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ASSOCHAM INDIA

Digital India

Unlocking the Trillion Dollar Opportunity

November 2016

Contents

Foreword

The Digital India program with its focus on three key vision areas – infrastructure as a utility to every citizen, governance and services on demand and digital empowerment of citizens – has the potential to provide an incremental 20-30% increase in India's GDP by 2025. Since its launch in July 2015, significant progress has been made in several initiatives under Digital India. However, a few challenges that remain, need to be addressed in order to realize the full potential of the program.

The government is focusing on developing the physical infrastructure as well as software and security infrastructure to ensure the success of its vision of providing infrastructure as a utility to every citizen. Till now, the government has successfully achieved the digitization of all department post offices and has set up Common Service Centers (CSCs) to deliver e-governance services in villages. To increase the speed of development and adoption of digital services, the government needs to increase availability of digital infrastructure in rural areas, leverage existing infrastructure and improve digital awareness.

There has been significant improvement in the wireless infrastructure over the last 12 months with 4G deployments by major service providers. However, the speed of development of the fixed infrastructure needs to be enhanced. Under the BharatNet project, the government plans to provide information highways in terms of high speed fiber networks. This project has witnessed delays over the last few years and now aims to provide connectivity to 100,000 gram panchayats by Mar 2017, which is much lower than the original target.

Wi-Fi hotpots are also required to provide last mile connectivity for digital services. To match the global average of a hotspot for every 150 people, 8 million hotspots need to be deployed in India. India currently has ~31,000 Wi-Fi hotspots. To further the development of digital infrastructure in India, the government should focus on improving the participation from the private sector through a collaborative engagement model which allows for a viable business case for the private sector as well as meet the objectives of the Digital India program.

Several digital services have been launched over the last few quarters that have seen significant adoption. The e-payment portal, RuPay promoted by National Payments Corporation of India represents 38% of all debit cards issued in India, ahead of Visa and MasterCard. MyGov app and Swachh Bharat App have been launched and have over 1 million and 0.5 million users respectively. DigiLocker, the cloud storage service under Digital India, is now used by 4 million users.

Capacity building is critical for the success of the Digital India program. As of mid-2016, digital literacy in India is less than 10%. The government has undertaken several initiatives to increase the rate of digital literacy in order to effectively harness the upcoming digital wave. Further, to develop sufficient skills to support the Digital India Vision, the government has instated the Capacity Building Scheme to provide training for designing and delivering projects under Digital India. Additionally, several measures are being taken to increase the adoption of digital technologies so that the benefits of Digital India can reach all sections of society.

This publication reviews the initiatives launched under the Digital India program, and attempts to address some of the challenges in the implementation of the program. In addition, the impact of these initiatives on citizens, business and the environment have been discussed. The tripod of 1 billion digital identities, 1 billion mobile and over 250 million bank accounts is waiting to unleash a very big digital revolution in India.

Hemant Joshi

Messages from ASSOCHAM

The world is witnessing the unfolding of the 4th Industrial Revolution, also known as the Digital Revolution, which will re-write the way we live, work and interact with each other – not only between people but also between people and machines. Businesses around the world are trying their best to 'go digital' for the sake of survival. To remain competitive, investing in digital technology is a must now.

India too has started experiencing this digital transformation. However, it may still take some time for India to feel the full impact of this change. Although the use of digital technology is on the rise in India, there still exists a wide 'digital divide' between urban and rural India which needs to be bridged urgently. Keeping in mind the global reality, our Prime Minister has launched the Digital India programme to promote digital inclusion and to expand the ambit of e-governance.

The recent move towards demonetization will further accelerate the adoption of digital modes for financial transactions at a much faster pace in comparison to other countries in the world.

I am very happy that ASSOCHAM has decided to organize this conference in this backdrop. I am not sure if there is any blueprint for successful adoption of digital technologies, but certainly there are plenty of success stories to learn from. This conference aims to bring to the fore such examples which can offer valuable insights into the approaches and actions of a successful digital transformation. I wish the conference a grand success.

Sunil Kanoria
President
ASSOCHAM

ASSOCHAM welcomes the Digital India programme being launched recently by the Hon'ble Prime Minister as flagship programme with a vision to transform India into a digitally empowered society and knowledge economy.

As citizens become more aware of their right, they have become more demanding in terms of better and quicker services from Government. Effective public service today, is more about transparency, efficiency and accountability.

e-Governance initiative in India have traditionally being confronted with the dual challenges of automating Government Departments and taking online services to the common man. But now has moved beyond government departments just having a portal. It is no longer confined to merely streamlining and automating processes. It is about transforming the way governments work and reinventing people's participation in the democratic process. It is about empowering both the Government and Citizen. Technology will be the enabler for the citizen to transcend the boundaries of departments and ministries, and provide a single platform for interaction with its citizens, thus promoting participatory governance and increased transparency and revolutionising public service delivery.

ASSOCHAM's initiative in creating awareness about the concept and practice of e-Governance is almost more than a decade, where efforts have been made to invite participation not only from Central Government but also from State Governments on one side and ensuring participation from Industry leaders on a common platform.

The 12th e-Governance National Summit with the Theme "Unlocking Trillion Dollar Opportunity through Digital India" is another step in that direction and we sincerely hope that all the Stakeholders will immensely gain from the deliberations at this National Summit in achieving the objective of creating the 'Digital India'.

I convey my good wishes for the success of this 12th National Summit on e-Governance and Digital India.

D.S. RAWAT
Secretary General
ASSOCHAM

For the past many years, through the National Summit on e-Governance & Digital India, ASSOCHAM has created a platform for the central Ministries, State and the industry to come together and deliberate on the way for forward for Digital India. The main focus of National Summit is to help in statewide inclusive growth through effective implementation of the Digital India Program so that its benefits reach the grassroots level in the remotest of areas. Creating a digital society will be the key in the competitiveness of nations in the upcoming years. Digital Society is broader than 'digital economy.' A digital society integrates all social spheres and lends a competitive edge to the overall economy. The post de-monetization scenario has further emphasized the importance of cash-less digital transactions which are possible only if we have a digitally serviced society.

E-governance initiatives in India have traditionally being confronted with the dual challenges of automating government departments and taking online services to the common man. It has lately moved well beyond government departments just having a portal, streamlining and automating processes. It is now about empowering both the government and the citizen. Technology will be the enabler and provide a platform for interaction promoting increased transparency and revolutionizing public service delivery.

This is also the decade of broadband – and we all recognize the vital importance of broadband as a social and economic development tool. It is a critical component of smart society. The Digital India program is aimed at further bridging the divide between digital "haves" and "have-nots". It is an opportune time for both the industry and the government to from a synergistic partnership towards bolstering India's socioeconomic development through digital empowerment. The initiatives of e-health, e-education and a wide variety of citizen services, can be delivered to rural citizens subject to conducive and progressive policy initiatives by the government and with the participation of the entire ecosystem. However, the need of the hour is to adopt a grassroots approach starting from the State-level with key enablers being awareness building and imbibing the benefits of e-services especially for the underserved parts of the country.

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Umang Das
Chairman
ASSOCHAM National Council on eGovernance & Digital India

Digital India holds the potential to truly transform India from a developing into a developed economy. ICT infrastructure lies at the very foundation of the success of Digital India. I believe that as a nation we should allocate a fixed percentage of our GDP to be invest exclusively on creating, upgrading and maintaining digital infrastructure. We have metrics on percentage of GDP spent on social infrastructure and physical infrastructure. It is time that we decide a minimum percentage of GDP which should be spent for ICT infrastructure. Digital India is transcending beyond eGovernance to every aspect in the life of an Indian citizen. ICT is deeply enmeshed in Digital banking, insurance, eCommerce, entertainment, eHealth, eEducation, KPOs, IT/ITES, modern manufacturing, transportation, agriculture and many such sectors today. The robustness and the quality of ICT infrastructure will determine the success of digitization of Indian economy and overall success of Digital India. As a nation we should also set targets to roll out fibre infrastructure both in urban and rural India. Our fibreisation is one of the lowest in the world amongst the large economies and we all should make it a national endeavor to bridge this gap.

ICT today has the power to ensure eGovernance reaches every nook and corner of India. Distances and locations which are remote physically do not look appear distant anymore in the digital realm. We must ensure that government departments get access to the latest ICT technologies at the most competitive prices. Government should come out with industry friendly procurement policies which will enable the ICT industry to supply latest ICT technologies and solutions to the government. A strong and robust project management and monitoring mechanism is essential to ensure that all ICT projects in government gets rolled out as per the planned schedule thus ensuring citizens derive benefits of ICT and at the same time protect the investments made by the industry.

Indian ICT industry is partnering corporations and governments globally in their digitization journeys and I am fully confident that we can partner government of India central, state and local in their digitization journeys.

Ramu Patchala
Co-Chairman
ASSOCHAM National Council on eGovernance &
Digital India

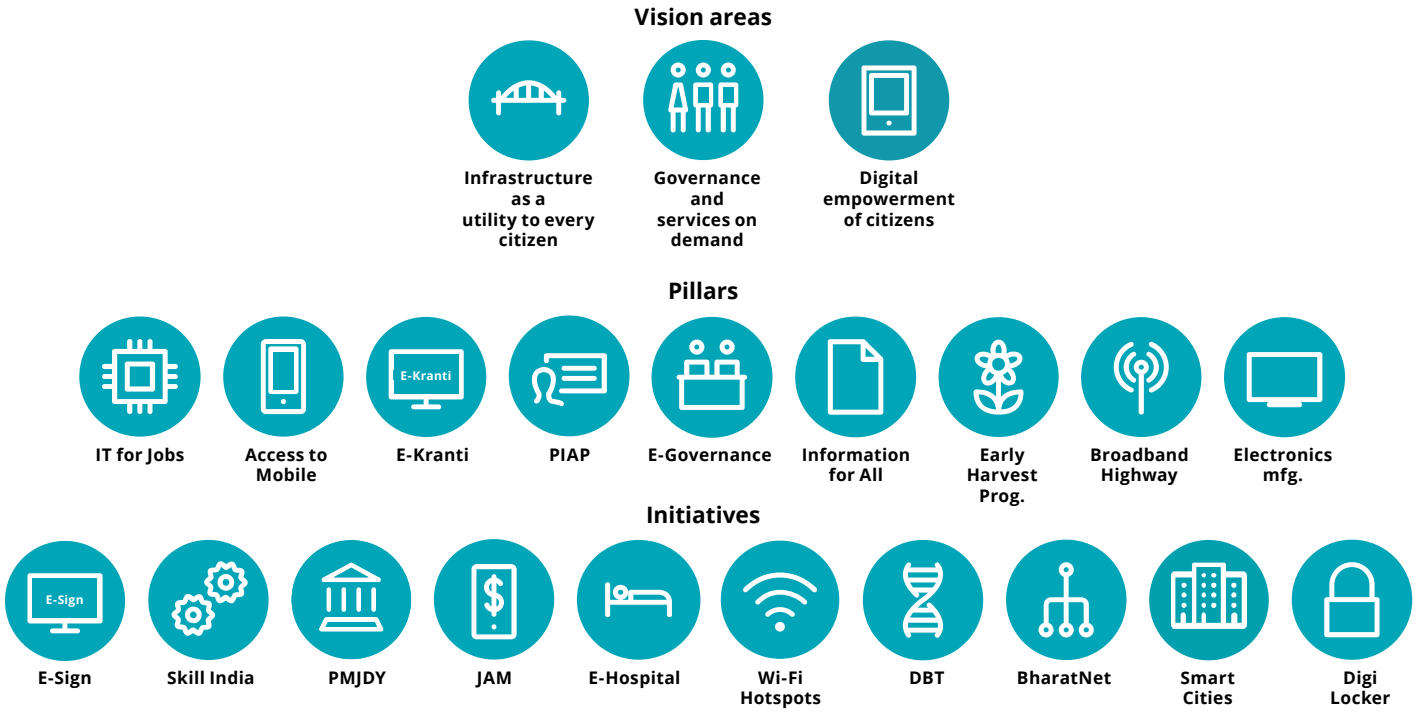
Current Status of the Digital India Program

Overview of the Digital India Program

The Digital India programme was launched over a year ago in 2015. The program has now moved from the planning phase towards execution and significant progress has been made in implementation of the various initiatives. However, some challenges have been faced during the execution which need to be addressed.

The Digital India programme is focused on fulfilling three vision areas through 9 "pillars" or focus areas, which lay down objectives in areas such as skill development, e-governance, mobile / broadband connectivity, etc. These 9 pillars are supplemented by initiatives that are operating at various levels. All the initiatives have been launched and are in various phases of implementation while significant progress has been achieved on some of these initiatives, such as Smart Cities, Jandhan, PAHAL, etc. in the last 6-12 months.

Figure 1: Overview of the Digital India Programme



Overview of Digital Infrastructure in India

The Information Communication and Technology (ICT) sector forms an essential part of the digital infrastructure requirement to ensure availability of telecom, broadband, computers and software across the country. While with increasing reach and affordability, ICT has evolved as a basic infrastructure, India's ICT readiness has remained low, ranking 131 in the ICT Development Index in 2015.[1] The Digital India program aims to increase reach of digital infrastructure through an extensive broadband and mobile network in order to enable electronic delivery of government services to citizens. To enable this vision, the development of a strong digital and telecom infrastructure backbone is critical.

The government has taken several initiatives to improve the digital infrastructure in the country which are in various stages of implementation. These initiatives extend beyond physical infrastructure and also address software and security infrastructure as all the three aspects are required in tandem to ensure the success of Digital India.

Table 1: Initiatives undertaken by the government to build ICT infrastructure for Digital India

Initiative	Description	Current Status
BharatNet	Aims to provide broadband access to 250,000 Gram Panchayats (GPs) through a network of Optical Fiber Cable	• 1,44,430 km of optic fiber laid; OFC connectivity to 62,943 GPs. • Initial target: Broadband to 150,000 GPs by Dec 2015. • Revised Target: Broadband to 100,000 GPs by March 2017.[2] • Non-involvement of states in the initial phases has led to hurdles, especially Right-of-Way issues, in laying of OFC.[3]
Smart Cities	Creation of 109 smart cities (target revised from 100) by 2022. INR 5 billion allocated to every city over 5 years for this purpose	• 60 cities have been chosen to be covered under the Smart Cities mission. • Allocation of INR 32 billion in union budget 2016-17.[4] • Budget allocation of INR 70 billion done at the time of launch, but revised to INR 1.4 billion in the 2015-16 union budget due to non-deployment of funds.[5]
Common Service Centers (CSCs)	CSCs are centers through which e-governance and related services will be made available to villages	• Over 1,70,000 CSCs are operational across India. • 2,50,000 GPs to have one CSC each (at least). • Village Level Entrepreneur (VLE) model being followed to empower locals; nearly 240,000 VLEs have been appointed.[6]
Digitization of Post Offices	Digitization of post offices including setting up centralized data centres, networking of all post offices and enabling digital payments	• All 25,297 departmental post offices have been computerized. • 238 million postal bank accounts have been digitized. • 155,000 post offices (130,000 in rural areas) to be digitized by March 2017.[7]
Universal Access to Mobile	Aims to provide mobile access to more than 55,600 villages that do not have mobile coverage	• 55,669 villages to be covered by March 2019. • 8,621 villages in the North East to be connected by September 2017.[8] • Accessibility of villages and sparse population make it commercially unviable.
Public Wi-Fi Hotspots	Creation of public Wi-Fi hotspots in India to enable citizens to access content without depending on mobile data	• India currently has over 31,000 Wi-Fi hotspots. • Over 100 hotspots to be made operational at various railway stations by March 2017. • India should have 8 million Wi-Fi hotspots to meet the global average of one hotspot for every 150 people.
India Stack	It is a set of open APIs that enables development of payment-enabled applications, using Aadhaar as the base for authentication	• Rapid adoption of the JAM (Jandhan-Aadhaar-Mobile) trinity has enabled customer identification and access, based on which several other digital transactions can be carried out. • The open API ecosystem combined with the digital literacy mission can go a long way in creating apps that are customized to suit local needs.
National Cyber Coordination Center (NCCC)	The Ministry for electronics and IT has planned to set up a center to safeguard India's cyberspace against potential threats	• Process has been fast tracked; RFP expected to be finalized by December 2016 – January 2017. • NCCC expected to entail an investment of INR 9 billion.[10]

The success of Digital India depends on the creation of an ecosystem in which every citizen is digitally empowered and has access to key services made available electronically. Globally, technology has been the most important enabler in ensuring the success of such massive transformational projects. While the government has been focused on developing key technology enablers for Digital India; adoption of digital technologies has remained a challenge.

The key enablers to development of digital infrastructure in India have been cloud computing and usage of analytics:

Cloud Computing

The government plans to use cloud technologies to enable seamless integration between various departments and delivery of services to the citizens. DigiLocker, for instance, is a cloud service which allows citizens to use a shareable cloud space to upload, store and share documents. As on date, the space available per user is 1 GB and the number of users is over 3.96 million[11]. The DigiLocker service is also being linked to governmental departments to enable users to pull documents in a digital format. For instance, the integration of DigiLocker with the Department of Transport enables users to download a digitally verified copy of their driving license. In May 2016, the government also made it mandatory for CBSE mark sheets to be made available in a digital format which can be uploaded and linked to DigiLocker.

While significant progress has been made in cloud technologies, several hurdles to large scale adoption exist such as:

- Ensuring safety and privacy of data,
- Lack of widescale access to citizens given infrastructure constraints,
- Low Digital literacy hampering adoption of cloud services, and
- Limited coordination among departments and state governments.

Use of Analytics

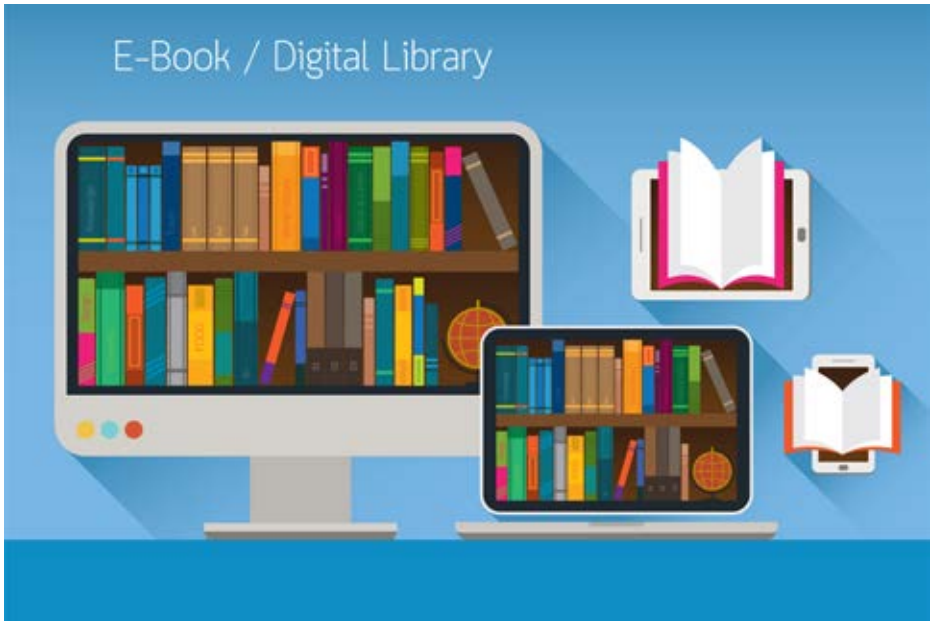
The Indian government initiated a data repository called the Electronic Transaction Aggregation and Analysis Layer (e-taal), which provides real time transaction data of citizens with various departments and agencies of the government along with a quick analysis of the information in graphical form. The e-taal portal currently provides data on over 3,100 e-services that can be analysed across geographies.[12] This data can be used by government agencies to assist in decision making in real-time.

While the e-taal service has seen some adoption, to increase usage and relevance of this portal, the following steps need to be taken concurrently:

- Increasing the number of services covered by e-taal to provide comprehensive, actionable analytics
- Ensuring higher cooperation among departments, state governments and government agencies
- Building capabilities within government agencies to enable data-driven decision making
- Using analytics to track the progress of various initiatives simultaneously, possibly through dashboards

Challenges faced in implementation of Digital India & way forward

The Digital India program faces a number of challenges that need to be addressed. These include:-



1. **Delay in development of infrastructure:** One of the biggest challenges faced by the Digital India programme is the slow progress of infrastructure development:
   - The BharatNet project was approved in October 2011, with a two year implementation target. As of 2016, under 40% of the target has been achieved.[13]
   - Spectrum availability in Indian metros is about a tenth of the same in cities in developed countries. This has put a major roadblock in providing high speed data services.
   - Public Wi-Fi penetration remains low. Globally, there is one Wi-Fi hotspot for every 150 citizens. For India to reach that level of penetration, over 8 million hotspots are required of which only about 31,000 hotspots are currently available.[14]
   - While the project has seen delays, the exercise needs to be reinforced with both funds and involvement of senior government functionaries towards making it happen on a 'war footing'
2. **Rural connectivity:** For Digital India to have a large scale impact on citizens across the nation, the digital divide needs to be addressed through last mile connectivity in remote rural areas. Currently, over 55,000 villages remain deprived of mobile connectivity. This is largely due to the fact that providing mobile connectivity in such locations is not commercially viable for service providers.
3. **Development of the application ecosystem:** For digital technology to be accessible to every citizen, significant efforts are needed to customize apps and services to cater to local needs. Finding vendors who can provide such applications has become a challenge.
4. **Policy framework for Digital India:** Challenges in policy, such as taxation, right of way, restrictive regulations etc. are major roadblocks in realizing the vision of Digital India. Some of the common policy hurdles include the following:
   - Lack of clarity in FDI policies, for instance, have impacted the growth of e-commerce.
   - Transport services like Uber have had frequent run-ins with the local government due to legacy policy frameworks which have not become attuned to the changing business landscape.
5. **Contracting:** Implementation of the Digital India program has been hampered by contracting challenges such as the following:
   - Several projects assigned to PSUs are delayed given challenges related to skills, experience and technical capabilities.
   - Several RFPs issued by the government are not picked up by competent private sector organizations since they are not commercially feasible.
6. **Digital literacy:** Reports suggest that, as recently as 2014, nearly 70% of Indian consumers indicated that lack of awareness was the main reason for not using internet services.[15] Non-availability of digital services in local languages is also a major concern.
7. **Data security:** With the proliferation of cloud-based services like DigiLocker, data security has emerged as a major challenge. The recent data breach in August 2016, in which debit card data for more than 3.2 million subscribers was stolen highlights the importance of implementing foolproof security systems.

Key takeways

Development of digital infrastructure is a critical component of Digital India. To further enable development of digital infrastructure, the following measures should be considered:-

1. **Uniform policies for deploying telecom and optic fibre infrastructure:** A uniform RoW policy across all states with a reasonable cost structure is required along with a single window mechanism for granting RoW permissions. PPP models need to be explored for sustainable development of digital infrastructure, as has been the case for civic infrastructure projects like roads and metro project. In addition, the government should make efforts to make additional spectrum available to telecom service providers for deployment of high speed data networks.

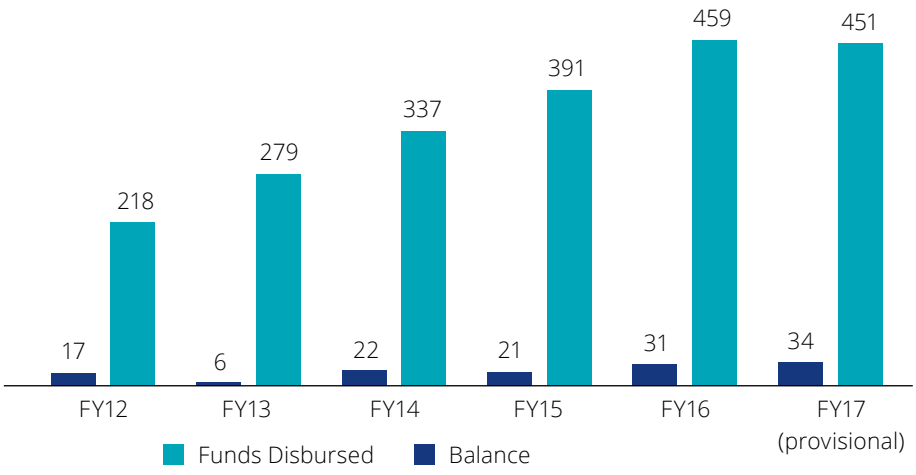
2. **Encourage collaboration with the private sector:** Effective collaboration with the private sector is critical to the development of the digital infrastructure. Innovative engagement models that ensure commercial viability needs to developed jointly through consultation with industry bodies. This will encourage private sector participation and ensure a better response to infrastructure RFPs. In addition, startups need to be incentivized for the development of the last mile infrastructure and localized services and applications.

3. **Rural infrastructure development:** Existing government infrastructure assets (e.g., post offices, government buildings, CSCs) should be further leveraged for provision of digital services.

   In rural and remote areas, private sector players should be incentivized to provide last mile connectivity. USOF can be effectively used to incentivise and create a viable business model. The deployment of funds so far has been erratic and not been used to effectively to fund the cost of infrastructure creation in rural areas. Currently, the fund has over INR 451 billion in reserves which can be used to finance rural digital infrastructure growth in India through direct investment or subsidies.

4. **Use of complementary technologies:** Satellite communication solutions could be used to speed up broadband access in rural and remote areas. For instance, banks can use VSAT technology to connect remote ATMs, remote branches that need instant access to customer data. It could be used as a last mile connectivity solution in rural areas which lack telecom networks. Another example could be of the navigational system NAVIC (Navigation with Indian Constellation), which can have applications in terrestrial, aerial and marine navigation, disaster management, vehicle tracking and fleet management, integration with mobile phones, precise timing, mapping and geodetic data capture, terrestrial navigation aid for hikers and travellers and visual/ voice navigation for drivers.

Figure 2: USOF Disbursed and Balance (INR billion)



Enabling Services for Digital India Transformation

Development and deployment of services under Digital India

After infrastructure, digital services is the second most critical component for the success of the Digital India program.

The government has undertaken a number of steps to develop applications and digitized services for citizens. While few of these applications (e.g., DigiLocker, MyGov) have witnessed high adoption, several others are lagging behind as they are perceived to be less user friendly and difficult to use.

This section provides an overview on the existing services landscape, key initiatives taken by the government, role of the private sector and the way forward with respect to the challenges faced. In addition, case studies demonstrating the impact of Digital services in Healthcare, Education and Agriculture have been showcased.

Table 2: Status of major services launched under the Digital India Programme

Services	Description	
eSign	eSign framework allows for online digital signature by leveraging Aadhaar authentication	• Implemented and deployed • Used for business documents & tax returns
National Centre of Geo-Informatics	GIS platform for sharing and collaborating GIS data source, location-based analytics and 'Decision Support System'	• Platform has been developed and is seeking support from state government for deployment
Information Security Education and Awareness (ISEA) Phase-II & Cyber Security	Capacity building in the area of Information Security to address the human resource requirement, training and develop information security awareness	• 51 academic institutions • 4- Info. Security Research and Development Centers (ISRDC) • 7-Resource Centers (RCs) • 30,000 people trained[16]
MyGov app	Citizen-centric platform empowering people to connect with the government & contribute toward good governance	• Service has been rolled out with more than 10,00,000 users[17]
DigiLocker	Digital Locker facility provides citizens a shareable private space on a public cloud and making all documents / certificates available on cloud	• With 39,60083 registered users DigiLocker this service is available for citizens[18] • App available in Playstore
Swachh Bharat Abhiyaan app	To further the Swachh Bharat mission, the government has launched this app which will be used by people and government organizations	• 500,000 installs so far[19]
Wi-Fi hotspots	Under this initiative, the government plans to deploy Wi-Fi at public and tourist places	• 2489 hotspots • 1209 hotspot locations[20]
Payment Bank by India Post	By March 2017, India Post will launch their own Payment Bank across India	• Development in progress
PayOnline Launch of e-Payment Portal	National ePayment gateway is enabling every Indian citizen to make online payments for all Government based transactions, ecommerce payments and other related tasks	• e-Payment started in Railways, CPWD, Ministry of Urban Development for 152 Divisions, a total of 278 Divisions to be on-boarded by the end of this year[21]
Launch of Post-Terminals (Rural ICT – RICT)	Handing over Post Terminals to rural Post Masters. This will help in providing the financial and other services in to rural areas	• In progress and expected to be completed by March 2017
National Scholarships Portal	One-stop-solution for end-to-end scholarship process right from submission of student application, disbursal to end beneficiary for all the scholarships provided by the Government of India	• Developed and deployed successfully • 1,22,96,926 registered students • 16,17,084 universities/institutes[22]

Launch of Online labs for schools	Under this nationwide initiative, Online labs will be available in Hindi, Malayalam and Marathi and offered in both urban and rural schools 30,000 teachers in all Indian states will be provided training on Online labs	• Online labs currently has over 90,000 registered users[23] • Being moved to the National Knowledge Network (NKN) to support large scale
E-education	Providing high-tech education in remote and urban areas using technology like smartphones, apps and Internet services	• In progress – Pilots / POCs deployed • Under deployment of nodal office and target to all school with broadband and Wi-Fi available • 30000+ teachers enrolled[24]
E- Health	Provides timely, effective and economical healthcare services such as online registration, payment, report, claim etc.	• DPRs have been prepared. Execution yet to start

Key enablers for the development of services under the Digital India program

A number of policy changes and initiatives have been undertaken by the government as enablers to develop and increase the speed of deployment of services. Some of the major enablers are detailed below:

1. **Mission Mode Projects (MMPs):**
   a. **Mission mode projects (MMP)** are individual projects within the National e-Governance Plan (NeGP) that focuses on one aspect of electronic governance. These projects are executed on fast track mode and directly impact the success of pillars under Digital India. The components of MMPs are as follows:
      i. Capacity building: To enhance service delivery with skilled people
      ii. Awareness and communication: To improve training and awareness
      iii. Impact and outcomes: To monitor benefits realization
      iv. Standards and Policies: To enable seamless collaboration across projects
   b. **MMPs aligned with Digital India**
      i. MMPs under Digital India includes a combination of projects managed by the center and states as well as those that are managed jointly.
   c. **Status of MMPs and challenges**
      i. Lack of incentives for promotion, awards and rewards for people, employees who use ICT
      ii. Low IT Education levels among semi-urban and rural areas to handle the applications
      iii. Limited workforce trained for ICT in the government and in the field (remote locations)
      iv. Internet connectivity in rural areas
      v. Infrastructure limitations especially in rural and semi urban areas (e.g., power, roads)
      vi. Operations and maintenance issue for system deployed in case of theft, breakage, etc.
2. **Financial Inclusion – Moving Towards Cashless Economy**
   a. **The Pradhan Mantri Jan Dhan Yojana (PMJDY)** is clearly the largest financial inclusion exercise ever witnessed in the world. Under the scheme, approximately 260 million unique accounts have been opened. With the PMJDY, nearly 100% of households have at least one bank account. As of September 2016, approximately 23% of these accounts had no deposits[26]. However, this should reduce significantly given the recent demonetization announcement by the government.

Figure 3: MMPs under Digital India[25]

b. The **demonetization** initiative undertaken in November 2016 will lead to a significant reduction in cash transactions and a higher usage of payment applications like m-wallets, online transactions and net banking. In conjunction with demonetization, the government has announced waivers on convenience charges, surcharge and service charge on digital payments by government departments and organizations to promote digital and card-based payments.

c. Further, with the launch of robust and secure **e-payment portals, RuPay, credit card, debit cards, NEFT, RTGS, IMPS** amongst others the government is making a push towards cashless economy where citizens are able to pay taxes, bills etc. online with help of internet banking, credit card and other non-cash mediums. National Payments Corporation of India (NPCI) promoted RuPay represents 38% of all debit cards inssued in India, ahead of Visa and MasterCard. However, share in the number of transactions is still low (~4% of POS transactions and 2% of online transactions)[27].

d. In another step towards a cashless economy, a new service **Unified Payment Interface (UPI)** has

been recently launched that will allow for transaction between two bank accounts using two smartphones. This is very helpful for secure transctions for people who are not technology savvy.

e. While the government has been has pushing towards a cashless economy, it faces a number of challenges including the following:
   i. A large sized legitimate cash economy
   ii. Reluctance to use plastic (due to limited knowledge, training on usage)
   iii. Unawareness of benefits
   iv. Security concerns with usage of plastic money

3. Role of VNOs (Virtual Network Operators) in driving adoption of services

a. The telecom department issued rules on 31 May 2016 for virtual network operators (VNOs) to set up operations in India. These operators could offer consumers more choices for voice and data services while allowing telcos more options to monetize unused airwaves.

b. VNOs would lead to faster penetration of telecom services and encourage lower rates and introduction of new & innovative services including machine-to-machine (M2M) communication services. Rural and untapped markets will provide a significant opportunity for VNOs and also help with job creation, digital literacy and propagation of digital services.

4. Technology as an enabler for Digital Services

a. Technology plays a pivotal role in the Government's vision for a Digital India.
   i. **Broadband infrastructure:** Under the BharatNet program, the government plans to provide information highways in terms of high speed fiber networks.
   ii. **Mobile networks:** 4G networks are currently being deployed by most service providers. To increase available capacities, the government announced rules for spectrum sharing and has increased available spectrum for auction. The government has also partnered with the private sector to setup Wi-Fi in public places.

b. Under the Smart cities mission, 100 new Smart Cities are being developed which will focus on delivery on smart services to citizens through a strong technology backbone. Over 500 cities are also being upgraded under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) program. Internet of Things (IoT) which comprises of machine to machine communication technology will play a vital role in the development services that will be provided to citizens of these smart cities

c. Technologies such as cloud computing, mobility and analytics are being used extensively by the government to enable the vision of Digital India (e.g., DigiLocker, eTaal).

d. Integrated technology framework is being used by government to integrate the systems together so that data can be pushed and pulled by any system as and when required for effective service delivery and decision making.

Case Study:

e-Hospital – A Digital India initiative towards making premier healthcare facilities accessible

What is the e-Hospital programme?
The e-Hospital programme enables patients to register, book appointments, pay fee, avail diagnostic reports and seek availability of blood types online in premier medical government institutes like All India Institute of Medical Sciences (AIIMS), Ram Manohar Lohia (RML) Hospital, National Institute of Mental Health and Neuro Sciences (NIMHANS) and Sports Injury Centre (SIC) as well as any other government hospitals.

What is the current status of the programme?
As on November 2016, 56 hospitals provide this service with a total of over 472,000 appointments booked online till date.

How it works?
e-Hospital runs an Online Registration System (ORS) which is a framework for connecting various hospitals to citizens through a Aadhaar based online registration and appointment system. The application is hosted on the cloud service of NIC and allows patients to book online appointments with different section of the hospital by using eKYC data of the Aadhaar. The salient features of the service include:

- Simplified online appointment process: The e-Hospital portal provides a simplified hospital registration and appointment process through linkage to the citizen's Aadhaar number.
- Dashboard reporting: Detailed reports can be viewed for the hospitals linked to e-Hospital along with their departments showing information about new and returning patients, patient history and lab results.
- Hospital on-boarding and management of registration process: By enrolling on the e-Hospital service, hospitals can provide their appointment slots for online booking by patients. Further, the system facilitates hospitals in managing and monitoring the registration and appointment process.

What is the impact of e-Hospital service?
The overall Indian healthcare market is valued at approximately $100 billion and is expected to grow to $280 billion by 2020 exhibiting a CAGR of close to 23% boosted by the increased adoption of digital technologies in healthcare. The e-Hospital service has a key role in the growth of the industry through:

- Providing wider accessibility to citizens: The services allows for citizens to access any government hospital through a click of button. It also helps eliminate queues and time consuming registration processes enabling people to access healthcare and facilities in an efficient manner.
- Better patient experience: Since patient can meet doctors at a pre-defined time, time is not wasted waiting in queues. Doctors are less stressed to pack in too many patients in compressed timeframes
- Management and monitoring of appointments: The e-Hospital facility provides hospitals with a streamlined method of managing and monitoring appointments helping them realize efficiencies in hospital operations.
- Accessibility of reports through digitization: The citizens can access digitized diagnostic reports through the e-Hospital portal enabling quicker service, diagnosis and monitoring.

Case Study:

Develop pilot Massive Open Online Courses (MOOCs) –An initiative to provide quality education in an affordable and scalable manner

What are MOOCs?
Massive open online courses (MOOCs) are a distance learning initiative allowing students to access video tutorials, curriculum and instructions online. The Digital India project is initiating pilot MOOCs under the e-Kranti pillar to provide real-time education. This will partly address the challenge of lack of teachers in education system through smart and virtual classrooms. It also has the potential to make education accessible in rural areas and to weaker sections of society through mobile devices.

What is the current status of the programme?
The Union Budget FY17 focused on providing entrepreneurship, education and training in 2,200 colleges, 500 government industrial training institutes, 300 schools and 50 vocational training centers via MOOCs.

How it works?
MOOCs enable distance learnings in an effective and cost efficient manner through digital platforms that can be accessed online and on mobile devices. The courses are made available to students through virtual classrooms encompassing instruction, curriculum and tutorials. The high speed network provides adequate infrastructure for MOOCs.

What is the impact of MOOCs?
With the increase in data connectivity and improved IT infrastructure, the education sector is moving towards online courses. India has seen a rapid rise in the number of students enrolling for MOOCs indicating that the interest in MOOCs will continue to grow growing forward. The MOOCs have the potential to create a wide scale impact through:

- Making education accessible: The poor literacy rate in India is due to unavailability of physical infrastructure in rural and remote areas. This shortcoming can be addressed by MOOCs that can be undertaken through online and on mobile platforms. The increasing smartphone penetration especially in lower tier towns and rural areas has enabled a large section of the population to access quality education through MOOCs. Moreover, students can refer the topic and read, view or hear material multiple times in several Indian language as per their convenience. With no restriction on class size and usage of social media and online tools, MOOCs can be easily accessed from anywhere.
- Increasing affordability of education: MOOCs are available to students at much lower educational fees than conventional classrooms and other educational platforms. Due to the higher affordability, the enrolment of students for MOOCs has seen a significant increase.
- Improving quality of education: Keys hurdle in the imparting of education across the country is access to quality educators and poor pupil tutor ratio (27:1). MOOCs can provide education to the masses through instructions from premier education institutes and the country's leading educators.

Case Study:

Krishidoot –An information and market place platform for the agricultural community in India

What is Krishidoot?
Krishidoot is a platform for the agricultural community in India, launched jointly by Small Farmers' Agribusiness Consortium, an agency under the Agriculture ministry and Reuters Market Light (RML). It provides valuable information to farmer groups such as mandi pricing, crop advisory and local weather forecast. It aims to increase productivity by allowing farmers to realize better prices for their agricultural produce and optimize procurement cost for quality agricultural inputs. The platform is currently available in 5 different languages and has proven transaction capability across 9 states and 55 commodities.

What is the current status of the programme?
As on December 2015, 400+ Farmer Producer Organizations (FPOs), 11,000+ Farmer Interest Groups (FIGs) and 10,000+ market players have been onboarded on Kirshidoot.

How it works?
Krishidoot utilizes ICT technology and on ground facilitation to empower farmer groups to carry out transactions on the platform. There is a five step process in which Krishidoot call centre, tablet or mobile based apps, event based SMS messages and on ground support are used to complete the transaction.

What is the impact of krishidoot?
With the increase in data connectivity and improvement in digital infrastructure under Digital India, a larger number of stakeholders including FPOs, FIGs and market players are using Krishidoot. This has led to an increase in the quantity and value of transactions completed.

Category	Number
Number of Transactions Completed	40,675
Total Quantity transacted (in Quintals)	1.4 million
Value of transactions (in INR)	3.9 billion

Krishidoot has the potential to create a wide scale impact by:

- **Benefiting farmers:** Krishidoot is benefitting farmers by helping them realize higher prices than the prevailing market rates and increasing their savings on overhead charges such as transportation and loading-unloading. As a result, FPOs have been able to gain up to 25% benefit relative to Mandi/aggregator prices and an additional income of INR 120 million has been generated. Farmers have also been able to save time on marketing and sale of produce and get access to on the spot payment and fair weighing practices.
- **Benefiting market players:** Market players have benefited due to improved quality of the produce and better visibility of produce supply. They have been able to procure produce at better prices and take advantage of bulk procurement.

Key takeways

Development of the digital service ecosystem is a critical factor in realising the benefits of the Digital India program at the grass root level. To further increase speed of development and adoption of digital services the following measures could be considered:

1. **Higher private participation in the services ecosystem:** Higher private sector participation is required for the development of digital services. The government needs to provide a policy framework and incentives that provide for a viable business case for the private sector for development and roll out of digital services to the citizens.

2. **Improve digital literacy:** Higher adoption of digital services, especially in rural areas depends on provision of digital infrastructure and effective and sustained training.

   Train-the-trainer approach should be taken in areas where usage and deployment is low. It will help in spreading the knowledge and benefits of digital services. E-learning by short modules and using social media and campaigns to encourage the usage of services is an effective way to improve adoption and deployment.

3. **Establish an effective governance framework:** Considering the complex nature of the country and multiple central/state/local government and various private players operating with different technologies, the time is ripe for the country to have a Chief Information Officer (CIO) who can permeate the right infrastructure, comprehensive policies & services and ensure technological interoperability of key government functions across the country.

4. **Provision of user friendly applications and services:** One of the major reasons for the lower adoption rates for services is the limited availability of applications. The government needs to encourage deployment of citizen friendly, visually appealing carrier class applications that will help deliver the promise of Digital India empowerment for citizens.

   The government needs to provide incentives and a collaboration and learning platform to entrepreneurs, technology startups and students for development of innovative applications.

5. **Enhancing cyber security mechanisms:** A centralized surveillance and security mechanism that monitors and safeguards India's cyberspace against threats such as data theft, hacking, etc. should be set up. Policies regarding cyber security should be assessed on a regular basis and should be extended to private sector enterprises.

Capacity Building for a Digital India

For the success of the Digital India program, capacity building is crucial. In addition to infrastructure development, Digital Literacy, skill building and higher adoption of digital solutions is key to program success. This section provides an overview across the following three dimensions:

- **Digital Literacy:** Despite rising smartphone penetration and internet user base, digital literacy in India has been low. In order for the benefits of the Digital India programme to reach all sections of the population, improving digital literacy is imperative.
- **Skill Building:** A strong skill base is required to support the initiatives and services that are envisaged under the Digital India umbrella. Development of technical skills within ministries and state governments will enable the spread of e-governance services, maintenance and upgradation and decision making on all digital initiatives.
- **Digital Adoption:** For Digital India to be successful, all segments of Indian society need to adopt digital technologies. This will not only create demand for Digital India but also achieve its vision of empowering all citizens.

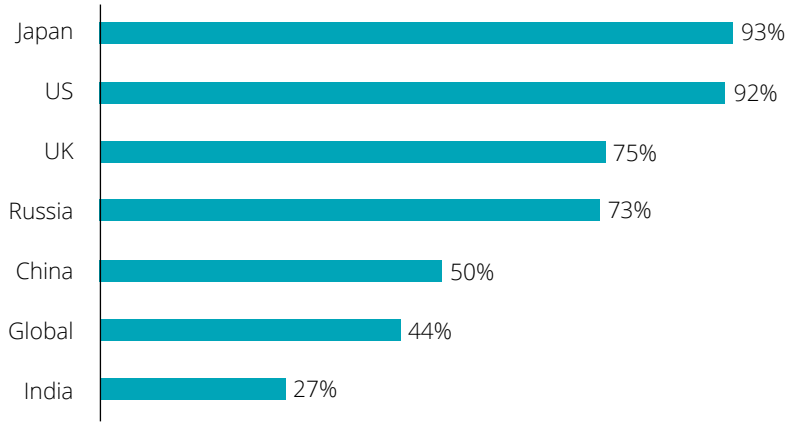
Digital literacy in India

India is rapidly evolving into one of the largest digital economies globally. The rising internet user base in India and smartphone penetration are expected to provide accessibility to digital technologies to all sections of the population.

- **Rapid growth in Internet user base:** With increased 4G and 3G penetration, the Internet user base in India is rapidly expanding and has reached a penetration of over 27% versus 50.3% penetration in China. It is expected to almost double to 600 million users by 2020 from approximately 343 users currently.[28] Going forward, rural adoption of data-enabled devices is expected to increase with the BharatNet initiative under Digital India.
- **Smartphone penetration:** India is the second largest mobile phone market globally with over 1 billion mobile subscriptions. Of this, smartphone users account for approximately 240 million subscriptions which is expected to grow to 520 million by 2020. Majority of internet users access the internet through mobile networks. Given the rapid growth in smartphones, penetration of digital services is expected to rapidly increase.

Although internet penetration has been on the rise, digital literacy in India is still as low as 10%.[29] To effectively harness the upcoming digital wave, it is important to increase digital literacy in India. The government as well as several private players have taken initiatives to create awareness and increase the rate of digital literacy in India.

Figure 4: Internet Penetration by Countries, 2016



Source: World Bank Data

National Digital Literacy Mission (NDLM)

In August 2014, the government initiated the National Digital Literacy Mission (NDLM) aimed at combating the digital skill gaps and enhancing digital literacy. The mission is headed by NASSCOM and targeted providing training to 5.25 million[30] people by 2018 through 20 to 30-day programmes.

The programme has been highly successful with close to 8.5 million people trained and 4.8 million certified under NDLM in since inception.[31] The key factors enabling the roll-out of NDLM have been:[32]

- Partnership with private sector companies such as Amdocs, Cognizant, Cyient, Google, Intel, Microsoft and Zensar Technologies to create NDLM centres across India.
- Delivery of the digital literacy training through PPP models with partner agencies identified by the respective State Governments and UTs. For example, NASSCOM is currently working with SAP India to set up 25 new centres across the country to add to the existing 75 in Tier –I and Tier – II cities.
- Common services centers (CSCs) established as access points for the delivery of various electronic services to villages to provide access to e-services for rural citizens utilising the existing infrastructure. By June 2016, approximately 170,000 CSCs in GPs had been set up across the country with the target is to reach out to 250,000 gram panchayats by the end of this year.[33]
- Encouraging village-level entrepreneurs (VLEs) to take up training and awareness generation in villages.

New Digital Literacy Mission

The government is also planning to launch a digital literacy mission scheme aimed at providing digital skills to 60 million people in rural areas representing 40% of the rural population in the next three years. The government intends to invest INR 300 on each training bringing the total cost of the programme to INR 18 billion ($265 million)[34]. For this programme, the government is working with content providers to include local languages and is giving special focus to improvement of skills with mobile devices in line with the strategic shift to m-Governance for various citizen-centric services.

Skill development programme for Electronics System Design and Manufacturing (ESDM) sector

The ESDM scheme is aimed at enhancing skills through training of 328,000 people in ESDM sectors. Under the scheme, the government provides 75% to 100% of training cost for industry specific skills for skilled and semi-skilled workers.[35] The scheme also provides opportunities for skill development for the private sector through telecom and electronics sector skills councils.

The Telecom Sector Skill Council (TSSC) aims to up-skill and certify 4.5 million personnel in 150 trades, train 24,000 trainers and accredit 500 training organizations[36]. Further, the Electronics Sector Skills Council of India (ESSCI) is created to provide training and skill development to enhance employability in the electronics manufacturing industry.

Till now, the ESDM skill development scheme has trained over 127,000 candidates and certified over 61,500 candidates with the assistance of 1,342 training partners.[37]

Other Initiatives

In December 2014, Intel along with the government unveiled a digital skills training application in 5 Indian languages including modules on digital literacy, financial inclusion, healthcare and cleanliness aimed to create digital literates across 1,000 panchayats[38]. Recently, Intel has initiated the following projects designed to accelerate digital literacy in non-urban India:[39]

- Inaugurated new 'Unnati Kendra at Common Service Centre' (UK at CSC) facilities in Karnal, Haryana under the 'Ek Kadam Unnati Ki Aur' initiative. The centre will serve as a common access digital learning centres and Intel aims to open several more of these facilities in the state.
- Launched the 'Digital Unnati' online portal, to upskill Village Level Entrepreneurs (VLEs) at CSCs. The webpage is being set up in collaboration with the CSC e-Governance Services India and will enable VLEs to improve their technology know-how.

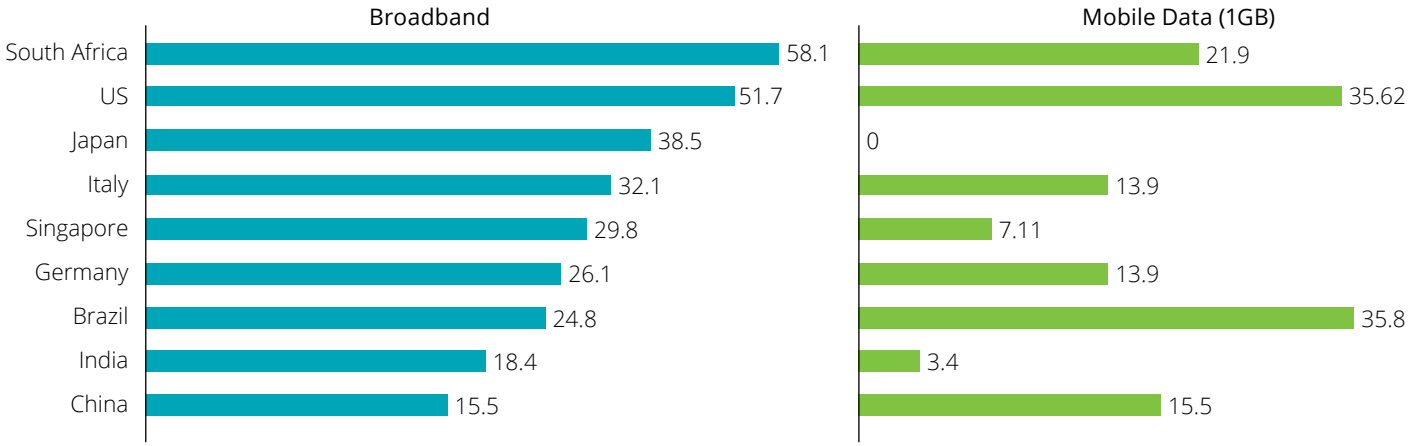
Several other initiatives such as dSaksharta, Microsoft's Digital Literacy Program and ICT Academy's Digital Literacy Programme have also been introduced to increase digital literacy in the country by providing training modules for introductory digital literacy skills. Further, Telenor India has converted a number of its stores to customer education hubs (Grahak Shiksha Kendriyas or GSKs).

Challenges faced in improving digital literacy

Given the diverse and burgeoning population of India, the proliferation of digital literacy faces several implementation challenges:

- **Access to affordable broadband and devices:** While penetration of the internet is rapidly increasing in India, access to affordable broadband, smart devices and monthly data packages is required to spread digital literacy. Even with the internet data plans in India being among the cheapest in the world and the average retail price of smartphones steadily declining, connectivity is still out of the reach of nearly 950 million Indians.[40]

Figure 5: Comparison of Internet Costs by Country (USD per month) [41]



- **Integration of local languages with technology:** India has over 1,600 languages and various dialects. This diversity has resulted in strong language barriers. In areas where people only use local languages, integration of local language and technology is required to drive digital literacy.
- **Cybercrime awareness:** Fear of cybercrime and breach of privacy has been a deterrent in adoption of digital technologies in India. In order to encourage people to switch to digital means, it is important to provide awareness and education on cyber security, risks and safeguarding of information on the internet.

Key takeways

Digital literacy is essential to the adoption of digital service. To further improve the digital literacy the following measures could be considered

1. **Increasing accessibility and scale of training platforms:** Mobile platforms and internet enabled programs should be used to improve the accessibility of training programmes.
2. **Provide credible and industry acceptable certifications:** Credibility and recognition of certifications provided by various initiatives is key to successful development of digital literacy. Sector Skills Councils (SSCs) associated with sub-sectors should get industry inputs on curriculum, trainings and services. Further, industry players should be compelled to recognize the credibility of certificates issued.
3. **Partnership amongst various stakeholders:** The various stakeholders (different government programs, ministries, institutions, industries etc.) involved in imparting digital literacy need to work in coordination to obtain the most effective implementation. This will require transparency of information, workflow management and timely updates on the progress of various factions.
4. **Defining the role of the private sector:** A framework needs to be defined for participation of the private sector in skill development programs which defines the role of the private sector, expectations in terms of investments, content and job guarantees.
5. **Enhanced synergy between Skill India and Digital India:** Skill India is aimed at providing skilled resources across the country. An integrated approach between Digital India and Skill India should be constructed to design programmes and impart training.
6. **Introduction of digital skill programs at an institutional level:** Skill training and digital literacy should be introduced as part of institutional trainings in schools, colleges and universities across India. Curriculum and interactive programmes should be mandated to ensure adequate digital skills of all graduates.

Skill building for Digital India

Building skills required to achieve the Digital India vision

India faces a severe shortage of well-trained and skilled workers. It is estimated that only 2.3% of the workforce in India has undergone formal skill training versus over 50% in the developed countries.[42] This shortage is accentuated in the electronic and digital sectors. However, to achieve inclusive growth, skilled and well-trained manpower is critical. Several strides have been made towards developing the right skills required to support Digital India and e-governance initiatives.

The Capacity Building Scheme (CB Scheme) was instated to provide training for designing and delivering projects under Digital India. The Capacity Building Scheme Phase I was implemented from 2008 to 2015 under the National e-Governance Plan. Phase II was initiated in January 2015 and will be executed through October 2017. The scheme provides technical and professional support to State level policy and decision-making bodies and develops specialized skills for e-Governance both at Central Line Ministries (CLMs) and state governments. The key mission of the scheme is as follows:

- Establishment of an institutional framework for strategic decision-making including setting-up of State e-Governance Mission Team (SeMT)
- Imparting specialized training and orientation programmes for SeMTs and decision-makers
- Developing skill set and training personnel for implementing NeGP and Digital India
- Bringing standardization and consistency across initiatives
- Maximising resource utilization and deployment
- Developing, training and implementing global best practices

Challenges faced in building capacity

- **Keeping up with technological advances:** The main challenge faced while training the workforce to support Digital India is in keeping up with emerging technologies. The training programmes and curriculum need to be continuously evolved to incorporate new technologies and applications which can significantly improve e-Governance and delivery of services.
- **Developing skills at entry level in state and central ministries:** The training programmes currently focus on decision-making and skill development at an executive level. Going forward, programmes to impart skills to entry level employees will be imperative to build long-term talent in the ministries.

Key takeways

While several steps have been taken to improve skill capacity for Digital India, further developing strong talent in digital and ICT is imperative. The following measures are recommended:

1. **Alignment with academia and university systems:** The development of digital and ICT skills in India should be closely aligned with academia and universities to ensure staying abreast of emerging technologies. Redesigning the curriculum and encouraging research and innovation in educational institutions would have a large scale impact on skill development and innovation.
2. **Accelerate partnerships with global technology leaders:** Another method to stay at the forefront of emerging technologies would be through forging partnerships with global technology players for trainings and skill development programmes in governments and ministries.
3. **Gradual migration from basic digital literacy to advanced programme and project management:** Currently, a major portion of the programmes being imparted are basic digital literacy and support trainings. However, the migration to advanced skill development and trainings is required over time to ensure a highly skilled manpower base.
4. **E-Governance skill development and capacity building:** Widening the reach of the Train-the-Trainer programmes can help in creating a pool of e-governance champions within the government to lead, support, manage and execute trainings.

Adoption of digital technologies and services

A key aspect in the successful implementation of Digital India is the adoption of digital services and technologies by all segments of Indian society. Currently, the adoption of technology amongst the economically weaker sections of society has been low. This can mainly be attributed to the low penetration of internet in the country which is at approximately 27% overall and about 13% in rural areas. However, other factors such as low consumer awareness and literacy levels, lack of content with regional relevance, lack of access devices, affordability and language barriers would also hinder the adoption.

Further, medium and large sized businesses are adopting technology in major ways, even ahead of their counterparts in developed economies. However, the usage of digital applications and technologies remains limited in MSMEs. The increased deployment of technology in MSMEs could have a large scale impact in not only creating awareness but also generating employment.

Challenges Faced in Adoption of Digital Technologies

The top barriers to adoption of technologies in the economically weaker sections of society as well as in MSMEs include:

- **Cost and affordability:** According to Asian Development Bank, approximately 22% of the population in India lives below the poverty line.[43] Thus, affordability of internet enabled devices along with data services becomes a challenge for a large section of the society. Further, a large section of the population is of the view that the cost of the adoption of technology outweighs the benefits in the current scenario. Similarly, several MSMEs are sceptical of the return on investment of technology adoption.
- **Limited high speed mobile data connectivity:** Most telecom operators so far have not invested significantly in development of high speed access networks in rural areas.
- **Low awareness of benefits of technology:** Amongst the lower strata of society, the awareness of the benefits of adopting technology is low

as is the awareness of government schemes and initiatives. Similarly, MSMEs also have low awareness of government and stakeholder schemes that could lead to numerous benefits.

- **Low rate of digital literacy:** A key hindrance to adoption of technology is the low rate of digital literacy in India. Several initiatives undertaken by the government and other organisations are expected to improve the digital literacy rate in the coming years which will in turn result in an increase in adoption of technology and digital services.
- **Limited digital content in regional languages:** While there has been an increase in localized content and applications, content still remains limited in several local and regional languages. Most applications that exist have been driven by the government. Private sector involvement remains limited to proof of concepts (PoCs) in limited test environments.
- **Security and privacy:** In India, several apprehensions about security and privacy exist when it comes to technology. While individual users fret about their private and financial data being accessible or stolen, business users worry about storing sensitive data, such as invoices, bills and client documents, on technology platforms without adequate protection.

Key takeways

Encouraging adoption of technology across all segments of the society is key to the success of the Digital India programme. To increase adoption, the following steps are recommended:

1. **Creating awareness:** Demonstrating the value add of adopting technologies is critical to improving adoption of technology. Programmes for generating awareness of technologies that can improve the standard of living for economically weaker sections and bring financial inclusion must be initiated. Comparisons and examples of growth between traditional operations versus IT-based approaches can be demonstrated to encourage adoption of technologies amongst MSMEs as well.
2. **Training on technology:** The digital literacy programmes and trainings need to be supplemented with trainings on data security, measures to ward against cybercrime and usage of technologies such as cloud. This will encourage people to adopt technology and dispel their fears of privacy.
3. **Providing affordable solutions and support:** Affordable solutions such as easy instalments, credit options, and pay-as-you-go options can provide sustainable options for addressing cost concerns. Additionally, support on technology and basic user training locally are required for easy adoption.
4. **Awareness on usage of electronic money post the demonetization:** Given the recent demonetization of high value currency notes[44], the usage of digital money is expected to increase. Awareness of digital financial options and security of e-money across all citizens is key to move towards a cashless economy.
5. **Increase security for electronic records:** Security systems should be installed and upgraded regularly to protect digital records and reduce risk of threat or misuse. This will also assist in assuring citizens of data security and encouraging them to adopt digital storage.

Digital India: Making an Impact

Digital India focuses on transforming India into a digitally empowered society and a knowledge economy, thus, impacting all facets of businesses, citizens and environment. It is projected that Digital India has the potential to provide an incremental 20-30% increase in GDP by 2025, resulting in an opportunity of close to $1 trillion annually by 2025.[45] The impact of this programme can be felt across all domains through the adoption of technology in key sectors including financial services, healthcare, agriculture, energy, infrastructure and education.

Impacting citizens

The Digital India project has the potential to impact the lives of citizens by creating employment opportunities, enhancing the quality and speed of service delivery, providing access to healthcare and education and improving social and financial inclusion.

1. Employment

- Job creation: With an estimated overall cost of INR 1,000 billion in ongoing schemes and INR 130 billion for proposed and new schemes, Digital India aims to create 17 million direct and 85 million indirect jobs by 2019.[46]
- Digital Training Programmes: The initiatives towards training and digital literacy by the government and private sector players such as NDLM, Digital Literacy Mission etc. have been successful in reaching out to millions of people. This has resulted in an increase in employability of the trained personnel, higher adoption of digital technologies and empowerment of a large section of society.

2. Speed and Quality of Service delivery

- **Public service delivery:** Digital India has enhanced the digitization of public services by increasing the reach and efficiency of service delivery. The number of e-governance transactions has doubled from 3.5 billion in 2014 to almost 7 billion in 2015, indicating that e-services are gaining momentum and reaching the bottom of the pyramid.[47]
- **Connectivity:** The government is focussed on increasing last mile connectivity by providing an affordable broadband network to rural households and institutions. This network will be leveraged to roll out and increase adoption of digital services.
- **Universal Accessibility:** The DigiLocker service has provided universal accessibility to citizens, by allowing then to access and share documents. Currently, there are approximately 4 million registered users with 5.0 million[48] documents uploaded on the digital locker facility.

3. Social inclusion

- **Education:** Digital India has the potential to overcome challenges in the education sector like inadequate infrastructure, high drop-out rate (40% in elementary education), low pupil teacher ratio (28:1) and poor gross enrolment ratio (21% in higher education)[49]. The government has allocated INR 1 billion[50] to build virtual classrooms and provide online courses to address the teacher shortage and teacher quality problem. Under Digital India, the use of SmartClass solutions has put many private schools in India ahead of the technology adoption curve than many other schools in the US, Singapore and Japan[51]. Online education platforms like massive open online courses (MOOCs) will provide easy accessibility from anywhere. The adoption of MOOCs, currently 8.8%[52] has been slowly increasing while OLabs (Online Labs) is expected to improve student performance by providing teaching aids and already has 90,000[53] registered users.
- **Healthcare:** Digital India has the potential to provide solutions to problems such as poor doctor patient ratio (1:1674)[54], fewer quality physicians, insufficient healthcare infrastructure, lack of equal access to healthcare facilities and advice (24% in rural areas)[55], and high healthcare costs. The e-hospital program is increasing delivery speed of healthcare services by allowing patients to book appointments online. Social Endeavour for Health and Telemedicine (Sehat) will increase coverage by providing healthcare access to citizens irrespective of their geographical location with close to 60,000 CSCs delivering tele-consultation services as part of Sehat.[56]

4. Financial Inclusion

- Reach of Digital Banking: India Post Payment Banks (IPPB) is expected to benefit 40%[57] of the population which is currently outside the formal banking system by providing digital and online banking services through post office. The mobile and internet banking will increase the coverage and volume of financial transactions which will be key in the light of the recent demonetization and move towards cashless economy.

Impacting businesses

Digital India is likely to have a significant impact on the profitability and operations of business. Through adoption of digital technologies, companies can consolidate documentation, automate processes and have access to efficient and cheaper ICT capabilities.

While the benefits will be realised in years to come, some of the key areas of impact are likely to be:

- **Increasing profitability:** In India, adoption of advanced business digital technologies can lead to increase in revenues by up to 27%, increase in employment by up to 84% and enhanced access to international markets by up to 65% for small and medium business (SMBs)[58]. Digital infrastructure can also help leveraging technologies like telepresence that can reduce the need for business travel and result in cost savings
- **Higher productivity:** Increased levels of digital technology-use under can improve employee satisfaction and collaboration, leading to a more productive workforce. In India, it is estimated that employees in SMBs with advanced digital engagement are 8.7 times[59] more likely to collaborate than offline businesses.
- **Ease of doing business:** The government has taken several measures to improve ease of doing business in India. Consequently, India has seen an improvement in the global ranking for ease of doing business[60]. Services such as eBiz portal, KYC and other e-governance initiatives have started to contribute to the improvement in ease of doing business and this is expected to further improve.
- **Faster time to market:** Availability of digital infrastructure will help companies drive significant efficiencies, reduce time to market (new products, new markets) by digitizing their core operations and supply chains.
- **Investment:** The vision and initiatives towards Digital India is expected to boost investment in the digital space in the short-term and lead to rise in digital innovation, efficiency and productivity in the long-term. Currently, a number of domestic and global companies have announced investments in the digital space in India.

Table 3: Pledged / announced investment Inflow Expected in the Digital Space

Company	Amount (in $ billion)	Key Areas
Reliance Industries	37.0	Wireless Broadband, Cloud Computing, Data centres
Bharti Airtel	16.0	4G connectivity, e-health, e-education
Sterlite Technologies Limited	3.7	Fibre & Cable Manufacturing
Aditya Birla Group	7.0	Network roll-out, broadband network, Wi-Fi deployment
Cisco	0.1	Investment in early-stage and growth-stage companies
Qualcomm	0.15	Investment in digital and innovation start-ups

Source: Company Announcements

Impacting the environment

The Digital India project through the use of next generation technologies will help in reducing carbon footprint and provide several environmental benefits. Some of the key areas of impact are likely to be:

1. **Reducing carbon footprint:** India has pledged to decrease its carbon emissions by 33% to 35% relative to its GDP from 2005 levels by 2030[61]. The Digital India program is likely to have a positive contribution towards achieving these goals.

   Wide spread implementation of telepresence and cloud computing technology under Digital India will lead to reduction in carbon emissions. For example, telepresence can eliminate 20% of the business travel, leading to reduction in carbon emissions by 1.08 million tonnes[62] globally. Use of cloud storage for documents will significantly reduce the consumption of natural resources like paper.

2. **Energy efficiencies and waste management:** India is the fifth-largest producer of e-waste, discarding approximately 1.8 million tonnes[63] of e-waste each year. Under Digital India adoption of ICT solutions such as waste collection automation and waste management information and prognostics are expected to considerably reduce e-waste.

   Using Digital infrastructure that is developed under the digital India program, city municipalities will be able to better manage the collection and disposal of solid waste and sewage. Several cities have started the deployment of pilot solutions for waste management in cities.

3. **Forestry and Agriculture:** Digital India can prevent deforestation by increasing the use of digital solutions in the coming few years. For example, Google in collaboration with University of Maryland and the UN Environment has developed Global Forest Watch 2.0 to prevent deforestation.[64] This tool uses satellite technology, data sharing and human networks to better manage forests.

4. **Environment Monitoring:** Availability of digital infrastructure across various locations along with sensors and customized applications will help provide better information related to environmental challenges like pollution, climate change, weather monitoring etc. This can help local governments react to local issues (like traffic congestions, high levels of pollution etc.) in real time.

Key takeways

Though the benefits of Digital India will be realised over the next few years, the program will have a significant impact on the lives of citizens, business and the environment. The following measures will help in realizing the maximum potential under the Digital India program:

1. **Increasing the effectiveness and reach of existing digital services**
   - **Education** - Development of content that is innovative, interactive, engaging and takes into consideration the varied needs of learners. The curriculum should be updated regularly based on consultations with the industry.
   - **Healthcare (eHospital)** – Increase coverage from existing 56 hospitals. Additional services like remote healthcare and telemedicine could be added to provide coverage to rural segments.
   - **Banking** – Digital trainings for existing bank employees as well as in the new banks (e.g., Indian Postal Payment Bank) to cater to the digital needs of the citizens.
2. **Increasing ease of doing business:** Ease of doing business can be improved significantly by reducing time for licenses / approval / sanctions, simplification and digitization of tax processes and availability of ICT infrastructure.

   In addition, the government needs to reduce the number of days needed to start a business by digitising key processes and providing a single window clearance for all approvals required. In India, it takes 29 days to start a business which is much higher than the global average of 20 days.
3. **Building a distributed, digital talent pool:** In order to encourage global companies in the digital sector to establish offices in India, there should be a considerable thrust on forming a highly skilled talent pool. Local capabilities along with lower labour costs would encourage companies to enter India driving innovation, infrastructure and services. Digital infrastructure should be used to proliferate talent to locations other than the existing big clusters - Bangalore, Pune, Mumbai and Delhi-NCR.
4. **Using digital infrastructure to create a positive impact on the environment:** Digital infrastructure can be leveraged to deploy IOT solutions that will help with issues such as pollution monitoring and management, waste management, water management, improving efficiency of energy grids, etc. This will have a positive impact on the environment. The government needs to develop a framework for use of digital infrastructure and participation of the private sector in the development and deployment of such solutions.

Concluding Remarks

The Digital India program is now in the second year of its existence and several of the flagship projects under the program have now moved from the planning phase to the execution phase. The progress made in these projects and across the three vision areas of Digital India has started to show an impact on the lives of citizens and on businesses. Several applications and services that have been developed have seen significant adoption. The cloud storage service, DigiLocker, is now being used by four million users. The MyGov application which provides a platform for citizens to interact with the government is used by over one million users to interact with the government.

While infrastructure build-out under the BharatNet program has progressed at a moderate-to-slow pace, the last 12 months have witnessed an explosive growth in data services on the back 4G services that have been launched across the country by telecom service operators. With ~350 million users, India now represents the second largest internet user base in the world. This provides a significant opportunity to transform the lives of the citizens through digital technologies.

The Digital India program is likely to benefit citizens over the next few years by generating employment opportunities, increasing speed and quality of service delivery and enhancing social and financial conclusion. Businesses will benefit by realizing higher productivity, an improved ease of doing business and a boost in innovation and investments. The adoption of next generation technologies under Digital India such as telepresence will help reduce costs and also have a positive impact on the environment.

While the usage of smartphones and the internet has increased, digital literacy and awareness is still low and is an area that requires enhanced focus. The government has initiated several programs like the National Digital Literacy Mission (NDLM) and Skill India program to increase IT awareness and literacy. To further strengthen the development of infrastructure, services, capacity building and enhance their impact, the government needs to take steps across multiple functional areas, some of which are summarized below:

1. **Increase availability of digital infrastructure at rural and remote locations:** The speed at which digital infrastructure (especially fiber networks) is being developed needs to be increased. Existing government infrastructure assets (e.g., post offices, government buildings, CSCs) should be further leveraged for provision of digital services at remote locations.

2. **Improve digital literacy:** Digital literacy needs to be increased by providing institutional trainings in schools, colleges and universities; accelerating partnerships with global technology leaders and using the workforce trained under Skill India to impart trainings. An integrated approach between Digital India and Skill India needs to be constructed to design programmes and impart training.

3. **Create awareness on the benefits of Digital services:** The government should increase awareness regarding the value add of technology to increase technology adoption. The benefits of technology such as increase in the standard of living of the weaker sections of society and enhancing financial inclusion should be communicated to citizens.

4. **Provide incentives for greater participation from private players and start-ups:** Private sector players should be incentivized to develop infrastructure, provide services and promote digital literacy as part of the Digital India program. Start-ups should be involved to create and customize apps to local needs to increase adoption of digital technology.

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