these sections, there is no standard to capture large–scale health–related information in India. This results in misleading statistics — which have a direct impact on budget allocated to fight a particular disease — and hence on the disease rate itself. Secondly, there is a lack of any comprehensive record of different types of health workers and their skill levels. This means that the right health worker is not available at the right place or time when required.

Using Aadhaar to capture information, enable e/m–health services, and enhance health services

E/m–health services[9] leveraging an Aadhaar–enabled health repository can help address some of the issues outlined above. In developed countries, centralized e/m–health database have been harder to accomplish, as there exist multiple databases that are independently usable but very hard to connect with each other. In India, we have the unique opportunity to create this de–novo as our standing position is non–existent and hence not a constraint.

Millions of Indians interact daily with the health system in different ways — some visit a general physician while others go for immunization to village camps. Basic information could be captured during these interactions at the organizational level — for example, the village camp might capture information about the health of the children it gives immunization shots to — there is no

9. E/m–health refers to health–care IT products and services that connect and enable all the participants in health — payers, providers, patients, and suppliers — to deliver quality care more efficiently.

mechanism to share this information between health organizations. This is the enabling platform that Aadhaar offers. By virtue of being the de–facto identification number, it could be used to register all these interactions in an Aadhaar–enabled health repository.

The fundamental change with e/m–health, is that records can be digitized, stored, and shared across systems for patients who are willing to avail of its benefits. This can primarily be done through Electronic Health Records / Electronic Medical Records (EHRs / EMRs). These are longitudinal[10] records of the digitally captured medical history of an individual as he / she visits different health–care facilities over a period of time. Also access to these records after being captured in a central registry need not be universal and can be provided selectively. The patient can decide when and where he would like to share this information and provide access accordingly.

One powerful example of the success of e/m–health based on digitized medical records is the Mosoriot Medical Record System (MMRS), an electronic HIV / AIDS medical records system for rural health centres in Kenya that has led to remarkable improvements in health–care delivery. In a country where, much like India, availability of doctors is scant, it has led to an approximately 50 percent reduction in provider–patient time, effectively doubling health–care capacity. Its other applications have been in drug inventory management, routine report preparations as well as in epidemiology.

Leveraging Aadhaar to address needs across various segments of the population

Usage of e/m–health can help enhance health–care delivery to each of the three segments. In the case of the un–served, Aadhaar could help address the fundamental issues of accessibility and affordability. Efficient tracking of government health beneficiaries will ensure that the limited resources will be focused on patients who really need them. As stated by some insurers, Aadhaar can also help resolve issues from duplication in the RSBY[11] and ensure the scheme reaches out only to the required target BPL customers. Remote delivery of medical services will also become feasible, with mobile ambulances connected to the Aadhaar–linked health cloud effectively bringing health services to the doorstep of this section. Finally, health insurance enabled by digitized records as discussed above could greatly reduce affordability issues for this segment.

In the case of the under–served, given that this segment has access to basic health care, their need is for a higher level of quality and more affordability. EHRs discussed above can help in increasing quality of health care by providing better decision support to health–care providers and reducing chances of medical errors. In addition, extended coverage of health insurance can arise from better information infrastructure.

Also, another area which Aadhaar could potentially help is in the delivery of primary health–care initiatives of the government. The government has allocated Rs 26760 crore for the health sector this year (2011–12) with most of the money being diverted to rural health–care programmes of the government. Large number of schemes are being pushed through by the National Rural Health Mission (NRHM) such as the Navjaat Shishu Suraksha Karyakram (NSSK–New born care programme) and the Janani Suraksha Yojana (JSY), a safe motherhood intervention for promoting institutional delivery. However one of the fundamental challenges that these schemes face is ensuring universal coverage/ equitable distribution. This can be better achieved by leveraging Aadhaar to ensure proper disbursal of funds to the intended beneficiary.

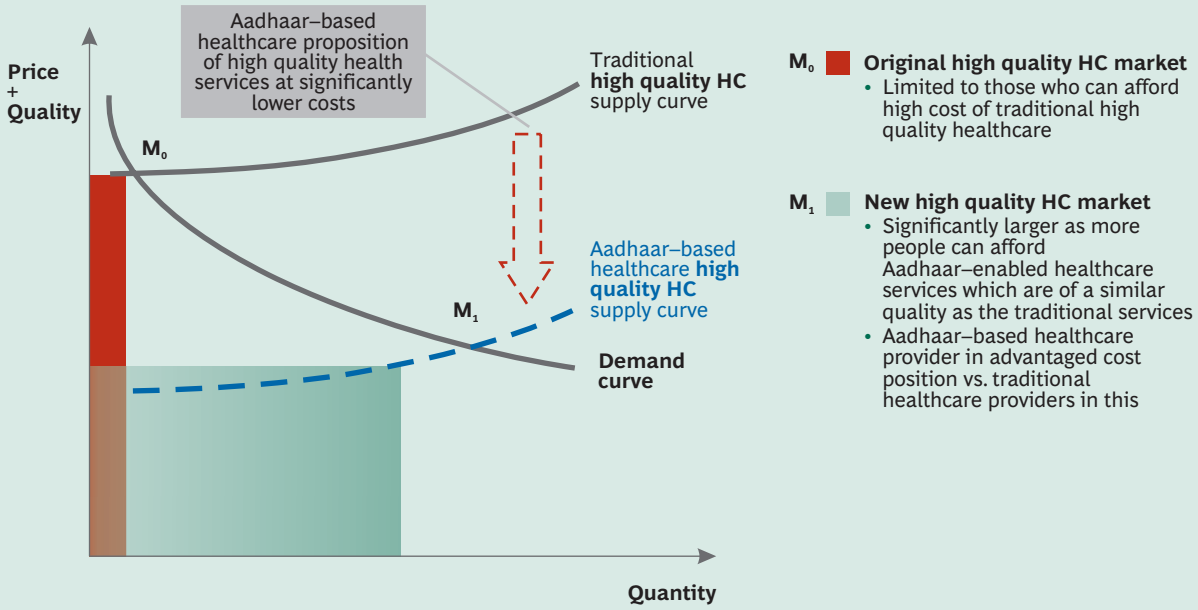
Overall, an Aadhaar–based health–care proposition will enable access to health–care services of a similar quality as the traditional health–care model to a larger number of people at a lesser cost (as shown in Exhibit 9).

The quasi–served segment can benefit from the host of value–added services that Aadhaar–based e/m–health can provide. Customers can sign up with clinics that track their health–related information from the database on a regular basis. These clinics can provide a suite of services customized to the particular individual, from general health tips to reporting on possible health risks. Patient tracking can also be of use in this section. For example, people with chronic diseases can agree to be tracked and their treatment compliance levels monitored through Aadhaar–based capturing of their interaction with the health system at different touch–points.

10. The term 'longitudinal' here refers to the continuity of time period over which the medical history of the patient can be determined due to the fact that medical records taken from different interaction points with the health system will be fused together with the help of Aadhaar.

11. Rashtriya Swastha Beema Yojana

Exhibit 9. Aadhaar–based health care can improve affordability and accessibility



Sources: BCG analysis.

Using Aadhaar–based health database for disease surveillance, national health monitoring, and health research

There is no uniform standard to capture large–scale health–related information in India. This results in inaccurate databases and misleading statistics that have a direct impact on budget allocated to fight a particular disease — and hence on the disease rate itself.

The e/m–health database, if aggregated to the community or regional level, could help address this. This in turn can be leveraged on applications without having to compromise on the privacy of individuals.

- **Enhancing disease surveillance to prevent disease outbreak:** Regular monitoring can be done to stay alert to report on symptoms or first cases of diseases. This could help health agencies take timely action. India launched the Integrated Disease Surveillance Project (IDSP) in 2004, but the state of preparedness of the country is still low. For example, when Chikungunya attacked India in 2006, it had taken two months from the first reporting in December 2005 before a national laboratory confirmed a disease sample
- **Overall national health monitoring and facilitating health research:** Aadhaar–based health records can be used to track overall health indicators at different points in time. This can allow the government to make better fund–allocation decisions depending on the key needs that are identified through these indicators. In addition, such health monitoring can also help the government or NGOs keep track of the progress and returns on the government's health programs. It can also enable better health policy research by providing data for detailed health–indicator calculations in various regions where health programs have been implemented, allowing basic cost–benefit analyses

Information infrastructure on health workers based on Aadhaar

Another major issue in our health–care system is the lack of any comprehensive record of different types of health workers and their skill levels. There is significant scope in building an information infrastructure around health workforce that can be of immense value across all segments. If the health workers are willing, Aadhaar–based records of skills and locations of different health workers (ranging from specialized surgeons to even para–

skilled nurses) can be created. For example, rural clinics facing a shortage of health workers can look up this database to find where they could source additional workers from. Patients keen to access a particular type of practitioner can scan these records for the availability of such a professional. This centralized repository can also be used to identify skill levels of different types of health workforce and accordingly provide them with opportunities to enhance their knowledge with additional training designed to suit their particular requirements.

This also includes health workers that are paramount to the success of our government led primary health–care initiatives such as Accredited Social Health Activist (ASHA), Auxiliary Nurse Midwife and Anganwadi worker (ANM). If an Aadhaar number was mandated for each of these individuals their skill development and training can be monitored using the same. This would enable a fundamental improvement in their productivity levels. This in turn will lead to a manifold increase in our health dividend by improving the delivery of our health–care initiatives such as immunisation programmes and institutionalising of childbirth. In addition, both performance–based and regular compensation payments to them can be managed seamlessly through their Aadhaar enabled bank account.

Residential Energy Monitoring Enabler

Existing state of residential energy consumption in India

As one of the fastest growing economies of the world, India's thirst for energy seems unquenchable. Without enough domestic resources to fulfil this demand, India's dependence on imported oil & coal is on the rise. Of India's total primary energy requirement of about 620 Mtoe[12] (Million Tonnes of Oil Equivalent), imports account for about160 Mtoe. By 2030, India is expected to import about 50 percent of its energy needs[13].

The residential sector is a growing consumer of total electricity consumption in the country. There is considerable scope in conserving energy in this sector. For example a study conducted by the Bureau for Energy Efficiency in four metros in India found that the penetration of star–rated (i.e. energy saving) refrigerators was 7.5 percent, while star–rated ACs were found only in 1.5 percent of the surveyed households. While renewable energy gadgets like solar cookers have made their appearance in a few homes, their use is still far from popular. In addition, increasing dependence on electronic devices leads to so–called 'ghost consumption' — electricity that is consumed when these devices are shut down without switching off their mains. This consumption is expected to be as much as 10 percent of total consumption by a household with such devices[14]. While developed countries have introduced incentives to reduce energy consumption, like the Better Energy Homes Scheme of Ireland or Residential Energy Credits in America, India has no scheme being actively practiced currently.

Using Aadhaar as a monitor of residential energy consumption

Households consume energy is different forms. The major ones are electricity, cooking fuel, and petrol or diesel for transport. The problem with determining the quantity of energy consumed by a household is that utility companies at best maintain their own accounts of electricity or fuel consumption, and there currently exists no feasible way to consolidate these accounts. Petrol or diesel consumption is not even recorded at the user level by oil marketing companies. Another problem is that with households that shift location, their electricity supplier changes, and there is no way to determine their long–term consumption.

It is in this context that Aadhaar, as a common identifier, can be used to link all these different accounts together and also maintain a trace for mobile households. It can enable a mechanism for monitoring and incentivizing an efficient energy consumption at the retail / household level. It allows us to capture the energy consciousness of an individual and develop methods and means for incentivizing responsible use of energy. Aadhaar can be creatively applied in different ways to foster this energy–conscious behaviour:

- **Enable set up of energy tracking measures such as a 'Green Index'** (as shown in Exhibit 10): An 'average' or 'expected' value of energy consumption for households of different sizes, professions, demographics, etc., can be computed by aggregating the information in this database. By comparing the actual consumption of a given household against this benchmark, a 'Green

12. National Health Expend Data – NHE fact sheet.

13. HSBC Global Research, Climate Change Report, January 2011 issue.

14. Literature search.

Index' can be computed to determine how efficiently a household consumes energy. Incentives can be given to those households that consistently demonstrate a healthy value of this index. Also, this will enable index — tracking to continue even if a household shifts locations. Such a scheme would create an impact in conserving energy at the national level.

Internationally, many countries measure energy efficiency of their households using different techniques. For example, in Europe, an organization called Odyssey collates data from energy bureaus in European countries to create an index of energy efficiency in different sectors, including the household sector. While direct monitoring of household energy consumption is not carried out, the index is computed using parameters like household usage of energy–saving devices, energy–efficient renovation of residential buildings, etc.

- **Allow pricing, product, and marketing innovation by energy sector:** Companies can use the database to assess different consumers and adopt their strategy.
  - If the database also captures bill payment information, customers who regularly default on their bills could be identified through this database and pre–paid energy meters / cards marketed to them
  - Track energy consumption of different consumers and create differentiated tariffs on the basis of consumption, including incentives based on their 'Green Index'

Exhibit 10. Aadhaar enabled 'Green Index' calculation (futuristic)

Rahul Venkatraman lives in his family bungalow in Hyderabad with his wife and 2 school–going children. At 35, he is a marketing executive with an IT firm earning a salary of Rs. 30 lakhs per year. The Venkatramans subscribed to the voluntary Energy+ scheme floated by the Government of Andhra Pradesh 3 years back. As part of the scheme, each member of the family had to register for an Aadhaar number. They receive a monthly report of their energy consumption, that has 3 sections:

Electricity Consumption:
The family got their electricity meter registered to Rahul's Aadhaar number as part of the requirements of the scheme. They currently have a high rating in this section indicating that they consumer a higher amount of electricity over a month than is expected from a family of their size living in similar houses in Hyderabad. The section also gives tips on how they can improve their rating and has advertisements by companies that manufacture energy–saving devices like low–power light bulbs.

PNG Consumption:
The family's PNG meter is also registered to Rahul's Aadhaar number. Their current rating in this section is also high, indicating that they consume more than the expected amount of LPG over a month. Rahul is considering installing a solar cooker in his garden to go up on the ratings scale.

Petrol Consumption:
Whenever any member of the family purchases petrol, they have to swipe their prints through the biometric scanner at the pump (which is compulsory under the Energy Regulation). The system, while deducting the payment from their Aadhaar–linked bank account, recognizes their Aadhaar number as one being registered for the Energy+ scheme, and adds this purchase to their account. Their rating here has come down from what it was 3 months back, when Rahul's wife, who used to drive to her office (covering a distance of ~20 km daily) switched to a car–pool scheme under which she has to use her car only once a week.

With the improvement in petrol consumption rating they have gained Energy+ points that currently make them eligible for a refund of Rs. 5,000 towards their energy costs at the end of the year.

Sources: BCG analysis.

Potential to control subsidy leakage and improve economics of energy companies

In the absence of electricity, kerosene is widely used by rural households as a lighting fuel. In order to make it accessible and affordable for the BPL population, kerosene is sold at a subsidized price through the PDS in India. However, it is a well–known fact that corruption in kerosene distribution is rampant. According to some sources, about 35–40 percent of PDS kerosene is diverted to the black market[15]. It is mixed with diesel and sold at higher prices than the subsidized price at which it is bought. Given the level of subsidization, the losses suffered by the system are enormous — in 2010–11, the total subsidy for kerosene stood at INR 18.21 per litre[16].

Some Aadhar–based solutions to address this issue are already underway, with Aadhaar being proposed as a solution, or at least a platform to reduce the mismanagement of kerosene subsidy. The basic proposition is to directly transfer a cash subsidy of approximately INR 400 a month (that amounts roughly to the value of kerosene subsidy availed by a BPL household in a month) directly into the Aadhaar–linked account of the female head of the household. Kerosene would be purchased by fair–price shops at market prices, reducing the incentive to divert it. In addition, while the subsidy is aimed at creating 'affordability' for certain sectors, there are no 'caps' for volumes. This allows everyone to consume any amount at subsidized prices. Aadhaar along with a developed database can help here. It can help determine 'eligibility' for both consumption volume and price. Fuel can then be sold to the consumers at unsubsidized prices while the government can reimburse the 'eligible' people directly for the 'eligible' amounts. This would have a two–fold benefit:

- By targeting the subsidy at the authenticated BPL population, Aadhaar can help reduce its wastage on unintended beneficiaries. In addition, it would help keep track of the intended beneficiary over a period of time. This in turn can help oil companies reduce their subsidy burden

- Also, by directly reaching the end consumer, it reduces the subsidy disbursal burden on the energy companies, thereby enabling them to focus on core activities

A similar initiative can be undertaken for Electricity too by providing 'direct' subsidy to the eligible people for eligible volumes only. The electricity distribution companies can then charge tariffs, which better reflect the 'costs'. This will make the sector more viable.

Aadhaar as Part of Social Development Infrastructure Fabric

The examples indicated above are representative of how Aadhaar, if leveraged effectively, can fundamentally enhance the development infrastructure of the country. There are several other potential ways in which Aadhaar, by virtue of providing a secure identity, can provide a backbone to the social development infrastructure of the country.

For example, land is a public good, critical for economic and social development. Due to poor land records and poor systems of tracking land holding, sales and transfers, the country is currently struggling with land zoning and planning its future usage — something that is critical for future growth of industry and agriculture as well as essential for residential and environmental planning.

It is critical to improve the management of land as an asset in India and set up a more transparent, fair and efficient process for future land usage. Aadhaar can be leveraged to achieve the above objectives. Aadhaar could be an excellent mechanism to track ownership, sale / purchase, and transfer of land in this country.

Another application, though completely different in nature but just as relevant, is making it mandatory to include Aadhaar identification and verification in death certificates and wills. This could control the instances of forgery of these documents and ensure that the entitlements reach the intended beneficiaries.

It is important to note that there are several other examples of social and public goods and services based on Aadhaar that are possible — such as water usage, environmental impact / carbon footprint. However, these applications will evolve over time as initial applications are established, gain momentum, and become successful. Once this happens, Aadhaar will be an integral part of India's social development infrastructure fabric.

15. Literature search; Kirit S. Parikh Report for Government of India.

16. Indiastat.

Enhancing Factor Productivity and Reducing Transaction Costs

"The world is changing very fast. Big will not beat small anymore. It will be the fast beating the slow"

— Rupert Murdoch

Productivity growth is important to a firm and a nation because it means that it can meet its growing obligations to customers, suppliers, workers, shareholders, and governments, and still remain competitive or even improve its competitiveness in the market place.

Aadhaar could potentially help in improving productivity and reducing transaction costs in many different ways. In the short run, just having a secure online identity will reduce transaction costs in a peer–to–peer transaction; for example, when a person is looking for a job or withdrawing money at a Business Correspondent (BC) or renting a house. In the long run, 'value–added' databases around one's identity (heath records, skill records, education record, etc.), as described in the previous chapter will allow an individual to be charged differentiated transaction costs. For example, an individual's credit history will allow him / her to get scientific risk–based rates on loans and skills history will enable an individual to get appropriate wages as an artisan.

This chapter is focused on how leveraging Aadhaar can potentially lead to an improvement in productivity and efficiency in the business / corporate context by highlighting two particular examples around improving efficiency in supply chain management and enabling e– and m–commerce related payments.

It is important to note that for many of these applications, IT infrastructure, and digital and network connectivity are a pre–requisite. Aadhaar could enhance effectiveness and the benefits we could put this infrastructure to. In addition, the relevance and value of Aadhaar in these applications might be especially felt by mid to small organizations with fragmented sourcing and distribution requirements.

Improving Efficiency in Supply Chain Management

Current scenario of supply chain management in India

Consumer goods companies procure raw materials from fragmented suppliers — agriculturists, dairy farmers, etc., — spread over a wide geographical area and with a highly unstructured market mechanism. For example, while India has the world's largest agricultural land bank (about 140 million Ha) after the US (about 170 million Ha), its average land holding is only about 1.3 Ha compared with about 40 Ha in the US[17]. An organization like the Gujarat Co–operative Milk Marketing Federation (Amul) collects milk daily from approximately three million dairy farmers spread out over 15,700 villages[18] that include marginal farmers and tribal communities. Distribution is quite fragmented as a large part of sales, especially for consumer goods companies, still happen through the over 12 million retail outlets that India has. Also, as rural consumption continues to rise in India, companies are trying to increase their presence in these markets. Inevitably, managing procurement and distribution at such a large scale and managing a supply chain of such geographic fragmentation is a complex process:

17. Indiastat.

18. Gujarat Co–operative Milk Marketing Federation (Amul) company web site.

- Demand forecasting is an important concern for consumer goods companies' supply chains. With increasing rural sales, there needs to be a mechanism to capture consumption information from remote locations without delay

- Systems to capture data on production by individual producers and companies usually need to go through intermediaries in the supply chain. This reduces visibility to individual suppliers and buyers and results in incomplete supply information. It also impedes the process of building deeper relationships with suppliers, especially those who are in remote areas of the country

Efficient management of supply chain in addition to ensuring efficiency in the physical distribution of goods is also about streamlining the flow of information across all the stakeholders in the supply chain. This is where Aadhaar can aid, as IT infrastructure in conjunction with the Aadhaar–based identification and authentication, could potentially streamline information flow along the supply chain to make it more granular, accurate, and real–time.

In sectors with lower levels of fragmentation, many of the larger players have already conceptualized and put in place efficient IT infrastructure to capture the flow of information across different stakeholders. However, for smaller players with largely fragmented supply chain, such as food and dairy, the solution would be far more challenging. It is here that Aadhaar, along with the right IT infrastructure, could streamline information flow and enhance overall productivity.

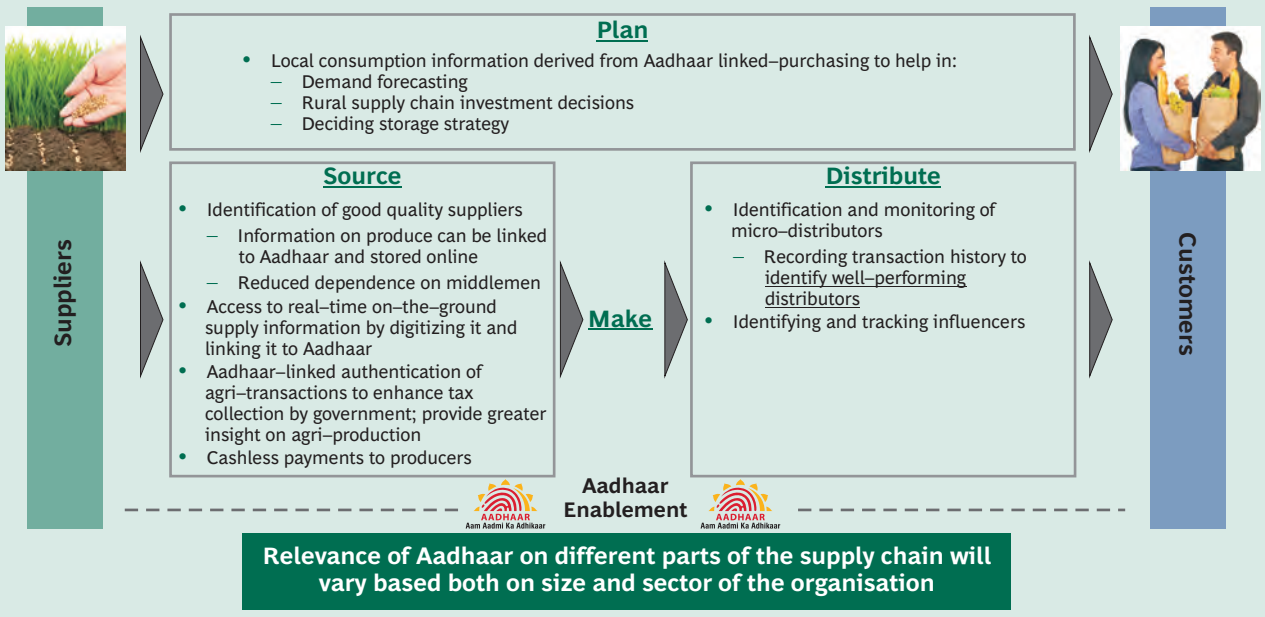
Aadhaar can create efficiencies in management of fragmented supply chains

Applications can be thought of at different levels in the supply chain (as shown in Exhibit 11):

- **Sourcing:** If suppliers, especially to food and dairy companies, like agriculturists, dairy farmers, etc., can be registered with Aadhaar and information related to produce (for example, quality of milk supplied, type of crop cultivated, etc.,) be stored against the number, the database could be leveraged in the following ways:

  - Identification, tracking, and monitoring of suppliers: Companies can capture transactions with the

Exhibit 11. Considerable potential for Aadhaar to impact the entire supply chain



Sources: BCG analysis.

producers through an Aadhaar–based identification and tracking system. This would give direct visibility to the company of the end supplier and they can thus trace quality and reliability of the producer

- Access to real–time production information: Producers identified by the above system can be made responsible to update information on levels of production on a real–time basis. As stated above, this information is currently not accurately available with consumer goods companies, and often sourcing decisions may be made erroneously based on rumours that are out of sync with ground reality

- Cashless payments to producers: Electronic payments to producers with Aadhaar–linked accounts will reduce costs associated with cash management for the company

It is important to note that several large companies have existing systems that identify producers. In fact, Amul was one of the pioneers in getting all producers together on a connected platform and leveraging the same. However, Aadhaar could provide to a producer a universal identifier across the industry. Smaller companies can leverage it to enable producer identification and tracking in their systems.

◇ **Distribution:** Consumer goods companies can use Aadhaar to improve distribution in one or more ways. It can enable tracking of different entities, such as micro–distributors in rural areas, influencers, or logistics contractors. In each of these cases, the data so captured can be used to track performance and focus sales and logistics activity accordingly. In some cases, for the larger organizations with rigid criteria for selecting distributors, this can expand the universe of distributors as Aadhaar identity would be available for a much larger universe than that covered by PAN or TIN numbers

◇ **Overall planning:** Current information systems allow companies to keep track of sales only to a limited extent. Except for a few large players, retail–level sales information is not tracked by most companies. If the end–customers' transactions with their retailers are linked to Aadhaar, these patterns can be studied. In the case of low–value items, this can be done for a sample of end–customers' transactions. This could benefit the firm by:

- Improving demand forecasting, especially as customer sales information becomes real–time. Improved local demand forecasting helps companies make better storage decisions and reduce wastage

- Making supply chain decisions using local (village–level) consumption data. For instance, whether local demand merits owning a distribution network or outsourcing it

- Effective marketing and decision–making will enable quick real–time response and decisions on marketing and pricing of the goods

Capturing this information will indeed be a daunting task and it will have to be made voluntary to the customer to give out Aadhaar numbers at the time of purchase. However, it has the potential to greatly increase industry–wide efficiency.

Spurring Rapid Growth in Electronic and Mobile Payments

Electronic payments in India grew from being below about five percent of the total payment value in 2005 to about 50 percent in 2008. This share is further expected to increase to about 70 percent by 2015. While a large chunk of these payments come from business–to–business transactions, consumer electronic transactions are expected to account for about 15 percent of total transaction value by 2015[19]. Mobile payments are in their infancy today, but are expected to account for about $350 billion in payment and banking transactions by 2015[20].

As stated in the report of the task force on Aadhaar–enabled unified payments infrastructure Aadhaar can help simplify the processes in electronic payments in the following ways:

◇ Aadhaar letter and Aadhaar authentication for Know Your Customer (KYC) requirements

19. Literature and publications on India's Emerging Payment market.

20. BCG Perspectives – The rush to mobile money — madness or master stroke, July 2011.

- Aadhaar number as a financial address for receiving and sending funds
- Aadhaar authentication for authorizing electronic transactions

In fact, in line with this, Aadhaar has launched its online verification of Aadhaar numbers facility on February 7th 2012. This facility is proposed to help banks, telecom companies and government departments authenticate an Indian resident via mobile phones, computers, tablets or other devices connected to the internet. The authentication service will also be free of charge until December 2013.

Enabling deeper access to rural markets

The past decade has seen much focus on rural markets in India. According to some data sources, they already account for about 50–60 percent of total FMCG market demand in India. While some sectors such as FMCG are more penetrated, others such as consumer durables are showing good growth.

Aadhaar can act as a further enabler for the proliferation of C2B e/m–payments in rural areas.

- Firstly, it will empower millions of people in remote locations with bank accounts and mobile connections to make or receive basic mobile payments. It is estimated that there will be an additional 70–170 million bank accounts[21] (depending on the set of financial inclusion initiatives undertaken by policymakers) by 2015
- This could especially be relevant for standardized products that are repeat purchases by customers, such as seeds and fertilisers or products such as travel tickets, games, and music. In the case of products and services where the physical look and feel is important, companies can potentially leverage business correspondents as well

As rural customers get more comfortable with transacting through the digital media, a futuristic but powerful model would be if Aadhaar could be leveraged along with the deep rural penetration of DTH companies (they account for about 95 percent of the rural transmission market), and Aadhaar–enabled bank accounts to develop a rural TV–shopping market. The set–top box could be attached to a low–cost biometric device to relay payment information over satellite. With more than 15 million rural households[22] owning a digital TV, this could be the key to popularizing electronic purchase in villages, where most households still do not own a personal computer.

Apart from providing much greater choice to customers, these models could also provide an additional source of income for DTH players, mobile companies or business correspondents, etc., through which the transactions take place (as shown in Exhibit 12).

The report of the task force on an Aadhaar enabled unified payments infrastructure enables the creation of an interoperable network. This Task Force envisions the creation of an interoperable network of 10 lakh Business Correspondent agents. In order to make the payments viable at the last mile the Task force suggests that the government bear a last mile transaction–processing fee with a cap per transaction. For interoperable transactions, part of the fee can be be paid to the issuing bank, part to the acquiring bank, and part to the switch. It also notes that the Aadhaar number, due to its uniqueness, serves as a natural financial address for sending such payments to accounts of beneficiaries through the Aadhaar Payments Bridge (APB). In addition, the Aadhaar authentication system allows the identity of a resident to be authenticated in real–time in a trusted manner during last–mile payments and transactions using MicroATMs.

Aadhaar–based C2B payments increasing transaction volumes among urban customers by providing stable platform with greater convenience and transaction security

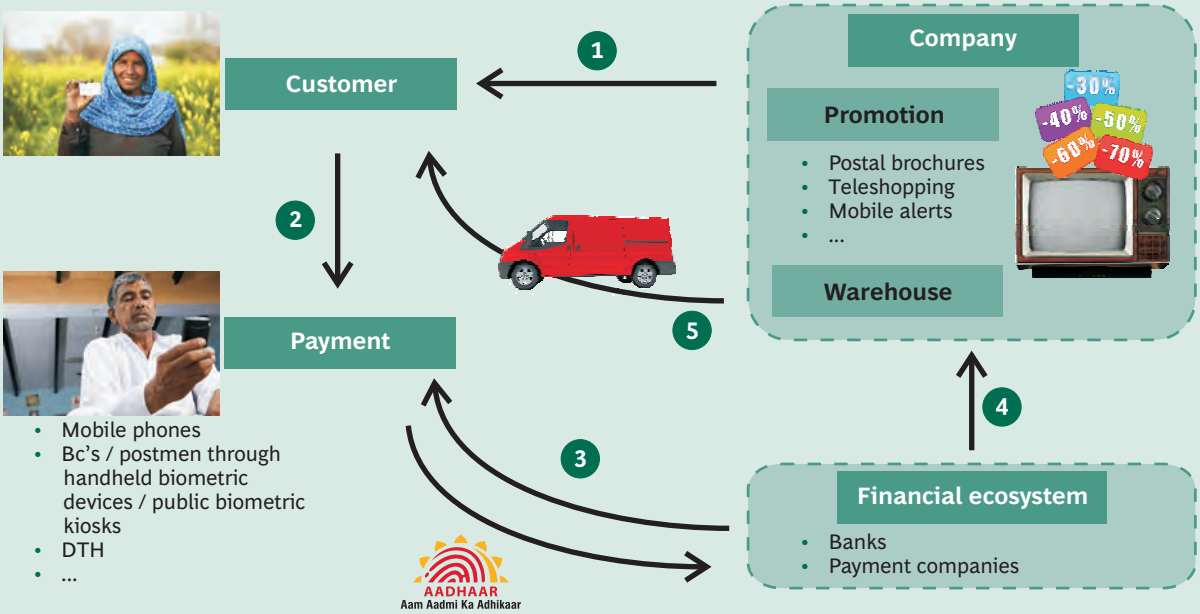
India now has 90 million (70 million in urban and 20 million in rural areas)[23] active Internet users and this number is going up rapidly, while the number of broadband connections is expected to increase to 80–120 million by 2015. The recent popularity of smartphones connected to internet networks has added a new dimension to this story. Furthermore, as prices drop, digital devices will be adopted by even larger swathes of urban consumers. This base

21. BCG CII Report on Financial Inclusion, February 2011.

22. Findings on the basis of a survey conducted across 250,910 households between January 2008 and April 2010 by India Readership Survey.

23. IAMAI – Report on Internet in India (I–Cube) 2011.

Exhibit 12. Aadhaar can fundamentally enable several e/m–commerce models for rural distribution



Sources: BCG analysis.

digital infrastructure provides a platform that can be leveraged for e/m–commerce transactions.

Today, online payments are not hassle–free. There is resistance to fill out lengthy online forms as well as a psychological barrier in entering one's credit card or bank account information on a computer.

Aadhaar can potentially enhance the experience on both the convenience and the security dimensions. For example, a biometric input–enabled smart–phone user can just browse through a collection of books offered by an online library on his phone, place an order and make the payment via biometric authentication through his Aadhaar–linked account.

Hence, given the multiple benefits that Aadhaar brings to an electronic payment infrastructure the task force on Aadhaar–enabled unified payments infrastructure has made the following recommendations:

- The Government and all financial regulators should recognize electronic Aadhaar biometric authentication as equivalent to a physical signature
- Based on the parity between physical and electronic documents, all financial regulators should recognize electronic Aadhaar demographic authentication as Proof of Identity and Proof of Address
- The Government and all financial regulators should recognize the Aadhaar number as a financial address for receiving and sending funds

An Aadhaar–enabled unified payments infrastructure can thus provide alternative means of access and availability to rural customers as well as fundamentally enhance the experience for urban customers, and therefore play a key role in providing an impetus to the e/m–payments market in India.

Heralding the Change

"Plans are only good intentions unless they immediately degenerate into hard work"

— Peter Drucker

As India stands poised for emerging as a major economic force in the world, it is important to realise that India's expanding role, as an emerging world player, will be significantly driven by the ability of the government and the private sector to leverage appropriate platforms for innovation. In this context, it is important for them to be cognizant of potential applications that could be facilitated or enabled by a platform such as Aadhaar and ensure that they are in a position to capitalise on it.

As discussed earlier, Aadhaar can be a strong enabler in applications ranging from those that can facilitate social welfare schemes, to mainstream applications that can have a significant impact on the development infrastructure of the country to, cross–sectoral next generation applications that can fundamentally improve productivity and reduce costs. Most of these applications, however, will be possible only on the basis of significant collaboration and cooperation among sectors. Also, many of these applications will be facilitated by individuals and organizations with entrepreneurial mindsets that avail of the new business opportunities that Aadhaar could potentially offer.

The question no longer is around whether Aadhaar poses an opportunity but more around the 'how' and 'when' of capitalizing on it. The time has arrived for all the stakeholders to come together and understand the opportunity that Aadhaar offers to them, assess the impact it has on their internal strategy and align themselves to act quickly.

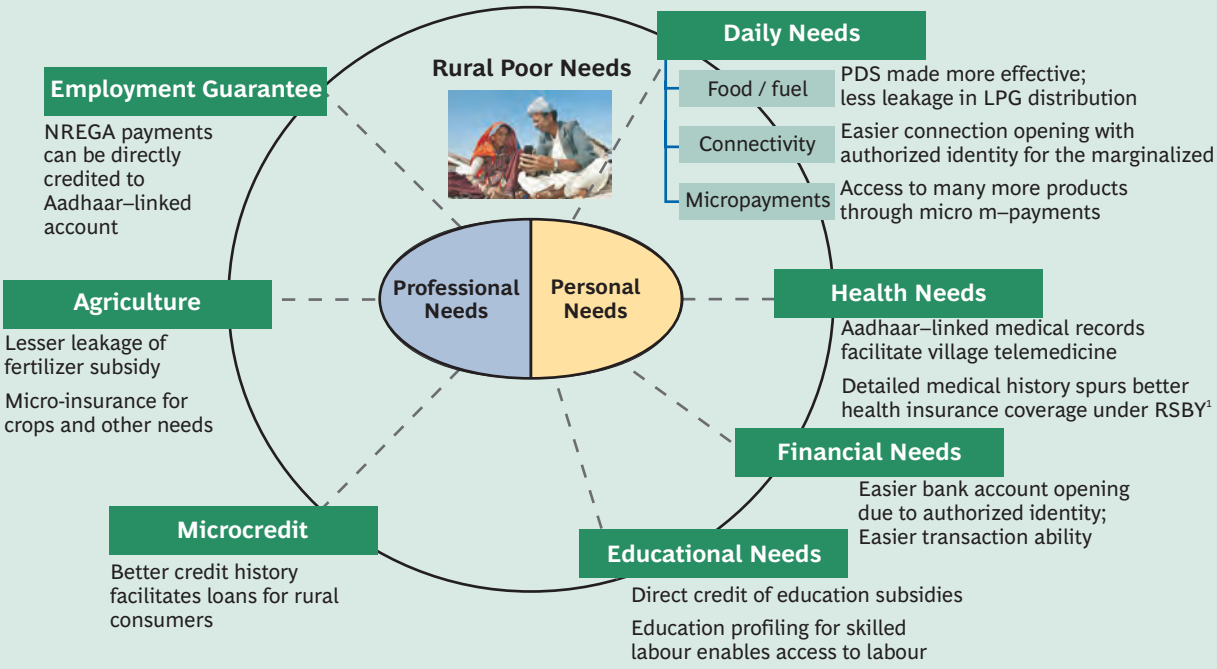
Comprehensive Impact on Consumers

Not all Aadhaar–based applications will occur at the same time and place or have the same speed of implementation. It is also important to realise that the depth and universality of applications will vary based on its criticality or importance to society as well as on the security and confidentiality concerns around the data. In fact, we believe there will be three primary categories to distinguish end use of the application:

- Where the application becomes the norm. A relevant example, of the same is delivery of social welfare schemes.
- Where it is registry based and is maintained with high levels of privacy and will need individual authentication to release. For example, a centralized Aadhaar–based repository on education where details around an individual's educational qualification could be provided to institutes, if the individual authorises the same.
- Where the usage is completely voluntary, where people make the trade–offs based on benefits that can be realized. For example, corporate applications leveraging consumer data.

One way to imagine the potential impact of Aadhaar is to fast–forward a few years and look at the potential impact that Aadhaar can have on a customer's life — be it an urban or a rural customer. Exhibit 13 highlights the potential impact of Aadhaar on a rural customer through a futuristic lens.

Exhibit 13. Aadhaar could potentially impact a rural customer in every facet of his life



Sources: Literature search; BCG analysis.
[1]Rashtriya Swasthya Bima Yojana.

Potential for Cross Sector Collaboration and New Business Opportunities

Leveraging Aadhaar for most of the applications and innovations mentioned above is beyond the purview of any one agency, organization, or discipline. Sectors will need to come together in healthy coalitions and partnerships to use Aadhaar as an enabler in solving several of the issues, social and otherwise, effectively and equitably.

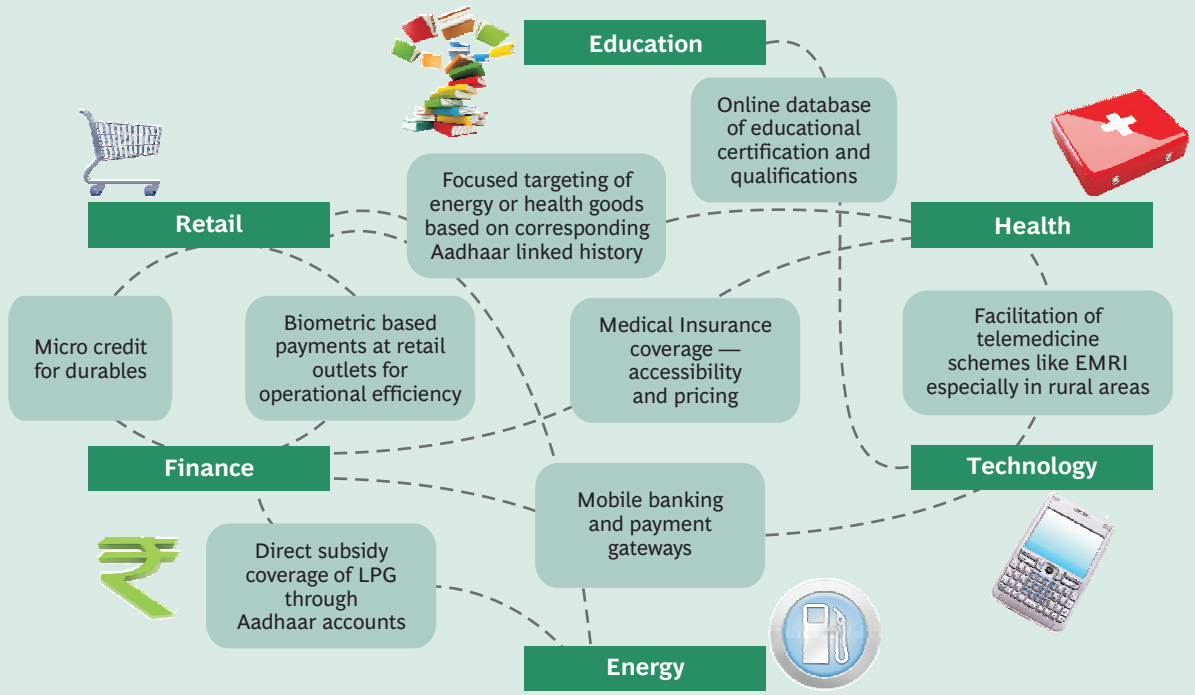
To illustrate the point further, take the example of leveraging Aadhaar for enabling direct subsidy for kerosene to the end customer through Aadhaar–enabled bank accounts. This would require an effective partnership between the financial services and energy sectors to ensure that the required end consumer has an Aadhaar–enabled account and the right systems and processes are in place to effect the subsidy transfer. Similarly, focused targeting of energy or health goods using a centralized Aadhaar–linked database requires collaboration between retail, energy, and health sectors (as shown in Exhibit 14).

Hence, it is important for organizations across sectors to come together, identify systemic challenges, define ways to address them using Aadhaar as an enabler, and work collaboratively to achieve sustainable and ideally transformative change. In addition, Aadhaar, by virtue of being a flexible national infrastructure with an open Application Programing Interface (API) platform, provides significant opportunity for collaboration across institutes, organizations, and individuals.

Aadhaar can also be leveraged for new, exciting, and financially rewarding business opportunities:

- **Public records analytics:** An agency that could integrate Aadhaar–linked public records of information and voluntary consumption data available in the public domain and leverage them at an aggregate level to provide cross–sector customer analytics

Exhibit 14. Several opportunities for collaboration across sectors



Sources: BCG analysis.

- **Corporate cyber security solutions:** Robust authentication and security solutions for corporates using biometric signatures, etc., leveraging Aadhaar–based authentication systems and processes

Aadhaar, along with all the other accompanying trends, such as rise in digital infrastructure and socioeconomic trends such as urbanization, rising middle class and consumerism, etc., has created a platform of opportunities for entrepreneurs to work on. It is now up to enterprising individuals and organizations to build on this platform and create new businesses.

The Way Forward

With approximately 12 crore Aadhaar numbers already issued, and a target of 20 crore during 2012, Aadhaar is fast becoming a reality. Once Aadhaar authentication is rolled out, the platform will be ready for use. Given the time it takes to plan a change, execute it, and disseminate it, it is imperative that business organizations start coming up with a roadmap to make use of this platform. They need to incorporate Aadhaar into their future business plans and put this on the senior management team's agenda. In addition, business plan creation around Aadhaar would receive a stimulus if sufficient funds were available for early stage fundings from VCs and other evangelists.

Action agenda for stakeholders and enablers

Aadhaar–based applications require several partners to come together — government departments, IT players, banks, payment companies, Even as business organizations start visualizing and planning for Aadhaar–based applications, it is important that the ecosystem, comprising these partners, starts coming together. This process is getting installed — IT companies have rolled out a few low–cost biometric–enabled terminals, and IT usage is on the rise in rural India. The number of rural Internet users is expected to have almost doubled over the last year by the end of 2011. Similarly, banks and mobile companies have accepted Aadhaar as a KYC and a major payment player has tied up with UIDAI to incorporate biometrics as a valid mode of payment

authentication. This, however, is just the tip of the iceberg — to keep pace with the planned enrolment rate of Aadhaar, infrastructure investment and adoption of Aadhaar into existing systems and processes would need to start.

Different stakeholders should consider working on specific action items:

Government and Regulators

- Execute basic far–reaching schemes like direct subsidy transfers linked to Aadhaar
- Step up IT as well as data analysis infrastructure in relevant departments to process Aadhaar–related information for improved decision–making and action
- Set up guidelines or policy on information–sharing using Aadhaar in accordance with privacy laws in India

Corporates and Institutions (health, education, etc.)

- Assess the Aadhaar–based opportunity and take strategic calls on how Aadhaar can fundamentally enhance business operations
- Adopt and integrate Aadhaar–based innovative systems and processes in increasing efficiency and productivity of operations. This would include ensuring sufficient encouragement to different stakeholders to enrol in Aadhaar. Such as employees, end customers as well as suppliers and distributors
- Collaborate with other industry bodies to create a framework for cross–sector application of Aadhaar

Financial ecosystem partners

- Banks should leverage Aadhaar for an ongoing reduction in KYC costs as well as piggyback on the Aadhaar enrolment program for enrolling customers for financial inclusion
- Leverage biometric authentication for partner merchants, business correspondents and other partners
- Credit bureau and other financial institutions could leverage Aadhaar–based information for enhancing and deepening coverage

Telecom and IT companies

- Provide greater bandwidth and also extend rural reach of networks to provide for massive flow of data expected from Aadhaar–linked transactions
- Develop and deploy low–cost biometric scanners that are voice–enabled in local languages to make application in poor or rural areas economically viable
- Explore opportunities in partnering with hospitals, corporate, educational institutions, etc., to facilitate m–health, m–commerce, m–education and other schemes which are further enabled by Aadhaar authentication

Individuals

- Ensure Aadhaar numbers are provided for relevant service and product transactions
- Educate themselves and make use of Aadhaar–enabled health services, education services, cashless payments, etc.
- Once convinced about security and confidentiality of data, participate in data registries that allow access to data at an aggregated level or in an appropriate fashion

It is critical for an economically advancing India to leverage available resources to solve the infrastructural challenges we face and enhance overall productivity. Aadhaar along with developing digital infrastructure can potentially help overcome the infrastructure challenges and be the harbinger of changes to come.

Note to the Reader

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