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Foreword

“Everything comes to us that belongs to us if we create the capacity to receive it.”
– Rabindranath Tagore

Recently India became the fastest growing large economy in the world outpacing China. The secret ingredient behind India’s exponential rise in the world economy is its massive young population. Citizen empowerment is the key agenda for the government, and there are several initiatives active for the effective socio-economic growth of citizens.

With this publication, our attempt is to provide an analysis of the initiatives taken for better governance and empowering citizens using digital platforms. It discusses the possibilities of leveraging mobile services, skilled IT workforce and Aadhaar-based authentication system to enable a digital economy. The key for digital economy is digital banking and finance systems which will need digital literacy and high trust factor. Accordingly, it also delves into different aspects of the development of a digital society and looks at the technology adoption and related challenges.

We believe that the growth and development agenda for the next few decades should not only focus on economic progress to cater to rising aspirations of young Indians but also in achieving that in a sustainable manner. To this end, the technical and managerial capabilities of public and private sector, under the comprehensive framework of Digital India, can be leveraged to take India into the digital age.

Deloitte hopes that you and your colleagues find this report a useful stimulant in your strategic thinking.

Hemant Joshi
With the rise of the 21st century, India’s telecom sector fostered the socio-economic growth as more and more parts of India got connected. From banking, education, e-commerce, rural connectivity, nothing has been untouched by innovations in the Telecom Sector.

India’s telecom sector is still going strong and has been one of the most dynamic sectors that has not only evolved with time but has also played a crucial role in shaping India’s vibrant economy. In other words, India’s telecom sector has certainly been a vital cog in the wheels of its development.

Jan Dhan Aadhaar Mobile (JAM) Number Trinity referred to as a “game changing reform” has become the zest of the season. The Jan Dhan Aadhaar Mobile Trinity holds the key to one of the greatest reforms in India, i.e. direct subsidy transfers.

Rural India will ultimately define the core strength of the industry, since the sheer volume of potential connections is immense. Inclusion of rural users in the customer base will strengthen the network and enable it to deliver multiple services in communication-starved rural areas.

The superiority of optical fibers for carrying information from place to place is leading to their rapidly replacing older technologies. Optical fibers have played a key role in making possible the extraordinary growth. Satellite based systems, though expensive, are the only means available for providing reliable communication to some of the remote and inaccessible areas like islands and mountains and are therefore, being planned and introduced for such areas. Thus Satellite communications play a vital role in the global telecommunications system.

Digital Wallets, Payment Banks, UPI is expanding in a big way. India is witnessing an exponential growth in the area of digital payment in recent times. With ever-increasing internet and mobile penetration, the country is all set to witness a massive surge in the adoption of digital payments in the coming years.

CII Telecom Convergence Summit will deliberate on some of the topical issues of the Sector and help charting a roadmap defining the growth path in the times to come.
JAM (Jan Dhan 240M+, Aadhaar 1B+, Mobile 1B+): Foundation of Digital Infrastructure

India has been known as the “Land of Villages” and this has been the biggest strength as a massive share of population i.e. almost 60% belong to the rural part of the country. The advent of industrial era and urbanization changed the agriculture trend. The GDP share of the agriculture sector has dropped from 51.81% in 1950-51 to 17.9% in 2014-15, while the Industry (24.2%) and Services (57.9%) sector has shown a significant increase over the same period.\(^1\)

![Figure 1: Major Sector Performance since 1950 (%)](source: Planning Commission)

The lacklustre agriculture sector has shifted the focus of employability and economic development to the urban India i.e. industry and services sector. The declining importance of agriculture has become a threat to the socio-economic development of rural India. The widening socio-economic gap between rural and urban India is a worrying factor as it deprives rural India from basic rights such as Banking, Healthcare, and Education. The economic empowerment and financial inclusion of rural population is necessary to close this gap. The rural development has equal importance as the urban growth to achieve overall progress of the country. The advent and rapid adoption of technology brings new and innovative ways to deal with this situation in India.

The economic empowerment of citizens demands a continuous connect between the citizens and the government. For a successful service provision model, the government needs to identify the citizens, create a platform for transfer of services and ensure last mile delivery of services to the underprivileged.

**Identity:** The identity of the citizens is the topmost priority and requires elimination of duplicate entries and can be used for efficient delivery of all services. An automated system using technology and biometrics has helped several countries in Europe and the US. The home grown Aadhaar card provides secure and safe
solution for citizens’ identity in India.

**Delivery platform:** Bringing the entire country into the financial ecosystem will provide a platform to deliver government benefits to the citizens directly by eliminating middle men and thus removing leakages and pilferages. The Prime Minister Jan Dhan Yojana (PMJDY) is helping in financial inclusion and provides a platform for benefit transfer to the right people at the right time.

**Last mile access:** It is a major challenge to ensure that benefits, such as subsidies reach the citizens at the appropriate time. The unprecedented penetration of mobile phones provides the opportunity for the last mile delivery.

The JAM Trinity is the consolidation of three critical projects i.e. Jan Dhan, Aadhaar and Mobile connectivity (JAM) expected to drive financial inclusion measures to bring about overall empowerment. It is a key reform to deliver the Direct Benefit Transfers (DBT) scheme along with subsidies, minimum wage payments and other government schemes. According to the Economic Survey, about INR 3.78 lakh crore or 4.2% of the GDP, is currently spent on key subsidies. The inefficient distribution system leads to wastage of resources rather than using for other developmental activities. The JAM Trinity would ensure last man delivery of benefits eliminating multiple mid-channel layers and empower citizens directly using technology.
Jan Dhan: Including Unbanked, Eliminating Leakages

Indian gross domestic product (GDP) grew at 7.6% in 2015-16 up from 7.2% in 2014-15, outpacing the growth of China to become the fastest growing major economy in the world. Despite India showing economic growth rates higher than most developed countries in the recent years, a majority of the country’s population still does not have basic access to banking infrastructure. Financial inclusion is a relatively new socio-economic concept in India to provide affordable financial services to the underprivileged, who might not otherwise be aware of or able to afford these services. People from weaker sections of the society tend to rely on traditional financial activities such as saving, borrowing and managing day-to-day expenses without any access to banks, savings accounts, debit/credit cards, insurance, etc., and depend on informal means such as cash-on-hand, pawn-brokers, money lenders, etc. Most of the time, these choices are insufficient, risky and expensive.

Figure 2: Advantages: Formal Financial System

- **Fighting Poverty**
  Enables the poorest and most vulnerable in society to step out of poverty and reduces the inequality in the society

- **Economic Development**
  Helps individuals and families for better management of their financials as well as collectively develops communities and drives economic growth

- **Financial Decision Making/ Entrepreneurship**
  Empowers people with the skill and knowledge for right decision making and fights financial uncertainties. Start & grow business with micro finance schemes

- **Better Education**
  Enables people to pay for education and in turn supports a new generation of educated and informed individuals

- **Leakage Proof Service Delivery**
  Connects the individual to the government for last man delivery of government services thus preventing leakages and pilferages
Programs

Pradhan Mantri Jan Dhan Yojana (PMJDY) is a national mission for financial inclusion in India, which encompasses an integrated approach to bring about comprehensive financial inclusion of all the households in the country. It helps the citizens with universal access to banking facilities with at least one basic banking account for every household, financial literacy, access to credit, insurance and pension facility. The government also provides RuPay debit cards to the beneficiaries which has an in-built accident insurance cover of INR 1,00,000. The Jan Dhan Yojana will not only provide financial access but it will also channelize all the government benefits (from Center / State / Local Body) to the beneficiary's accounts. The Direct Benefit Transfer (DBT) will remove multiple layers of intermediaries for a smooth flow of benefits with least leakages and pilferages.

The first phase of PMJDY, which was from 15 August 2014 to 14 August 2015, improved the financial inclusion in India significantly. Currently, the mission is in its second phase with a healthy progress report.

Table 1: Progress report - Jan Dhan Yojana

<table>
<thead>
<tr>
<th>Bank Type</th>
<th>Rural (million)</th>
<th>Urban (million)</th>
<th>Total (million)</th>
<th>Balance in Accounts (INR crore)</th>
<th>% of Zero Balance-Accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Sector Banks</td>
<td>108.7</td>
<td>85.3</td>
<td>194</td>
<td>34235.01</td>
<td>24.15%</td>
</tr>
<tr>
<td>Regional Rural Banks</td>
<td>35.9</td>
<td>5.8</td>
<td>41.8</td>
<td>7302.35</td>
<td>20.29%</td>
</tr>
<tr>
<td>Private Banks</td>
<td>5.2</td>
<td>3.3</td>
<td>8.6</td>
<td>1590.9</td>
<td>36.61%</td>
</tr>
<tr>
<td>Total</td>
<td>149.9</td>
<td>94.5</td>
<td>244.4</td>
<td>43128.25</td>
<td>23.93%</td>
</tr>
</tbody>
</table>

Source: PMJDY website as on 24 September 2016

The scheme also provided 190 million RuPay cards and 125.2 million accounts are linked with Aadhaar card.4
Other Programs

• Payments Banks: Payments banks are virtual banks that will provide banking solutions mainly through mobile phones rather than traditional bank branches. The Reserve Bank of India provided guidelines and licenses to 11 entities in August 2015 to work as payments banks. This is a step to counter the lack of physical banking infrastructure in India and will help in bringing more population under financial ecosystem through technology. For example, the India Post payments bank’s proposal was cleared with a budget of INR 800 crores which will open 650 operational branches by September 2017 and will scale-up further by 2018-19. The extensive outreach of the Department of Posts will boost the financial inclusion program.

• M-Banking: Many telecom operators are providing mobile based banking services in India for easy money transfer. The banking services such as M-Pesa are helping underdeveloped and developing African countries in financial inclusion.

• Micro-financing: Microfinancing initiatives in India such as Bandhan (Society and NBFC), Microcredit Foundation of India, Saadhana Microfin Society, Grameen Koota, etc. are bringing individuals as well as small and medium businesses under financial ecosystem.

• Digital Wallets: The digital wallets are rapidly gaining momentum in India due to mobile and data proliferation. With 12-15 digital wallet players, the mobile wallet market is expected to reach $6.6 billion by 2020 in India. Third-party mobile operators such as PayTM, Oxigen, MobiKwik are successfully providing services such as utility bill payment, phone and DTH recharge, shopping, etc. Some wallet operators have created platforms interoperable with IMPS (enabling instant transfers to bank accounts), offer peer-to-peer transfers via mobile apps and are working on physical cash-in, cash-out locations.

Challenges

The PMJDY mission is helping transform the socio-economic condition of the underprivileged citizens. Nevertheless, it faces many challenges that need attention and focussed efforts.

• Duplicate accounts: The rise of duplicate accounts under PMJDY is a worrying factor for banks. As per report by MicroSave, 31% of multiple account holders having a bank account under PMJDY are actively using alternate bank account. In multiple cases, single person has opened more than one account in different banks under the PMJDY mission. The absence of KYC norms resulted in many duplicate accounts.

• Dormant and zero balance accounts: As per a report by MicroSave, there are 28% dormant accounts (i.e. no transaction in the last three months) and 24.31% zero balance accounts. Rising dormant and zero balance accounts are causing concern to the banks as they hardly provide any return. Though public sector banks might find it sustainable, private sector banks do not find this a viable business proposition.

• Banking literacy: The lack of banking or financial literacy has been preventing many users to take advantage of these services. The transaction frequency and amount could be increased when people are aware of the schemes such as Suraksha Bima Yojana and Jeevan Jyothi Bima Yojana. There is a rising demand for Bank Mitra (bank correspondents) who are usually not properly trained with accurate knowledge, skill and attitude.

• Logistics: The government as well as private players need to work on offering more POS centers and ATMs to increase the frequency of transactions. There are 1 million POS, 160,000 ATMs and 1,15,000 bank branches in the country. 188 million RuPay cards have been issued to the public. While the demand has been created by issuing debit/credit cards, the logistics should be improved to meet the demand.
Digital: A revolution in the making in India
Aadhaar: Single Identity, Single Window

Citizen identity is an important aspect of effective governance. For a developing country like India with a population of 1.33 billion, wide geographical presence, and diverse culture, citizen identity helps in a two way communication between the government and public. It improves the relationship between the state and its citizens, and creates new avenues to redefine relations between the privileged and the less powerful in the society. Similar to the social security number in developed nations, the government of India is also attempting to establish an identification method by which every citizen is registered in the country. The government has taken up the Unique Identification Authority of India (UIDAI) initiative to provide a single identification to all the citizens, including children and infants. Aadhaar card is expected to act as a one-stop solution for citizen identity in India and empower the citizens by providing a digital platform to authenticate anytime and anywhere.

Program

The Unique Identification Authority of India (UIDAI) is a program started by the central government in 2009 in India with an objective to provide a 12-digit unique identity number called Aadhaar to each citizen. This number is mapped to the citizen's biometrics and demographic data. As on August 2016, the program has issued more than 1 billion Aadhaar cards to the Indian citizens.

Aadhaar Authentication Process

Aadhaar authentication helps a citizen to provide identity anytime, anywhere to avail different services in the country. In case of an Aadhaar authentication, the Aadhaar number along with the Aadhaar card-holder’s personal identity data is submitted to the Central Identities Data Repository (CIDR) for matching. CIDR verifies the correctness on the basis of the match.

Demographic matching: Demographic matching refers to the usage of Aadhaar authentication system for matching Aadhaar number and the demographic attributes such as name, address, date of birth, gender, etc. It helps in authentication in case of:

- Automated KYC checking in banks
- Address verification while availing a service such as telecom service, LPG, etc.
- Eliminates fake and duplicate identities

Biometric matching: Biometric matching is the use of Aadhaar authentication to match biometric attributes of a resident in the CIDR, thus providing authentic identification of the citizen. It is being used as authentication in case of:

- Identity verification in banks while opening new accounts or applying for loans
- Telecom service providers before issuing a new connection
- Identity authentication for better governance

One-Time-Password (OTP) based authentication: In this case, an OTP is sent to the registered mobile number of the resident seeking Aadhaar authentication. The resident shall provide the OTP during authentication, which is matched with the OTP in CIDR for authentication. OTP-based authentication is used in case of:

- Banks for authenticating customers during an internet banking transaction
- E-commerce companies before completing a cash-on-delivery transaction
Associated Programs
Aadhaar is being used as the important authentication parameter by many departments and service providers for efficient service delivery.

- **Pahal Scheme**: Through this scheme, the LPG consumer can link their Aadhaar details to the LPG account to get the subsidies directly deposited in their bank account. Due to the Direct Benefit Transfer (DBT), the government managed to save INR 14,672 crore by October 2015.11

**Figure 3: Aadhaar Achievements**

- **LPG Connections**
  Mar 31, 2014: 28.2 million
  Mar 31, 2016: 122.8 million

- **Ration Cards**
  Reached 114 million in March 2016
  from 12 million in 2014

- **MNREGA Job Cards**
  59 million cards has been issued by March 2016

- **NSAP Pension Schemes**
  9.5 million schemes linked with Aadhaar by March 2016

- **Epic Cards**
  310 million EPIC Cards have been linked with the Aadhaar card by 2016

Source: Ministry of communication & IT

- **Jan Dhan Yojana**: The Pradhan Mantra Jan Dhan Yojana (PMJDY) which has an objective to bring Indian citizens under the financial inclusion program uses Aadhaar as the only authentication document sufficient to open an account. Aadhaar eases the process of verification and helps in providing RuPay card, zero balance accounts, and insurance schemes to the citizens.

- **Acquisition of Passport**: Aadhaar card now helps citizens to get a passport in 10 days where police verification will be done at a later stage. Aadhaar number is now mandatory to get a passport in India.

- **DigiLocker**: The digital locker is a key initiative to provide citizens a shareable private space on a public cloud and making all documents / certificates available on this cloud by linking the 12-digit Aadhaar card number. Self-uploaded documents can be digitally signed using the eSign facility.

- **Digital Life Certificates**: The Digital Life Certificate i.e. Jeevan Pramaan is a biometric-enabled digital service for pensioners to provide easy, hassle-free seamless experience of getting the life certificates. With this initiative, the pensioner’s requirement to be physically present in front of the disbursing agency or the certification authority will become obsolete as their details can be digitally accessed by the agency through their Aadhaar Card numbers.
**Challenges**

Though there is good progress in Aadhaar card registration in India with more than 1 billion registration and 93% of adults (age > 18 years) having been registered, the project still needs to take care of a multitude of challenges. The privacy of individuals and national security are major challenges as the project deals with sensitive data like the demographics and biometrics of the citizens of the country. The reachability of Aadhaar in remote parts of India, availability of documents to register for Aadhaar, migrant population, participation of banks and private parties and the availability of required infrastructure for last mile connectivity are some of the major challenges.

- **Privacy and Security:** The UIDAI project collects and stores the demographic as well as biometric information of the citizens for authentication purpose. The rising issue of cyber security and theft is a major challenge for the storage, safety and privacy of the huge amount of sensitive data. The Aadhaar authentication links personal information to various databases maintained by banks, income tax offices, ration cards, electoral polls, airline and railway ticketing, internet and telecom service providers to name a few, which creates a huge concern for individual privacy and could compromise national security.

- **Migrants:** Three out of 10 people in India are internal migrants as per the UNESCO report “Social Inclusion of Internal Migrants in India”. The number of internal migrants may cross approximately 400 million according to Census 2011. Due to the massive migrating population, existing state policies have failed to provide legal or social protection to these people. In absence of proof of identity and residence, many people find it difficult to apply for Aadhaar cards and thus do not get the benefit of direct transfer schemes from the government.

- **Identification procedure:** The Aadhaar identification procedure requires proper identity and residential proof for Aadhaar registration. The lack of these documents allows a person to get an introducer to vouch for someone’s identity which is a weak link in the process. The carelessness during registration has resulted in duplicate records which weakens the authentication process and can lead to the misuse of this facility.

- **Lack of associated infrastructure:** The government has successfully issued Aadhaar cards to the citizens in the country but needs to improve access infrastructure such as bank branches, banking correspondents, ATM machines, POS, internet connectivity, etc. for comprehensive financial inclusion.
Mobile: Complementing the Traditional Channels

Mobile has become an integral part of life for almost everyone in the last decade. The evolution in communication technology is not only making life easier for the end users but also provides millions of opportunities for the government to connect to the citizens and provide better governance. Currently, India is the 2nd largest telecom market in the world with 1.05 billion subscribers out of which 1.03 billion use wireless means to communicate.\(^{15}\) There is an exponential rise in terms of internet users as well as smartphone users in the country.

The lack of banking infrastructure poses a serious problem mostly in rural India for getting money from banks to the last man. Only 27% of the villages have banks within 5 kms.\(^ {14}\) To address this banking infrastructure challenge in India, RBI has licensed 23 new banks including 2 universal banks, 11 payments banks and 10 small finance banks.\(^ {15}\) The high penetration of mobile phones provides appropriate solution to serve the rural population via payments banks. RBI is also pushing mobile banking option for other banks.

Program

Keeping in mind the successful initiatives of delivering financial services through mobile by many countries, the Government of India constituted an Inter-Ministerial Group (IMG) to create a framework for delivery of basic financial services using mobile phones in 2009. Mobile banking policies in India aim to enable funds transfer from an account in any bank to any other account in the same or any other bank (inter-operability) on a real-time basis irrespective of the mobile network the customer has subscribed to.

In June 2016, RBI released ‘Vision-2018’ for payment and settlement systems in India to encourage greater use of electronic payments by all sections of society so as to achieve a less-cash society. The vision seeks to create policies for mobile banking to facilitate faster payment services. It will enhance the options for customer registration for mobile banking services, enable wider access to mobile banking services in multiple languages for non-smartphone users, and encourage innovative mobile-based payment solutions. The National Payment Corporation of India (NPCI) has connected all the banks with mobile banking permissions and Telecom Operators offering GSM services through its USSD aggregation platform.

Initiatives

- **Mobile-based information:** The high mobile penetration in India has provided an opportunity for the government to send information to people directly. The registered mobile number acts as a last mile delivery to give important information to the end user. Citizens are able to get subsidy based information directly on their mobile phone rather than visiting a nearby bank. The government is also providing the information on various schemes by mobile phones for highest reachability.

- **Mobile-based booking system:** Registered mobile numbers are slowly becoming a one-stop solution for different government and private service booking. Citizens can book LPG gas, pay utility bills (electric bill, water bill, etc.), book train, and bus tickets directly from the mobile phone.

- **Transaction security:** Mobile phones are being used as authentication devices in case of banking activities, financial transactions like fund transfer, online payments, etc. The OTP service helps authenticate the transaction.

- **Apps enabled by government:** The Digital India initiative has developed multiple easy-to-use apps to provide information to the targeted segment of the population. These applications also help in a two-way communication as it works as a citizen grievance system and takes feedback from the public. For example, MyGov, mPassport Seva, mobile seva, Kisan svidha, etc. are working on providing information directly to the end users.

Challenges

Mobile phones provide a one-stop solution for last mile delivery but the price war in the Indian telecom sector and the intense competition brings new challenges to the last mile solution of JAM trinity.

- **Customer authentication:** Though there are strict rules on background verification while allotting a SIM card in India, most of the rural and semi-urban areas do not follow the regulation and SIM cards are available without prior verification. This will create a problem while authenticating a person from the mobile number and may increase duplication.

- **Literacy:** Mobile literacy is one of the biggest challenges as most of the rural population uses mobile phones for voice-based calls only. To bring mobile as a last mile delivery platform, the government needs to educate people on how to avail services and understand the information on mobile phones. In addition, the applications and messages should be in local languages and easy to understand and use for common man.
Recommendations
The economic growth of the largest democracy in the world in the last few years has been highly commendable. Yet the country is known to be one of the poorest in the world. Corruption, malnutrition, unemployment, and poor literacy rate are the biggest barriers in India’s growth. A sustainable long-term growth is not possible when the gap between rich and underprivileged is wide. To achieve sustainable economic growth, the country needs to focus on the socio-economic development of the underprivileged. The JAM trinity is a great initiative that aims to increase the effectiveness of welfare measures by making use of available technology. It is an attempt to improve the subsidy regime by bringing underprivileged citizens into the financial ecosystem. The seamless integration between Jan Dhan, Aadhaar and Mobile will help in direct benefit transfer to the people and remove intermediaries.

Data privacy: Security and privacy of sensitive data (i.e. Biometrics and Demographics) is a big challenge. The Central ID repository is the single location where the personal data is stored. With full-fledged launch, large databases will be created to provide access to different government as well as private organizations such as banks, e-commerce companies, etc. and is prone to falsification, misuse, etc. As per the agreement various collection agencies in the form of registrars, sub-registrars and enrolment agencies across India will collect the details of the residents and pass them in batches to the CIDR. The involvement of registrars, sub-registrars for aggregation of the data puts a question mark on the integrity, authenticity and security of this data. The government should provide extra efforts to protect this data and take necessary steps to ensure the authenticity of data entered in the CIDR.

Improve interoperability: The efficient service delivery demands an interoperable ecosystem. Innovative delivery channels such as mobile banking, digital wallets, etc. need to enhance the interoperability between banks and non-banking service providers to create an efficient payment system. Biometric and demographic identification needs to integrate with credit information and credit bureaus to build an effective credit system to help citizens obtain loan at reasonable cost as well as avoid bad debts.

Priority to financial literacy: Financial literacy is equally important as the access to institutional finance to empower a citizen. Financial literacy will create a new knowledge-empowered generation and will encourage citizens to raise their voice against corruption, black marketing, informal lending, etc. While classroom-based medium of financial education is expensive and lacks customization, the interactive way of delivering financial education via Banking Correspondents (BCs) with the help of ICT is more efficient and effective to reach target audience. Integrating BCs into the banking business model will help in spreading financial literacy to rural and unprivileged citizens. With proper remuneration, training and skills, BCs can spread the banking knowledge to a mass population. Samwad is an interactive platform for financial literacy and uses ICT technologies such as SMS, IVR and mobile applications to deliver the subject in different languages to different demographics.

Encourage private participation: Private participation of banks and non-banking sectors will speed up the process of financial inclusion effectively. However, the private participation is low in Jan Dhan Yojana due to many dormant and no-frills account. The private banks find it difficult to sustain a business model where return is low and operating cost is high. The break-even cost per account is INR 120 and Jan Dhan accounts do not seem to provide much return. Issues with distribution of territory to open Jan Dhan accounts where there are no penetration of private bank branches is another reason for low participation. There is an urgent need to encourage the private banks for Jan Dhan participation by resolving these issues.

Infrastructure readiness: The lack of infrastructure in the last mile is a big challenge for the success of the program. The lack of physical banking infrastructure space can be fulfilled by ATMs and POS machines in the rural and remote India to encourage transaction related activity. Government, banks, payments banks, and mobile operators should make sure that there is enough infrastructure at place for a successful last mile connectivity.
Digital: A revolution in the making in India
4G, Fiber and Satellite: Providing Seamless Connectivity

Current State of Broadband
Broadband internet has emerged as one of the key driving forces of development in the 21st century. Many countries have actively included broadband development in national policies. Benefits of broadband are not confined only to social needs but are also widely realized in economic and environmental aspects as highlighted in figure 4.17

Figure 4: Benefits of broadband
### Data landscape in India

#### Table 2: Data usage by device

<table>
<thead>
<tr>
<th>Number of users per device type</th>
<th>Technology</th>
<th>Applications</th>
<th>Data consumption per month (in PB)</th>
<th>% usage in India</th>
</tr>
</thead>
<tbody>
<tr>
<td>698 million</td>
<td>2G</td>
<td>• E-mail&lt;br&gt;• Social networking apps&lt;br&gt;• Web browser apps</td>
<td>38</td>
<td>27%</td>
</tr>
<tr>
<td><strong>Feature phone</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>220 million</td>
<td>2G/3G</td>
<td>• Mobile video streaming/gaming&lt;br&gt;• Location based apps&lt;br&gt;• Social media apps&lt;br&gt;• Shopping apps</td>
<td>81</td>
<td>57%</td>
</tr>
<tr>
<td><strong>Smartphone</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 million</td>
<td>3G</td>
<td>• Mobile video streaming/gaming&lt;br&gt;• Reading apps&lt;br&gt;• Shopping apps</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Tablet - cellular</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 million</td>
<td>EVDO/3G</td>
<td>• E-mail&lt;br&gt;• Video streaming&lt;br&gt;• Lifestyle/social media websites</td>
<td>8</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Dongle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 million</td>
<td>Wi-fi/Wi-Max</td>
<td>• Lifestyle/social media websites&lt;br&gt;• Location based websites</td>
<td>15</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Wired &amp; Fixed wireless</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Nokia MBiT, Ericsson, TRAI, Deloitte Research
India has grown by leaps and bounds in the ICT space in the past 20 years. Growth in mobile voice telephony drove much of the development in the last decade. Broadband internet is the current engine of growth in telecommunications in India and rest of the world. As highlighted in table 2, among all internet-connected devices, mobile handsets dominate data landscape in India. With falling prices of smartphones, there is an increasing substitution of feature phones by smartphones. Going forward, smartphones are expected to play a significant role in data demand.

As highlighted in figure 5, fixed-line broadband accounts for ~11% of broadband subscribers in India, while wireless broadband accounts for ~89% of broadband subscribers.

**Broadband delivery**

Delivery of broadband involves various components and technologies used at various stages of the internet value chain as highlighted in figure 6. They are broadly divided into broadband wholesale infrastructure connectivity services and broadband access services.

**Figure 6: Broadband delivery value chain**

<table>
<thead>
<tr>
<th>Wholesale Infrastructure &amp; Connectivity Services</th>
<th>Value Chain</th>
<th>Retail Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undersea Cables</td>
<td>Backhaul (FTTT)</td>
<td>Retail Services</td>
</tr>
<tr>
<td>National Long Distance</td>
<td>Enterprise Connectivity</td>
<td></td>
</tr>
<tr>
<td>Domestic Transmission</td>
<td>SME Connectivity</td>
<td></td>
</tr>
<tr>
<td>Connect to Submarine Cables</td>
<td>Access Services</td>
<td></td>
</tr>
</tbody>
</table>

**Dominant Technology**

- Fiber
- Fiber
- Fiber
- Micro-Wave
- Fiber
- 3G/LTE
- 3G/LTE

**Competing Technologies**

- Copper
- Microwave

**Fiber Growth Potential**

- High demand for bandwidth
- Future proof
- High demand for bandwidth
- Reliability and uptime
- Increase in bandwidth demand
- Reliability
- Demand for bandwidth
- Higher SLAs
- Reliability, uptime & security
- Future proof
- Medium to high Bandwidth requirement
- Future proof
- Medium to high Bandwidth requirement
- Future proof

Source: Deloitte Research
**Broadband wholesale infrastructure and connectivity technologies:** As highlighted in figure 6, optic fiber has emerged as the dominant technology in deployment of broadband wholesale infrastructure and connectivity. Hence, investment in optic fiber, especially for deployment in national backbone and backhaul, is essential for supporting broadband fixed-line and wireless access technologies.

**Broadband access technologies:** With the evolution of fixed-line technologies and liberalization of spectrum usage in India, a number of broadband access technologies are being used today for fixed-line and wireless broadband services.

**Wireless broadband - 3G and LTE/4G:** With the advent of wireless broadband and smart devices such as smartphones, tablets and dongles, there has been a paradigm shift in data consumption behavior of internet users in India and across the world in the past six to seven years. With 89% share of subscribers, wireless has emerged as the most dominant broadband access method used in India, driven by a number of factors highlighted in figure 7.

**Figure 8: Drivers of wireless broadband in India**

- **Availability**
  - Expanding 3G & 4G coverage
  - RoW issues faced by ISPs in expanding fixed-line coverage

- **Mobility**
  - Changing data consumption behavior
  - Rising usage of phone applications 'on-the-go'

- **Data Affordability**
  - Falling data prices
  - Rising use of bandwidth intensive applications

- **Device Affordability**
  - Reducing average smartphone prices

Source: Deloitte Research
Wireless broadband is well-positioned to drive India’s broadband penetration going forward due to the factors mentioned above. As highlighted in figure 9, 4G can become dominant technology in case of high data usage scenario.

Figure 9: Wireless subscriber base by technology (million)

**Base case scenario**
- 3G would remain more dominant than 4G

**Medium data usage scenario**
- By 2020, 3G and 4G technology would be equally dominant, post which 4G can dominate

**High data usage scenario**
- By 2017, 4G users would be more than 3G users due to significant increase in supporting devices and better network coverage

Source: Deloitte Research
• **Digital Subscriber Line (DSL):** DSL accounts for nearly 70% of wired internet access.

• **Fiber to the Home / Enterprises (FTTH):** As highlighted in figure 10, FTTH currently accounts for only 0.5% of fixed-line access. Developed economies like UK and OECD countries are aiming at broadband speeds of 100+ Mbps. As bandwidth consumption in India reaches OECD levels, alternate fixed-line technologies might be needed to fulfill those needs.

• **VSAT:** Satellite internet access is relatively expensive compared to other contemporary technologies and is only suitable for internet access in remote locations where other forms of internet connectivity are ruled out. Satellite communications so far have been used only in enterprises. In addition, regulation allows only the use of satellites launched by ISRO for satellite communication. Procurement of satellite capacity on foreign satellites through Department of Space often results in delays. There is a need to open the sector to private players.

• **Wi-Fi:** Wi-Fi is used prolifically at homes and business establishments alike for providing wireless internet access typically through fixed-line broadband service. It can be a significant enabler in providing connectivity to remote and rural areas in India, which are otherwise unviable for other fixed-line and wireless technologies. Wi-Fi offloading helps reduce data load on cellular networks by interworking with cellular network and using Wi-Fi access point to deliver data to the user.

• **Advanced Wireless Services (AWS):** AWS refers to the next phase of mobile telecommunications that goes beyond the LTE standards and provides data access at speeds higher than 4G. Telcos and tower companies in India will have to ramp up fiber connectivity to towers to do the ground work in preparation of 5G, which will require significant capital investment.

**Figure 10: Fixed-line technologies in India**

New internet technologies are being developed and tested that have the potential to provide innovative means of internet access in rural and remote areas where other infrastructure cannot be deployed. Project Loon and Television White Space (TVWS) are two such key technologies. Project Loon provides high-speed cellular internet coverage by setting up a network of helium balloons floating in stratosphere and setting up a radio link between the helium balloons and ground based stations. TVWS refers to unused TV channels between active ones in the VHF and UHF spectrum. TVWS signals can penetrate foliage and works well in difficult terrain. These can be used for wireless internet transmission in remote and hilly areas.
Challenges
Every broadband technology is supported by five network components – access, backhaul, domestic transmission, national long distance, and international long distance. As highlighted in table 3, the choice of connectivity medium for every network component is largely governed by data volume, data speeds, and other requirements of the technology.

Table 3: Network components to support broadband technologies

<table>
<thead>
<tr>
<th>Technology</th>
<th>Access</th>
<th>Backhaul</th>
<th>Domestic Transmission</th>
<th>National Long Distance</th>
<th>International Long Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE/4G</td>
<td>IP Microwave (eNode B)</td>
<td>IP Microwave/Fiber (FTTT)*</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
</tr>
<tr>
<td>3G</td>
<td>IP Microwave (Node B)</td>
<td>IP Microwave/Fiber (FTTT)</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
</tr>
<tr>
<td>AWS/5G</td>
<td>IP Microwave</td>
<td>Fiber (FTTT)</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
</tr>
<tr>
<td>DSL</td>
<td>Copper</td>
<td>Fiber/Copper</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
</tr>
<tr>
<td>FTTx</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
</tr>
<tr>
<td>Wi-Fi</td>
<td>IP Microwave (UBR)</td>
<td>Fiber/Copper</td>
<td>Fiber</td>
<td>Fiber</td>
<td>Fiber</td>
</tr>
<tr>
<td>VSAT</td>
<td>Satellite</td>
<td>Satellite</td>
<td>Satellite</td>
<td>Satellite</td>
<td>Satellite</td>
</tr>
</tbody>
</table>

* Pre-dominantly fiber is used in backhaul

Optic fiber connectivity has emerged as the most optimal choice for domestic transmission, national backbone and for international connectivity. While there have been significant developments in India in fixed-line and wireless broadband in the past 10 years, we are faced with a number of challenges on our way to realizing the 'Digital India' vision.

The slow pace of fiber deployment can create impediments in multiple growth initiatives as highlighted in figure 11:

Figure 11: Potential challenges arising from slow broadband deployment

- Can slow down the start-up ecosystem
- The digital disconnect between India and China will rise
- Future broadband access technologies like 5G will not be successful as they are hinged on complete backhaul fiberization
- Top government programs aimed at financial inclusion like Aadhar and Direct Benefits Transfers will not get fulfilled
- Implementation of GST across India will be difficult
- Overall consumer broadband experience will not improve
- The ‘Make-in-India’ initiative which is expected to evolve to become robotics based will suffer
- The smart cities initiatives will get delayed

Source: Deloitte Research
Broadband speed definition
According to Akamai, the global average internet connection speed was 6.3 Mbps in first quarter of 2016, whereas average speed in India stood significantly lower. India ranks 114 out of 189 countries worldwide in internet speeds. The NTP-2012 defines minimum broadband download speed of at least 512 Kbps. Various industry leaders have highlighted the urgent need for increasing the minimum broadband speed to at least 2 Mbps, and the importance of a scalable backbone network infrastructure which can support higher speeds in future. Hence, there is a need of an updated definition of broadband for implementation of digital services such as e-governance, smart cities, delivery of mobile video and mobile banking that define the Digital India vision.

Low investment in fiber
Fiber is critical to drive various broadband technologies including wireless. Yet, India continues to remain highly under-fiberized, with cumulative fiber-deployed-to-population ratio at ~0.1x (v/s US: 1.2x and China: 0.7x) and only ~20% of towers (for incumbents) currently fiberized v/s the required ~70-80% required to support 4G today and 5G in future. As highlighted in figure 12, India stands far behind developed countries and some of the major developing countries in fiber deployment.

Figure 12: Population vs Fiber deployment

Most telcos are not left with significant financial resources to make heavy investment in fiber after paying for expensive spectrum along with other statutory charges.
Policy and Implementation challenges
Policy and implementation challenges have been identified in deploying broadband network infrastructure through discussion with industry experts. These can broadly fall in the following categories highlighted below:

- **Policy**
  - **Clarity on licensing for digital infrastructure roll-out**: Currently IP-1 Government policy is a key lever which can accelerate the pace of broadband infrastructure roll-out. Policy needs to tap into potential of all ecosystem players to drive roll-out of digital broadband infrastructure. Roll-out by Telcos and ISPs are primarily driven by demand and return potential. Telco infrastructure players have a key role to play and can potentially form the fulcrum to drive broadband infrastructure roll-out at a faster pace. Currently IP-1 licenses put a restriction on portfolio of infrastructure player to only passive infrastructure. However, end-to-end digital infrastructure includes both passive and active components which are more closely integrated like in case of micro-sites, fiber, small cells, distributed antenna systems etc. This has hindered potential roll-out benefits from being realized which were done in the case of roll-out of voice networks. Infrastructure players are reluctant in deploying digital infrastructure due to fear of being subjected to licensing costs and associated rules. The government can ease policy to enable faster roll-out.

- **Implementation**
  - **Efficient & sustainable roll-outs**
    - **Inter-play between various technologies**: The government should have clearly defined policy for using various technologies depending upon demand and investment requirements.
    - **Standardization**: Lack of GIS mapping and route planning has resulted in non-traceability of sections of existing fiber deployed and incorrect network topology, respectively. Technical standards have not been followed due to lack of technical skills of ground-level workers. There is lack of guidelines and legislation to have mandatory provision of ducts for fiber deployment in buildings.
  - **Use of other infrastructure**: OFC deployment has largely been expensive and inefficient as considerable costs are involved in obtaining permits and right of way. Lack of awareness and absence of government policies around ‘dig once’ have resulted in high cost of OFC deployment.
  - **Bottlenecks in network roll-out**
    - **Rights of Way (RoW)**: There is lack of standard guidelines for RoW process in India due to disagreement between Center, States, and municipalities. In addition, there is lack of standardized charges for RoW approvals as States and municipalities view broadband network deployment as source of revenue which leads to huge variation in RoW charges from place to place. Finally, there is lack of SLAs for time bound RoW decisions, which leads to delays in deployment and time over-runs in projects.
    - **Others**: For wireless network deployment, clearance is needed from multiple entities such as SACFA and Term Cell, which can result in penalties and impediments in network roll-out. There is lack of Center’s/DoT’s involvement in providing solutions to local impediments in network roll-out.

- **Financing**
  - **High cost of debt and low liquidity**: Most telcos are already under a lot of debt taken to finance the spectrum acquisitions in the recent auctions. Revenue sharing and meeting debt obligations have resulted in low liquidity and high cost of debt. This has also hindered the pace of broadband infrastructure roll-out in India.

Low rural demand for broadband
The success of many initiatives targeting growth in rural areas is hinged on demand for broadband, which has remained low. A number of factors have contributed to low demand for broadband data in the rural areas as highlighted below:

- **Lack of digital literacy and awareness**: The computer literacy rate in India was reported as 6.5% in 2012.21 Low digital literacy, especially in rural areas has led to low awareness of internet and lack of skills to access internet and make use of broadband services.
- **Limited affordability of device and data**: Though prices of smartphones, which have now become the anchor devices for a majority of users, have declined in the past few years, they still are fairly high for low-income users. Similarly, we have seen a decline in data prices. This has driven adoption of mobile internet in urban areas. However, prices of smartphones and broadband data will have to reduce further to drive adoption and usage in semi-urban and rural areas.
- **Lack of relevant content**: A major barrier to adoption of broadband in both urban and rural areas in India has been the lack of relevant content for public. For a vast section of population, many G2C services are absent and even in areas where they are present, their usability is low, especially on small screens.
**Recommendations**

The challenges identified on the demand and supply fronts of high speed broadband need to be addressed suitably to realize the vision of digital India. Some of the broad recommendations that can address the barriers are discussed below:

| Technology choice for broadband infrastructure | • Evaluating technical characteristics for each type of infrastructure  
• Network dimensioning on the basis of demand and demographics |
| Policy changes to promote deployment of infrastructure | • Upgrading broadband definition  
• Policy to encourage infrastructure players to deploy broadband  
• Policy on Rights of Way |
| Increasing broadband infrastructure investment | • Increasing investment in broadband network deployment  
• Incentives for private players to invest in rural infrastructure |
| Improving implementation of broadband infrastructure | • Ensuring efficient & sustainable network roll-outs  
• Role of government and other players in implementing broadband infrastructure |
| Demand measures to drive broadband adoption & consumption | • Increasing digital literacy and awareness  
• Increasing affordability of data  
• Creating relevant content & services |

Source: TRAI Performance Indicator Report-March 2016, Deloitte Analysis
Digital: A revolution in the making in India

Technology choice - broadband
There are major technical characteristics to be considered leading to the best-fit solution for each type of infrastructure as highlighted in figure 14:

Figure 14: Technology considerations for fixed and wireless solutions

<table>
<thead>
<tr>
<th>Fixed Solution</th>
<th>Throughput (DL)</th>
<th>Protocol</th>
<th>Robustness</th>
<th>CAPEX</th>
<th>Scalability</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTx (GPON)</td>
<td>&gt; 1 Gbps</td>
<td>IP</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>xDSL (vDSL2)</td>
<td>&lt; 300 Mbps</td>
<td>ATM/IP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFC (DOCSIS 3.0)</td>
<td>&lt; 400 Mbps</td>
<td>IP</td>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BPL</td>
<td>&lt; 500 Mbps</td>
<td>IP</td>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wireless Solution</th>
<th>Throughput (DL)</th>
<th>Bandwidth</th>
<th>Range</th>
<th>CAPEX</th>
<th>Robustness</th>
<th>Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE/LTE – A</td>
<td>&lt; 100/300 Mbps</td>
<td>1,4 – 20 MHz</td>
<td>5 – 100 km</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>Satellite</td>
<td>&lt; 24 Mbps</td>
<td>1 – 40 MHz</td>
<td>100 – 6000 km</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>Wi-Fi (802.11ac)</td>
<td>&lt; 433 Mbps²</td>
<td>20 – 160 MHz</td>
<td>35 – 115 m (indoor)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>DC-HSDPA +</td>
<td>&lt; 84 Mbps</td>
<td>5 – 20 MHz</td>
<td>&lt; 50 km</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
</tbody>
</table>

Legend: Better | Average | Worst

Notes: (1) If infrastructure already existent; (2) type AC600, 5 GHz band
Source: 3GPP specifications, ITU specifications, IEEE specifications

Best Fit Solution

- FTTx (GPON) ➤ Extreme reliability, high throughput, future proof technology
- xDSL (vDSL2) ➤ Proven, cheaper to adopt and maintain technology
- LTE ➤ High throughput, good legacy interoperability, high mobility technology
- Satellite ➤ Global coverage, severe conditions appropriate technology

Source: Deloitte Research
Technology choice is also significantly influenced by demand. Network infrastructure is dimensioned on the basis of demographic information and broadband demand forecasts. Services to be provided should be defined along with definition of each network layer i.e. last mile, access, backhaul, and core.

Figure 15: Demand clusters and technology mapping

Source: Deloitte Research
Policy changes - Broadband

• **Upgrading broadband definition:** Increasing minimum broadband speed definition will have significant positive impact on the broadband experience of users. In the long term India should aim to achieve broadband speeds at the level of those in OECD countries. The minimum broadband download speed should increase to 2 Mbps soon.

• **Policy to encourage infrastructure players to deploy broadband:** Infrastructure players should be allowed to deploy end-to-end digital infrastructure necessary for supporting broadband without subjecting them to licensing rules and costs that would otherwise make infrastructure deployment cost inefficient.

• **Policy on Rights of Way:** The three critical issues in RoW centered on uniformity of procedure, cost and timelines should be addressed through policy actions:
  - The central government should create guidelines towards a standard process for obtaining RoW for laying fiber, which should be followed by all agencies.
  - Standard charges for RoW should be put in place for all agencies. This will help control RoW costs in laying optic fiber.
  - Introduce SLAs to ensure time-bound decisions on grant of RoW. This will help in avoiding delays in Fiber deployment.

It is also important to ensure that there is agreement between the Center, States and municipalities so that the RoW policies are implemented at the ground level.

Increasing broadband infrastructure investment

• **Increasing investment in broadband network deployment:** Investment in broadband network in India’s investment levels are low in comparison to other countries, as highlighted in figure 16. Considering the limited financial resources with telcos in India after paying for spectrum, government investment in broadband network deployment should be comparable to that of some of the leading developed and developing countries.

![Figure 16: Broadband infrastructure investment ($ Billion)](source: TRAI, Deloitte Research)

- **Investment should increase in broadband infrastructure deployment**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>NOFN estimates</td>
<td>USA NBP</td>
</tr>
<tr>
<td>NOFN committee revised</td>
<td>France NBP</td>
</tr>
<tr>
<td>China</td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>11.00</td>
</tr>
<tr>
<td>15.91</td>
<td>27.00</td>
</tr>
</tbody>
</table>

Source: TRAI, Deloitte Research

• **Incentives for private players to invest in rural infrastructure:** Incentives could be provided to them by reducing USOF obligations or through other innovative revenue sharing methods to cover rural connectivity. For example, implementation adoption models could be used, where operators are asked to adopt rural areas/gram panchayats for deployment of broadband infrastructure against discounted USOF payments.
Improving implementation of broadband infrastructure

• Ensuring efficient and sustainable network roll-outs
  – Fiber deployment standards: Sustainable fiber deployment should ensure that all technical standards regarding route planning, GIS mapping and laying fiber are documented and followed. Adequate training should be imparted to ground-level workers for this.
  – Creating utility corridors and ‘Dig Once’ policy: There should be mandatory creation of utility corridors along the medians of highways. This is an efficient way of deploying fiber along highways as it avoids repeated digging up for deploying fiber.
  – Fiber deployment with other utilities: With increasing focus on minimizing cost of fiber deployment, deploying it with other utilities where feasible is the most efficient approach as additional costs are minor and no separate RoW approvals are needed for laying fiber.

• Role of government - implementing broadband infrastructure.
  Where government is deploying broadband network:
  – The center should conceptualize network and allow States to execute the network, on lines of Power.
  – Governments should partner with managed services players to deliver network efficiently, and thereafter maintain it on an end-to-end basis.

Demand measures for broadband

In addition to investment in supply side measures to deploy and strengthen broadband network infrastructure, the government should take adequate steps to generate demand for broadband, especially in semi-urban and rural areas.

• Increasing digital literacy and awareness: Addressing digital literacy and increasing awareness will help drive adoption of broadband. Towards this objective the government has launched National Digital Literacy Mission (NDLM) which aims at imparting IT training to 5.25 million people. The program should be further strengthened through the involvement of private players.

• Increasing affordability of data: The government could increase the affordability of data by introducing subsidies for mobile broadband in rural areas. The subsidies could be planned for the short-term, until data prices reduce sufficiently.

• Creating relevant content and services: The state has to play an important role in creating digital content and services relevant for the use of public in urban and rural areas. It will be important that the digital content is available in local language for generating public interest. As more government services will be delivered online in urban and rural areas, broadband adoption will increase.

Apart from the existing solutions, emerging internet technologies like Project Loon and TVWS, discussed earlier, should be taken into account to provide innovative solutions to India’s broadband demand and supply side challenges.
Technology Innovation: Boosting Rural, Women, Governance

In 70 years of our independence, in spite of the constraints and challenges we faced in managing such a densely populated and diverse country, we made considerable progress in addressing key issues in public health, sanitation, primary education, rural development, and various social development measures, without large scale adoption of Information and Communication Technologies (ICT). As we embark on the digital journey to enable next phase of economic growth by efficiently adopting the latest technology innovations in mobility, analytics, cloud, and Internet of Things, a key question that arises is whether such large-scale investments in technology are necessary. To appreciate this, we need to understand the way in which our country has evolved in the past 25 years.

India over the past 25 years has seen tremendous economic growth, thanks to the economic reforms initiated in 1991. The country’s GDP growth rate in 2015 was pegged at 7.57% a sea change from the ~1% growth rates witnessed in 1991. The relaxation of import restrictions and the opening up of the Indian economy to foreign investors, saw significant foreign capital in key sectors such as infrastructure. By 2015 India became the world’s leading foreign investment destination in the world.

The demography of India presents a unique opportunity, unmatched by any country in the world. As per Census 2011 data, 64.9% of the country’s population is between 15 and 64 years. Further, the median age is just 26.2 years, one of the youngest in the world. India has also seen significant migration to urban cities over the past two decades. The share of urban population has grown from 25.7% in 1991 to 31.2% in 2011. While the population growth over the 2001-11 decade was 17.69%, urban population grew at 31.8%.

The growth and demographic dividend present an unprecedented opportunity for India in the global economy in the coming decades. As India becomes a thriving market for goods, services, and talent, there also arises new set of challenges in managing the growth, in a sustainable manner, with efficient use of resources.

- **Robust consumer sector** - India’s consumer market is expected to grow 3.6 times from 2010 to 2020. Of the sectors that comprise this market, education and leisure is expected to grow four-fold reaching $296 billion by 2020.

- **Thriving market for talent** - Almost one-half the Fortune 500 companies will be based in an emerging market.

- **Rapid urbanization** - India will be 38% urbanized by 2025, with eight high-performing states to contribute 52% of incremental GDP. It is expected that just 49 metropolitan clusters will account for about 77% of India’s incremental GDP, 72% of its consuming-class households, and 73% of its income pool from 2012 to 2025.

Governing such a rapidly changing economic and social landscape and providing opportunities for increasingly aspirational people to realize their dreams require continuous investments in physical, digital, and policy infrastructure.
In this context, investments in technology assumes significance. ICT is an important tool to effectively manage economic growth and social development in a sustainable manner, which requires harmony among economic progress, social inclusion, and environmental protection. The United Nations (UN) encourages member states to utilize ICTs in designing public policies and providing public services, as they embark on the 2030 agenda for sustainable development through Sustainable Development Goals (SDG). The foundations of sustainable development include a professional, responsive, and ethical and ICT-enabled public administration.28

There is a correlation between e-governance and global competitiveness of countries, as we can understand from the World Economic Forum in its Global Competitiveness Report 2015-201629. The countries that have a good position in e-government development are more competitive. While correlation is not causation, it is fairly practical to assume that the competitiveness of economy is driven by the factors conducive to progress in the economy, and a high level of technical capability and adoption of technology in public and private sector has a positive effect on the overall economy. E-government brings about new business models and revolutionizes industries, paving the path for future innovations that can drive long-term growth.30

Other advantages include - improved convenience for citizens, reengineered and improved back-end processes and services, improved robustness of delivering large scale welfare measures, and cost reduction.31

One of the key benefits of implementing ICT solutions for governance is the higher degree of transparency and efficiency that it brings in citizen services.

The United Nations Department of Economic and Social Affairs (UNDESA), in its flagship publication, benchmarks e-government development achieved by the UN member states. The survey uses a performance rating to provide an indicative assessment of the diffusion of e-government of national governments, relative to one another. Countries in the survey are grouped into four categories, depending on their E-Government Development Index (EGDI). As compared to the numbers in the 2014 UN survey, the trend signals that more countries are advancing toward higher levels of e-government.

In the 2016 survey, India’s EGDI ranking falls within the third category, grouped as Middle-EGDI (between 0.25 and 0.5), along with 66 other countries, while the global average EGDI is 0.49. The total list is topped by the UK, with an EGDI score of 0.919. As we embark on our digital journey, we should learn from the successful implementations from around the world and adopt their best practices.
Dementia is widely recognized as a public health priority. Although there is no cure for the disease, ICT enables individuals to get an earlier, more accurate diagnosis and personalized treatment. The EU has funded project Dem@Care that uses smart mobile sensors to monitor health parameters, emotional and cognitive status of users, and activity levels. Using this innovation, hospitals and public health institutions can provide a more timely diagnosis and optimized personalized care solutions. 11 academic and industrial partners from all over Europe are a part of this program, and have been working since 2012 to improve differential diagnosis and create effective interventions for people afflicted with dementia in various settings.

The city of Rio has leveraged ICT to better the data collection system and coordinate its city services in real time. The city’s multiple sectors, including transportation, energy, public safety, health, and communications, are monitored by staff from 30 different municipal sectors. The operation center was established to improve the city’s emergency response system following the troubles faced in the 2010 floods. Essential data is obtained, with the help of Big Data analytics, with important information such as weather forecasts, so that officials can respond to problems in a timely and multi-sectoral, integrated manner.

Uzbekistan faced issues related to an insufficient number of people paying for communal and housing services. It was noticed that one of the key reasons for this problem was the lack of information about how much to pay and for which services. The Uzbekistan government released a website that provides essential information and includes a handy tariff calculator to assist in payments and check the accuracy of bills. A feedback mechanism is incorporated into the website, in the form of a discussion forum where members discuss problems encountered daily.

Table 4: Best practices from the world

<table>
<thead>
<tr>
<th>European Union</th>
<th>Rio de Janeiro</th>
<th>Uzbekistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia is widely recognized as a public health priority. Although there is no cure for the disease, ICT enables individuals to get an earlier, more accurate diagnosis and personalized treatment. The EU has funded project Dem@Care that uses smart mobile sensors to monitor health parameters, emotional and cognitive status of users, and activity levels. Using this innovation, hospitals and public health institutions can provide a more timely diagnosis and optimized personalized care solutions. 11 academic and industrial partners from all over Europe are a part of this program, and have been working since 2012 to improve differential diagnosis and create effective interventions for people afflicted with dementia in various settings.</td>
<td>The city of Rio has leveraged ICT to better the data collection system and coordinate its city services in real time. The city’s multiple sectors, including transportation, energy, public safety, health, and communications, are monitored by staff from 30 different municipal sectors. The operation center was established to improve the city’s emergency response system following the troubles faced in the 2010 floods. Essential data is obtained, with the help of Big Data analytics, with important information such as weather forecasts, so that officials can respond to problems in a timely and multi-sectoral, integrated manner.</td>
<td>Uzbekistan faced issues related to an insufficient number of people paying for communal and housing services. It was noticed that one of the key reasons for this problem was the lack of information about how much to pay and for which services. The Uzbekistan government released a website that provides essential information and includes a handy tariff calculator to assist in payments and check the accuracy of bills. A feedback mechanism is incorporated into the website, in the form of a discussion forum where members discuss problems encountered daily.</td>
</tr>
</tbody>
</table>
Current Status in India
Governance Redefined
In India, e-governance initiatives have evolved over a period of years through various projects launched by the center, and state governments. Successful projects include computerization of railway reservation, digitization of land records in Karnataka - Bhoomi project, electronic payment of pensions and subsidies, digitization of passport seva kendras, Aadhaar-based Direct Benefit Transfer, and many others.

The framework for e-governance during the last decade was defined by the National eGovernance Plan (NeGP), approved in May 2006. With a vision to make all government services accessible to the common man in the locality, through common service delivery outlets, ensuring efficiency, transparency, and reliability of services at affordable costs, NeGP comprised 31 mission mode projects and 8 components. Mission mode project is an individual project that focuses on one aspect of e-governance, such as banking, land records, or commercial taxes, etc. Such projects have clearly defined scope, implementation timelines, measurable outcomes, and service levels. 31 mission mode projects were further classified as central (Banking, Insurance, Passport, MCA21, UID, Income tax, etc.) state (Agriculture, Land records, PDS, Education, Health, etc.) or integrated projects (e-Biz, e-Courts, e-Procurement, etc.)

To provide the core infrastructure necessary to support NeGP, various initiatives such as State Data Centers (SDCs), State Wide Area Networks (S.W.A.N), Common Services Centers (CSCs) and middleware gateways i.e. National e-Governance Service Delivery Gateway (NSDG), State e-Governance Service Delivery Gateway (SSDG), and Mobile e-Governance Service Delivery Gateway (MSDG) have been developed over the years.

In 2015, NeGP, and various other initiatives aimed at providing ICT-based governance and citizen services were unified under Digital India program, which provides a more integrated approach for planning and development of digital infrastructure and services.

<table>
<thead>
<tr>
<th>Digital Infrastructure as a Core Utility to Every Citizen</th>
<th>Governance and Services on Demand</th>
<th>Digital Empowerment of Citizens</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Availability of high speed internet</td>
<td>• Seamlessly integrated services across departments / jurisdictions</td>
<td>• Universal digital literacy</td>
</tr>
<tr>
<td>• Unique digital identity</td>
<td>• Real-time services (online / mobile)</td>
<td>• Universally accessible digital resources</td>
</tr>
<tr>
<td>• Mobile phone and bank account</td>
<td>• All citizen entitlements portable and available on cloud</td>
<td>• Availability of digital resources / services in Indian languages</td>
</tr>
<tr>
<td>• Easy access to common service center</td>
<td>• Digitally transformed services for improving ease of doing business</td>
<td>• Collaborative digital platforms for participative governance</td>
</tr>
<tr>
<td>• Sharable private space on a public cloud</td>
<td>• Cashless financial transaction</td>
<td>• Citizens not required to physically submit Govt. documents</td>
</tr>
<tr>
<td>• Safe and secure cyber space</td>
<td>• Geospatial Information Systems (GIS) for decision support systems &amp; development</td>
<td></td>
</tr>
</tbody>
</table>
One of the key pillars of Digital India program is e-Kranti, which redefines NeGP with focus towards transformational and outcome oriented e-governance initiatives. Key themes include – leveraging emerging technologies such as cloud, mobile, and social, making use of agile implementation models, promoting replication and integration of e-governance applications, and localization of languages.

Key focus areas of e-Kranti include technology for Education (e-Education), Health (e-Healthcare), Farmers, Financial Inclusion, Planning, Justice, Security, Planning and Cyber Security.

<table>
<thead>
<tr>
<th>Education</th>
<th>Health</th>
<th>Security</th>
<th>Justice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadband connectivity for schools</td>
<td>Online medical consultation</td>
<td>Mobile based emergency services and disaster response</td>
<td>Interoperable criminal justice system i.e. e-Court, e-Prosecution, etc.</td>
</tr>
<tr>
<td>Free Wi-Fi</td>
<td>Online medicine supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massive Online Open Courses (MOOC)</td>
<td>Pan-India exchange of patient information</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Agriculture</th>
<th>Financial Inclusion</th>
<th>Cyber Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-time price information</td>
<td>Mobile banking</td>
<td>National Cyber Security Coordination Center to be set up to ensure secure cyber space</td>
</tr>
<tr>
<td>Online ordering of inputs</td>
<td>Micro ATM program</td>
<td></td>
</tr>
<tr>
<td>Cash, loan, relief payments through online/mobile banking</td>
<td>Citizen Services Centers / Post Offices</td>
<td></td>
</tr>
</tbody>
</table>

e-Kranti has identified 44 mission mode projects classified under center, state, and integrated projects. This also includes the previous mission mode projects identified in NeGP and are current under implementation.
**Women Empowerment**

One of the key aspects of leveraging the demographic dividends envisaged for India is through increasing the participation of women in work force. When we talk about women empowerment, it's largely about three key aspects – decision-making power through financial independence, personal safety & security, and mobility. Technology can play an important role in all these aspects in enabling women achieve greater independence and empowerment.

When it comes to women's safety and security, many new kinds of mobile-based applications are paving the way for women to feel more secure in public places. One such example is Safetipin, which collects information about public places. It follows a safety audit, measuring nine parameters, that includes availability of police, lighting on the streets, state of the walk path, presence of people specifically women on the streets, and public transport and 'eyes on the street'. Each audit gives the safety score of an area and appears as a pin on the map. Individual users are given the option to pin unsafe places themselves as well. City authorities can use this app to collect data on a large scale, and also to ensure better planning and governance.

Another such example is Indian Railways’ mobile app - R-Mitra - that contributes to ensuring women’s safety. 27 to 30 million individuals use the railways daily, and are potentially subject to various types of crimes. R-Mitra (Railway Mobile Instant Tracking Response and Assistance) alerts the nearest RPF inspector and divisional security control room of emergencies when a button is pressed. With the pressing of the button, the victim’s physical location is sent to the control room and can ensure immediate action by tracking the user. The app can be developed to operate offline as well, in an SMS mode by using a helpline number.

Similarly, when it comes to women’s health, many technology based solutions are being launched in the market. One such example is Operation ASHA in India, which has a portable biometric tracking system for monitoring Tuberculosis. TB ranks as one of the top five causes of death among adult women between the ages of 20 to 59, and India has the most number of cases globally, with 2,20,000 total deaths in 2014, according to WHO. Operation ASHA in India, in partnership with Microsoft research, has developed a portable biometric tracking system called eCompliance that helps to take TB treatment to rural communities and to the slums. This technology helps in completing the treatment regimen, and prevents the development of new drug-resistant strains of the disease. Operation ASHA makes use of fingerprint recognition and SMS messaging to make sure that patients are adhering to their treatment regimens. Digitization of records also helps to provide targeted counselling and allows for accurate reports to be produced.

**Rural Development**

The connectivity and data infrastructure envisaged under Digital India program will usher the next phase of rural development. Initiatives such as Kisan call center, Rural BPO scheme, and Common Service centers in villages brings digital access to rural areas which can help them access information about weather, market price information for agricultural produce, and other employment and job opportunities. A few applications include:

- **Location based intelligence - Wide adoption of remote sensing technologies for discovering key natural resources like water helps improve agriculture productivity. Similarly, using GPS and other latest location-based technologies for navigation and resource mapping can help fishermen locate key catchment areas and also prevent them from inadvertently crossing national boundaries.**

- **App-based service delivery**
  - Kisan Suvidha – omnibus mobile app that gives access to relevant information in weather, market prices, agro advisory, plant protection, pest management practices, etc.
  - Pusa Krishi – information related to farm machinery, resource conserving cultivation practices, and new varieties of crops developed by Indian Council of Agriculture Research

- **Crop insurance App – information related to Govt. crop insurance scheme**

- **Agri Market App – provides market prices of crops in the markets within 50 km radius**

In addition to government initiatives, there are other commercial solutions from technology entrepreneurs aiming to address the challenges in improving agricultural productivity. One such example is an Internet of Things (IoT) based solution for dairy industry from Stellapps, which uses sensors and machine-to-machine technology to monitor the health and productivity of cattle and ensure the quality of milk by tracking key quality parameters across the dairy supply chain.

Such technology-based solutions from private sector complement government initiatives in improving the agricultural economy and rural livelihood.
Challenges

• **Connectivity** – one of the biggest challenges in achieving the milestones set out for digital India is to ensure that the connectivity and data infrastructure is functional and continuously maintained across the country. With increased adoption of e-governance for delivering citizen services, we need to ensure that the remotest parts of the country are connected with the national broadband network and are fully functional throughout the year. While the National Optical Fiber Network (NOFN) has undertaken the goal of providing broadband connectivity to over 2,00,000 gram panchayats in India, we should also make sure that mobile communications infrastructure is equally developed and covers all parts of the country in delivering mobile first solutions. Availability and efficient usage of spectrum remains a challenge in this case.

• **Data security and management** - Data is a key policy driver in today’s world. Many developed nations have taken initiatives to share information and make government data accessible to its citizens, in a bid to increase their participation at local governance. India is traditionally a data-starved country, but the adoption of Digital India initiatives is poised to generate substantial amounts of big data that can be used to generate key insights on governance and also effectively monitor public development projects. While there are commercial solutions and expertise available within the country to implement such large-scale big data analytics solutions, the key challenge that remains is to ensure that the data is secure against viruses and other malicious cyber attacks.

• **Change management** – E-governance projects bring about substantial changes in the way government processes are designed and implemented, and they emphasize collaboration between various departments in state and central governments. For example, for implementing a smart city solution, a number of government departments such as Education, Health, Transportation, Safety, Urban development, etc. in the state government that usually operate in silos, have to work together. Bureaucrats, especially at the grass roots level are accustomed to a certain way of working, and successfully transitioning the work environment towards a transparent, accountable, and service-oriented culture remains a key challenge.

• **Digital literacy and talent** – Successful adoption of digital as the main channel for citizen services requires that the recipients are sufficiently equipped to transact in the channel. This also means doing away with complex user interfaces, and adopting user-centric design principles in designing solutions that are intuitive and easy to understand for the common people. Availability of design expertise and skilled manpower in government for emerging technologies like mobility, and UX design is a challenge.

• **Localized services** – In a diverse country such as ours, every city / village have unique characteristics and challenges associated with it. For Bangalore, it could be urban mobility and traffic issues, whereas for Pune or other industrialized cities, it could be that of pollution and air quality. The technology infrastructure and backbone created for NeGP mission mode projects should lend itself to create customized and localized applications relevant for local needs.
Recommendations

- **Leveraging private sector talent** - India has a unique advantage of having skilled technical and managerial talent in technology, especially the leadership cadre, in implementing large-scale transformational projects around the world. Effectively utilizing the technical and managerial talent from the industry to implement and monitor high-impact programs is key to adopting latest technological innovation for social good. One such example of successful Government-Industry collaboration is the Aadhaar project. To enable better collaboration, suitable mid-career opportunities should be created for private sector professionals with relevant experience and skills in e-governance projects, to help interested professionals have a long-term association with government services.

- **Localizing service delivery through Open APIs** – Platforms and Application Programming Interfaces (APIs) form the building blocks of digital transformation. Successful digital applications such as Uber, Google, Facebook, etc. follow a platform approach to product design wherein the core product is extended by third-party applications enabled through APIs. World-wide initiatives on open government focuses on Open APIs to expose the information collected by the government for public usage. These Open APIs can be used to develop localized applications by startups and private sector enterprises to extend the core digital India platform and provide localized services. One such initiative along these lines is India Stack. It's a set of APIs that form the building blocks to develop applications leveraging the technology backbone envisaged in Digital India. Various components included within the stack are Aadhaar to authenticate, e-KYC and DigiLocker for use of documents, use of digital signatures and a unified payments interface (UPI). This initiative, hopes to expand the reach of Apps in the financial services, healthcare, and education sectors. Such API-driven integration would bring in a significant change to e-Governance applications.

- **Data security** - Data protection to ensure confidentiality, integrity, and availability of data is not compromised. An end-to-end encryption system can be implemented to protect the privacy of users across data storage and transmission using various security tools. In addition to that, giving access only to authorized personnel using Identity and Access management tools protects the confidentiality of the data. To ensure data security is maintained at all times, a continuous monitoring system using Database Activity Monitoring (DAM) methods and periodic security audits and vulnerability assessment tests to identify gaps in the security policies can be adopted.

- **Connectivity** - An optimal mix of fixed line optical fiber, and wireless communication networks in licensed (3G, 4G) and unlicensed spectrum (Wi-Fi) should be used to have fail safe broadband networks across the country. Experimental initiatives like Google’s Project Loon, which provides internet connectivity through balloons in remote parts, and other network optimization techniques like Wi-Fi / mobile data offload should be evaluated and implemented in a suitable manner to create a robust and failsafe connectivity infrastructure across the country.

In 70 years, we have come a long way from our socialist roots. The last 25 years of economic reforms have created the economic growth necessary to bring millions of people out of poverty and create a space for ourselves in the globalized world. Our development agenda for the next 25 years should not only focus on economic progress to cater to rising aspirations of young Indians but also in achieving that in a sustainable manner. Effectively adopting the latest technological innovations in digital, mobile, analytics, and social technologies by leveraging the technical and managerial capabilities from government and private sector will help us manage the transition better and establish India’s leadership position in the new world order.
India’s tryst with cash is ongoing; however, digital payments are projected to pick up and go to 15% of GDP by 2020 as innovation and acceptance of digital payments increase. Amidst heightened customer expectations, Indians will conduct more digital banking activities. Simple to complex transactions such as checking accounts, bill payments, money transfers, financial investing, shares transactions and others are likely to be done using digital channels. With smartphone availability increasing and costs plummeting, mobile-based payments are bound to increase. The launch of 4G services in the country is a step in enhancing payments using not just mobile but all connected devices (Pay on TV, etc.) and making online payments the new checkout standard.

**Different strokes for different folks**

India needs a payments infrastructure to bring the benefits of a digital economy to the common man. Banks therefore need to focus on restructuring their payments offerings into winning propositions. A multitude of payments services is the need of the day and value creating solutions will coexist. In this chapter, we discuss three promising payments constructs and their role in India’s tryst with becoming cashless.

**Figure 17: Moving to Cashless: Payments constructs with a promise**

1. **Digital Wallets**
   - Increasing options and convenience
2. **Payments Banks**
   - Reaching the grassroots
3. **Unified Payment Interface**
   - Masterstroke of high policy
Digital Wallets: Increasing Options and Convenience

E-wallets, a payment instrument conceptualized to eliminate cash changing hands is a promising proposition that has got banks and nonbanking operators such as Telecommunication and Fintech companies to come up with wallets. Once a user preloads an amount onto the wallet, he or she can spend on daily services such as utilities, food and travel, provided the wallet is accepted at the point of sale. Using mobile serves a dual purpose; one, the medium eliminates the need to carry a physical card, and second it allows operators the opportunity to scale up. What provides wallets an edge over other payment systems is that wallets are aggressive on cashbacks. As more merchant point-of-sale (POS) terminals get Near Field Communication (NFC) enabled, as more phones have NFC technology, it increases the odds a customer will use a digital wallet on checkout. The success of the mobile wallet can be gauged by the growth in the value and volume of transactions over the past few years. The number of mobile wallets in India has been estimated at around 135 million, whereas the number of credit card users is ~24.5 million.44

Given the promise of wallets and their critical role in driving volumes, the path ahead is one that wallet providers must tread carefully. They face certain challenges and must make certain strategic choices to create a unique selling proposition.

Wallet providers have begun altering their strategies. A case-in-point is them shifting from an “online only” to “in-store purchases” to open up to the plethora of transactions.

Figure 18: Challenges faced by wallet providers

1. Fear of adoption among users due to transacting online
2. Unearned Interest on money sitting in the wallet as opposed to a bank a/c
3. Inadequate merchant tie-ups
4. Lack brand recall among rural population

Figure 19: Strategic choices ahead

- People use wallets for offers / cash backs
- Incentives increase the adoption of wallets
- Wallets presently cater to the banked and super banked
- This trend hasn’t percolated down to the unbanked
- Need to stay relevant – Wallets face increased competition as cost of switching for customers has lowered with more banks on the horizon

Observations

Implications for wallet providers

Wallet providers would need to ensure loyalty programs keep pace and tailor them. Providers should aim at allowing interaction with loyalty programs - seeing rewards alongside accounts, across devices.

Scale up - Wallet providers will need to cater to the underbanked going forward, opening up many more avenues for them.

Must cross sell to their existing customer base and allow even small payments to be made via digital wallets. Example – Paytm is launching electronic Aadhaar based e-KYC for user verification in an effort to provide enhanced security.

Source: Industry News45
Payments Banks: Reaching the Grassroots

Payments Banks (PBs), an agenda in India’s financial inclusion initiative, are conceptualized to provide access and bring the unbanked population under the ambit of formal financial services. Census 2011 had pegged Indian households having access to banking services at 59%. Although this number has gone up due to the Jan Dhan Yojna, a large number of the accounts remain inoperative. This is where the basic mobile will be the differentiator by increasing outreach and catering to a larger share i.e. 83% of the addressable market. Payments banks are expected to use mobile as the channel of delivering banking services over the traditional branch banking channel, thereby increasing access to banking services.

Regulatory Restrictions imposed by the Regulator ensure PBs are designed to reach the grassroots

- Must have a mandatory focus on rural India – At least 25% of a Payments Bank’s physical access points (own or others’ network; not branches) have to be in rural centers
- Cannot Lend – A Payments Bank cannot undertake lending activities. With a mandate to operate as “deposit taking institutions”, they are designed to channelize money into the formal banking system
- Can offer payments and remittance services through various channels – “Remittances” are allowed by RBI with the intent of taking money from urban areas to rural areas. The chances migrants will switch channels for remittance services from the current informal and formal channels that charge higher transaction fee 9%-1.5% to the PB channel that will charge lower fee, is high

Figure 20: What PBs additionally need to reach the grassroots

1. Mobile over Bank Branches
2. Technology Muscle
3. Capital Expenditure for creating network
Running sustainable businesses at the grassroots

Given their unique structure, Payments Banks will need to dovetail their business model to build volumes to break-even and profitability.

- Connecting with customers via multiple touch-points

Figure 21: Assisted methods in rural areas

PB license holders are likely to deploy asset light business models and play around with their offerings. They will differentiate their business models in terms of new and targeted product offerings, products requiring varying degrees of technology in the user interface, lower for rural and higher for urban, till the time they achieve economies of scale. Either way, their solutions should be structured around moving to a cashless economy. Some examples:

- Offering mobile talk time, especially by mobile groups with PB offerings. A mobile connection and a bank account with an operator will definitely increase cost of switch for the customer.
- Deploying “Tokenization” technology to address customer concerns around security for mobile-based payments as technology becomes more mainstream.
- Some such as Paytm will allow digital withdrawal of funds, without any cash exchange. It plans to launch debit cards with Quick Response (QR) code for the people void of smartphones.46
- SBI, on the other hand is facilitating cardless transactions by scanning QR code on the mobile.47
Unified Payments Interface: Masterstroke of High Policy

Unified Payments Interface (UPI) by National Payment Corporation of India (NPCI) is expected to change the payments landscape in India. Digital banking is being transformed by the path-breaking technology powering UPI. Using smartphones, it is expected to facilitate instant transfer of funds under a lakh to Aadhaar number/mobile number/virtual address (without the IFSC code) across multiple banks. Although transactions on this platform are currently predominantly person to person (p2p) and ~5,000 transactions a day, they are projected to significantly increase as merchants join the platform.

The interface intends to democratize payments by bringing everyone on the digital net. The coming of small p2p transactions online will move India toward a cashless economy. By virtue of coming online, transactions can also be tracked, leading to lower overall tax evasion. Benefits of lower tax evasion will then be passed on to consumers, in terms of lower transaction rates. Removing intermediaries in the payment process will also reduce transaction costs.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unique Payments Interface (UPI)</th>
<th>Immediate Payment Service (IMPS)</th>
<th>National Electronic Funds Transfer (NEFT)</th>
<th>Real Time Gross Settlement (RTGS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of transfer</td>
<td>Uses IMPS - Real time - Enables instant transfer through mobile phones</td>
<td>Real time - Enables instant transfer through mobile phones and internet</td>
<td>Funds are transferred in batches</td>
<td>Funds are transferred real time</td>
</tr>
<tr>
<td>Processing time</td>
<td>24/7 service, transacting on holidays</td>
<td>24/7 service, transacting on holidays</td>
<td>Limited processing time - not on holidays or during non-bank hours</td>
<td>Limited processing time - not on holidays or during non-bank hours</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Requires beneficiary bank name &amp; mobile number/virtual address/Aadhaar number</td>
<td>Requires beneficiary information such as Bank A/c number &amp; mobile number</td>
<td>Requires beneficiary information such as Bank A/c number, IFSC code</td>
<td>Requires beneficiary information such as Bank A/c number, IFSC code</td>
</tr>
<tr>
<td>Maximum Transaction Value (per transaction)</td>
<td>INR 50 – INR 1 lakh</td>
<td>Mobile/Internet: INR 1- INR 10,000 (using MMID) Mobile/Internet: INR 1- INR 2 lakh (using IFSC)</td>
<td>INR 1 – INR 10 lakh</td>
<td>INR 2 – INR 10 lakh</td>
</tr>
<tr>
<td>Inter-operability at the core</td>
<td>Does not require payer and payee to use same Payment Service Providers (PSP)</td>
<td>Payer and payee should be a part of the IMPS network</td>
<td>Payer and payee should be a part of the NEFT network</td>
<td>Payer and payee should be a part of the RTGS network</td>
</tr>
<tr>
<td>Inter-operability at the fore</td>
<td>Yes. Can use multiple banks (live with 21 banks and more are likely to join. May include e-wallets) without going back to a specific bank a/c. UPI app can be used to access other Bank’s accounts and a cross section of merchants who are tied up with other Banks.</td>
<td>Yes, across banks and mobile operators</td>
<td>No, can only use own bank</td>
<td>No, can only use own bank</td>
</tr>
<tr>
<td>Authentication</td>
<td>MPIN - Single click, dual authentication</td>
<td>Mobile Money Identifier (MMI) code for transactions</td>
<td>2 Factor Authentication</td>
<td>2 Factor Authentication</td>
</tr>
<tr>
<td>Transfers</td>
<td>Push (Payer initiates payment to payee) &amp; Pull (Recipient is empowered to initiate a payment request)</td>
<td>Push (Payer initiates payment to payee)</td>
<td>Push (Payer initiates payment to payee)</td>
<td>Push (Payer initiates payment to payee)</td>
</tr>
<tr>
<td>Use cases</td>
<td>P2P, Bill Split, Utility Bills, B2B, Cash on delivery options for online shopping, EMI, donation, Toll charge, online shopping</td>
<td>Fee payments, OTC, utility bill payments, recharge, trading, donation, insurance, e-commerce, retailers, travel</td>
<td>Focuses on retail / individual fund transfers</td>
<td>Focuses on business / corporate fund transfers</td>
</tr>
</tbody>
</table>

Source: Deloitte Research
Challenges
Smartphone users transacting online are ~ 18% of the addressable market.

- 22-25 million smartphone users banking online
- 220 million smartphone users
- 636 million bank accounts
- 1,035.12 million mobile phone subscribers

Figure 22: Teething issues anticipated in UPI’s uptake

Security Concerns
Customers hesitate transacting online in order not to expose bank accounts to online fraud.

Issues in effective seamless and instant transactions
Money debited from Payer but not credited to Payee, calls for stabilization of the product for technical glitches.

Push Merchants
Service providers will have to push merchants to urge consumers to use the platform.

No Cashbacks
Unlike ‘wallets’, UPI does not allow cash backs to be credited to the user.

Does it come down to the better App? Will Banks ‘Opt Out’?
The UPI interface is Bank and Device agnostic. Once a customer of a certain bank downloads the UPI app of another bank and begins transacting, he is open for acquisition by that bank.

Source: Deloitte Research

UPI, the payment technology being patented
Enhancing adoption of the UPI interface will be a result of greater interoperability as more banks join the interface, greater availability across soft-wares, improved bandwidth and lower transaction costs for users. Although catering to a mere 18% of the current addressable market, once merchants, consumers and banks are on this open platform, daily transactions on the interface are likely to grow exponentially. The open architecture of the platform will lead to greater innovation from banks and better user experience. UPI is an opportunity that will not only be embraced by Payments Banks but also coexist with wallets (by virtue of opening up opportunities for them). It excludes e-wallet providers for now but they could be included in the future.
Digital: A revolution in the making in India
Digital: A revolution in the making in India
About Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering with industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India’s development process. Founded in 1895, India’s premier business association has over 8000 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 2,00,000 enterprises from around 240 national and regional sectoral industry bodies.

CII charts change by working closely with the government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists the industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, healthcare, education, livelihood, diversity management, skill development, empowerment of women, and water, to name a few.

The CII theme for 2016-17, Building National Competitiveness, emphasizes the industry’s role in partnering the government to accelerate competitiveness across sectors, with sustained global competitiveness as the goal. The focus is on six key enablers: Human Development; Corporate Integrity and Good Citizenship; Ease of Doing Business; Innovation and Technical Capability; Sustainability; and Integration with the World.

With 66 offices, including 9 Centers of Excellence, in India, and 9 overseas offices in Australia, Bahrain, China, Egypt, France, Germany, Singapore, UK, and USA, as well as institutional partnerships with 320 counterpart organizations in 106 countries, CII serves as a reference point for Indian industry and the international business community.
Digital: A revolution in the making in India
Digital: A revolution in the making in India
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