



MITSOT



# Digital India: Unleashing Prosperity



Knowledge Partner

**Deloitte.**

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# Foreword

Digital India – the dream project of the government and a blessing for the citizens, could help in connecting the dots of various projects, past and present, to bring India to a global platform. It will help in moving with the universal trends of digital innovation and create positive impact in the lives of people – rural and urban, young and old.

As per the World Bank report, a 10% increase in mobile and broadband penetration increases the per capita GDP by 0.81% and 1.38% respectively in the developing countries. If Digital India project could help increasing the broadband penetration across India (current ~7%) by 50% and mobile penetration in rural India (current ~45%) by 30% in next 2 years, the corresponding increase in GDP could be 9% (~\$180 billion). This is just the impact of 2 out of 9 pillars of Digital India project. Adding to this growth and prosperity would be the impact of other pillars that would empower the citizens with gamut of services at their fingertips. The benefits of the Digital India initiative are beyond imagination and the opportunities to innovate in the digital world for all stakeholders are limited only by their own imagination. The Aadhaar card (722 million as on December 2014) would facilitate lifelong and unique identification and authentication of citizens across the country. This unique id along with digital platforms could enable efficient and equitable service delivery at anytime, anywhere and on any device.

With increased penetration of mobile, they become obvious choice for attaining inclusiveness in others sectors like financial, education, healthcare to name a few. 115 million bank accounts were opened under the Jan Dhan project in less than a year, which was first step

towards inclusion in financial systems for base of the pyramid. Moreover, with several industries undergoing digitization lately, local language content would help to gain adoption and to bridge the rural-urban divide. Problem of urbanization could be tackled by enabling equivalent infrastructure in rural areas or building satellite towns through 3 types of connectivity proposed by APJ Abdul Kalam namely: physical, electronic and knowledge. The digital business models not only help in reaching to wider audience, but at the same time, make the services more affordable, attractive and feasible for the end users. For example, entrepreneurial ventures such as BigBasket (grocery at home), Portea Medical (home healthcare), SuperProfs (online education), etc. are enabling inclusive growth by delivering high quality services to masses at low-cost. E-Commerce is bringing paradigm shift in the delivery of sale and service and slowly replacing the traditional brick and mortar sellers. As per GSMA, the global business impact of connected life could be \$4.3 trillion by 2020. India will be a big beneficiary of this. All these digital initiatives, technologies and services would together create a multiplier effect and transform individuals, governments, enterprises and societies towards greater prosperity.

Digital India initiative could help in achieving the objectives of Education for all, Information for all, Healthcare for all, Broadband for all if the government focusses on strong leadership structure, enables private participation, creates detailed implementation plan with common 'citizen centric' framework and robust security / privacy measures, and ensures integrated efforts from all departments.

As they say "The sky is not the limit" for the benefits.



Hemant Joshi

# Message from Organiser

The Indian Telecom market is one of the fastest growing markets in the world, providing huge potential in this booming sector across the globe having Network Operators, Infrastructure Companies, Telecom Billing Companies, Enterprise Solutions, VAS providers and service providers as its verticals this field provides ample opportunities for business and research.

The Government of India has set out its vision of how telecoms can help drive the Indian economy and bridge the digital divide. But for India's mobile broadband vision to become reality, ecosystem will need access to more regulatory support, new digital network capabilities and contemporary revenue models.

The most important element of change for enabling a more prosperous India with digitization is the changing user habits. People are evolving more contemporary business models, increasingly downloading data and using mobile applications. The true age of information is evolving now in India with more impetus on data connectivity.

Thus to prepare world class Techno Savvy business leaders of tomorrow, MIT Pune's MIT School of Telecom Management (MITSOT) a symbol of academic excellence has endeavored in the field of Telecom Education and research to guide, motivate and stimulate youngsters for

pursuing their glorious careers in this booming sector. MITSOT is one of the leading AICTE approved telecom institutes offering PGDM & MBA.

MITSOT backed by the industry, blends the technical and managerial skills of professionals to create future managers and entrepreneurs in telecommunications. MITSOT is a leading institution in the country in the area of telecommunications and "ICT" as an inclusive growth. It attracts the brightest students in the country and also caters to the rural students.

MITSOT is the first educational institute in India to be accredited as "Authorized Training Partner" by Telecom Sector Skill Council (TSSC), NSDC, Government of India. MITSOT is in the process of becoming a "Nodal Centre" of IIM Ahmedabad and IIT Delhi as Centres of Excellence. Two products, one each in M-Health and M-Agriculture space are going to be launched for commercial production after successful lab and field trials and many more products are in the pipe line.

In coming weeks, MITSOT will be at the helm of providing innovative corporate trainings in productivity, transition and specialized programs management. This will be a breakthrough initiative for industry-academia collaboration.



Dr. Milind Pande  
Project Director,  
MITSOT

# Message from Industry Partner

The Government of India has embarked upon an ambitious journey which has a vision to transform India into a digital state where the government will interface with its stakeholders digitally. Whether it is interfacing with the Citizens, Businesses or within the Government, the fundamental principle is digital enablement of the services which has led to inception of the 'Digital India' program. It is a proven fact that digitally enabled economies grow faster than the others a case in point being China.

Digital India is a large umbrella program which will restructure and re-focus several existing schemes to bring in a transformative impact. The Digital India vision aims to transform our country into a digital economy with participation from citizens and businesses. This initiative will ensure that all government services and information are available anywhere, anytime, on any device that is easy-to-use, seamless, highly-available and secured.

With proven technologies like Cloud, Machine-to-Machine (M2M), Analytics, Mobile (web-based interface), Social and Security at our disposal, this transformation can be made into a reality. A program of this scale, however, has never been conceived and one may well imagine the challenges that this will present. Challenges of managing scale, complexity and breadth will present themselves aplenty.

The nine – pillar program sits on three key vision areas:

- Digital Infrastructure for Every Citizen of India – The enablement of the urban and rural digital infrastructure is the prime focus to provide eGovernance / mGovernance to citizens

- Governance and Service on Demand – Modernization and reengineering of government processes & services will simplify governance and these services will be provided on an electronic or mobile channel to reach the remotest parts of India
- Digital Empowerment of Citizens – Address the current gap of the digital “haves” and “have nots” by developing skills and capacities of not only the citizens but also of the government agencies and employees at large

It is clear from the above mentioned vision that the Government wants this program to be 'Citizen-Centric'.

The Digital India program also spawns off the 'Make in India' program which has been launched globally. The vision of 'Net Zero Imports by 2020' will have a much needed, huge boosting effect on the Indian Manufacturing sector.

Digital India is a complex initiative and a program of this size requires disruption in traditional model of government operations. However, the disruption should be structured and controlled without derailing the current operations. As one may expect, a program of this size will have its own share of successes and failures. The success of this program depends on the cooperation and partnership of the government and the industry.

These are exciting times in the government and the whole world is now watching with bated breath for India to deliver on Digital India! Let's go and make this happen...



Soumitro Ghosh  
Chief Executive,  
Wipro Infotech

# Overview of Digital India

A good governing body requires a good communication platform to communicate with the stakeholders efficiently. Communicating with the citizens has been a big challenge for the government of India with widespread geography, massive population, and enormous linguistic & cultural diversity. The way of communication has changed a lot from postal and telegraph era to print and broadcasting media to the era of Digital Communication. The efficient way to communicate with the citizens of the world's largest democracy with a population of 1.2 billion is only possible by connecting with everyone on a digital platform. Though India is considered as the IT powerhouse of the world, there is a huge digital divide.

The Digital India initiative is a dream project of the Government to transform India into a digitally empowered society and knowledge economy. It is centered on three vision areas:

- Digital Infrastructure as a Utility to Every Citizen: The government is planning to provide high-speed internet connectivity to 250,000 Gram Panchayats, which will be a core utility for digital inclusion. The citizens will be provided with a digital identity which will be unique, lifelong, online, and valid. There will be easy access to Common Service Centers and a

shareable private space for every citizen on a public cloud.

- Governance and Services on Demand: Under this vision, all the government departments will be seamlessly integrated with high-speed optical fiber, which will improve inter operability of these organizations and will result in real-time service delivery from online or mobile platform. Apart from this, the government is planning to make all citizen entitlements portable through cloud for easy and country-wide access and to digitally transform the services for improving ease of doing business in India. The government also plans to use the power of Geographic Information Systems (GIS) for decision support systems & development.
- Digital Empowerment of Citizens: This vision is to empower citizens through digital literacy and universal access to digital resources. e.g. all documents/certificates to be available on cloud and in Indian languages. Government also wants to provide collaborative digital platforms for participatory governance. e.g. MyGov website for crowd sourcing ideas.

These three vision areas further encompass nine themes or 'pillars' of Digital India. Some of these are discussed below:

Figure 1: Nine Pillars of Digital India Project



### Pillars of Digital India

The Digital India initiative covers many important projects like National e-Governance Plan, National Knowledge Network, National Optical Fibre Network, digital cities, etc. which will help in digital inclusion in the country and empower the citizens to eradicate the digital divide.

### Broadband highways

The government with the vision of "Digital India" has allocated ₹5 billion to build high speed broadband highways connecting all the villages, government departments, universities, R&D institutes, etc. The digital development sees broadband as a key driver in addressing the challenges in the Millennium Development Goals primarily through fibre networks.

The National Optical Fibre Network (NOFN) project, funded by the Universal Service Obligation Fund, has set the stage for providing broadband access to the country's 250,000 gram panchayats by 2016. <sup>1</sup> This ₹200 billion project involves laying 600,000 km of fibre across the country. BSNL, RAILTEL (telecom arm of the Indian Railways), and PowerGrid Corporation are the three PSUs responsible for this mammoth task.

The participation of private players is very important for faster rollout of optic fibre networks across the length and breadth of a vast country like India. The competition from private players will not only bring efficiency into the processes but also helps in bringing down the price of high speed digital services. Moreover, the innovation in marketing, operations and business process proven by private players can help in faster and greater adoption of high bandwidth services in the remote and rural areas.

### e-Governance

The National e-Governance Plan (NeGP) has been formulated by the Department of Electronics and Information Technology (DeitY) and Department of Administrative Reforms and Public Grievances (DARPG). The e-governance project works in both centralized and decentralized way. The centralized way focuses on inter-operability of various e-governance applications and ensures optimal utilization of ICT infrastructure and resources while allowing for a decentralized implementation model.

There are many different initiatives from central government as well as state-governments under the NeGP project to ensure government services are available to citizens electronically.

- Pensioners' portal, a web-based portal called Pensioner's Portal has been created for the redressal of pensioners' grievances. It also provides information to pensioners on retirement and pension-related issues.
- The Digital Chip Maker Intel along with the government unveiled a digital skills training application in 5 Indian languages,<sup>2</sup> which includes modules on digital literacy, financial inclusion, healthcare and cleanliness. Intel will work with the Indian government to create digital literates across 1000 panchayats, a move that will impact five million citizens by the end of 2015.

Table 1: e-Governance State Level Initiatives

Project	State	Details
MobileOne	Karnataka	Provides access to 4500 services in the public and private domain. It helps in income tax return, railway inquiry, ticket booking, etc.
e-FIR system	Odisha	Crime and Criminal Tracking Network and System (CCTNS) were launched to make the registration of FIRs and tracking of criminals digital.
e-Cabinet	Andhra Pradesh	By using e-Cabinet app the state ministers accessed all the data and the agenda for the meeting digitally.
e-Registration	Maharashtra	Facility to digitally registering properties. The facility is applicable in housing societies with over 200 houses, where members can register their property 'online' from the office of the builder.
PRISMS	Maharashtra	E-Governance for jails in India. Prison management e-governance initiative. This initiative began in the Yerwada jail in November to store data of every prisoner from his date of entry into the prison to his date of release.
RTA's SMS service	Telengana	The Road Transport Authority (RTA) began a new SMS service for both, its field staff and citizens, for easier and faster access to data.
Digital Locker	Maharashtra	In an Aadhar-linked facility, it is an online repository for important documents like certificates, degrees, etc. frequently required for job application.

## e-Kranti

The e-Kranti project provides electronic delivery of services to the citizens. The government has allocated

₹5 billion for the e-Kranti project which includes many sub-level projects discussed below:<sup>3</sup>

**Table 2: e-Kranti Sub-level Projects**

Sub-projects	Initiatives	Organizations
e-Health	<ul style="list-style-type: none"> <li>Online medical consultation and medicine supply</li> <li>Online availability of medical records and patient information on a pan-India basis</li> </ul>	<ul style="list-style-type: none"> <li>OncoNET, Kerala and Tamil Nadu</li> <li>Medical Literature Analysis and Retrieval System (MEDLARS)</li> </ul>
e-Education	<ul style="list-style-type: none"> <li>Broadband Connected Schools</li> <li>Free Wi-Fi in all schools</li> <li>Digital Literacy program</li> <li>Massive Online Open Courses</li> </ul>	<ul style="list-style-type: none"> <li>Sakshat Portal (Ministry of HRD and IGNOU)</li> <li>Aakash Tablet</li> <li>National Repository of Open Education Resources (NROER)</li> <li>National Electronic Library (NEL)</li> </ul>
Technology for Farmers	<ul style="list-style-type: none"> <li>Real time price information</li> <li>Online ordering of inputs</li> <li>Online cash, loan, relief payment with mobile banking</li> </ul>	<ul style="list-style-type: none"> <li>Farmer's Portal<sup>4</sup></li> <li>mKissan Portal</li> <li>Kisaan call center<sup>5</sup></li> </ul>
Technology for Planning	<ul style="list-style-type: none"> <li>GIS based decision making</li> <li>National GIS Mission Mode Project</li> </ul>	<ul style="list-style-type: none"> <li>Planning Atlas of states<sup>6</sup></li> </ul>
Technology for Security	<ul style="list-style-type: none"> <li>Mobile Emergency Services</li> <li>National Cyber Security Co-ordination Center</li> </ul>	<ul style="list-style-type: none"> <li>Mobile App 'Himmat' and 'Abhayam' for women safety</li> <li>iClik (Instant Complaint login Internet Kiosk) centers</li> </ul>
Technology for Financial Inclusion	<ul style="list-style-type: none"> <li>Mobile Banking</li> <li>Micro-ATM program</li> <li>CSCs/ Post Offices</li> </ul>	<ul style="list-style-type: none"> <li>Kiosk Banking – Public /Private banks</li> <li>Mobile Banking – Telcos</li> <li>Payment banks</li> <li>Aadhar based Micro-ATM payments</li> </ul>
Technology for Justice	e-Courts, e-Police, e-Jails, e-Prosecution	<ul style="list-style-type: none"> <li>e-Court mission mode projects at state and central level</li> <li>e-Cabinet, Andhra Pradesh</li> <li>e-FIR system, Odisha</li> <li>PRISMS, Maharashtra</li> </ul>



### Impacts of Digital India

The Digital India project provides a huge opportunity to use the latest technology to redefine the paradigms of service delivery. A digitally connected India can help in improving social and economic condition of people living in rural areas through development of non-agricultural economic activities apart from providing access to education, health and financial services. However, it is important to note that ICT alone cannot directly lead to overall development of the nation. The overall growth and development can be realized through supporting and enhancing elements such as literacy, basic infrastructure, overall business environment, regulatory environment, etc.

#### Economic impact:

According to analysts, the Digital India plan could boost GDP up to \$1 trillion by 2025.<sup>7</sup> It can play a key role in macro-economic factors such as GDP growth, employment generation, labor productivity, growth in number of businesses and revenue leakages for the Government.

As per the World Bank report, a 10% increase in mobile and broadband penetration increases the per capita GDP by 0.81% and 1.38% respectively in the developing countries. India is the 2nd largest telecom market in the world with 915 million wireless subscribers and world's 3rd largest Internet market<sup>8</sup> with almost 259 million broadband users.<sup>9</sup> There is still a huge economic opportunity in India as the tele-density in rural India is only 45<sup>10</sup> where more than 65% of the population lives. Future growth of telecommunication industry in terms of number of subscribers is expected to come from rural areas as urban areas are saturated with a tele-density of more than 160%.

The digital platform can enable more creative and service-oriented business models that create employment opportunities. The Digital India project itself will create employment opportunities for 17 million<sup>11</sup> people directly or indirectly which will help in fighting against unemployment problems in India. Government has planned to give IT training to 100 million students in smaller towns and villages as employment opportunity in IT sector is very high in India.

#### Social impact:

Social sectors such as education, healthcare, and banking are unable to reach out to the citizens due to obstructions and limitations such as middleman, illiteracy, ignorance, poverty, lack of funds, information and investments. These challenges have led to an imbalanced growth in the rural and urban areas with marked differences in the economic and social status of the people in these areas.

Modern ICT makes it easier for people to obtain access to services and resources. The penetration of mobile devices may be highly useful as a complementary channel to public service delivery apart from creation of entirely new services which may have an enormous impact on the quality of life of the users and lead to social modernization.

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“It is a myth that only metro and urban citizens use & need digital services. Huge traction for digital services is already being witnessed beyond cities. For, Idea Cellular, the usage of data services is growing exponentially in non-urban centers. Digital services constraints are on the supply side—not on the demand side.”

**Himanshu Kapania**

Managing Director, Idea Cellular



The poor literacy rate in India is due to unavailability of physical infrastructure in rural and remote areas. This is where m-Education services can play an important role by reaching remote masses. According to estimates, the digital literacy in India is just 6.5%<sup>12</sup> and the internet penetration is 20.83 out of 100 population.<sup>13</sup> The digital India project will be helpful in providing real-time education and partly address the challenge of lack of teachers in education system through smart and virtual classrooms. Education to farmers, fisher men can be provided through mobile devices. The high speed network can provide the adequate infrastructure for online education platforms like massive open online courses (MOOCs).

Mobile and internet banking can improve the financial inclusion in the country and can create win-win situation for all parties in the value-chain by creating an interoperable ecosystem and revenue sharing business models. Telecom operators get additional revenue streams while the banks can reach new customer groups incurring lowest possible costs.

Factors such as a burgeoning population, poor doctor patient ratio (1:870), high infant mortality rate, increasing life expectancy, fewer quality physicians and a majority of the population living in remote villages, support and justify the need for tele medicine in the country. M-health can promote innovation and enhance

the reach of healthcare services.

Digital platforms can help farmers in know-how (crop choice, seed variety), context (weather, plant protection, cultivation best practices) and market information (market prices, market demand, logistics).

#### Environmental impact:

The major changes in the technology space have not only brought changes to the economic system but are also contributing to the environmental changes.

The next generation technologies are helping in lowering the carbon footprint by reducing fuel consumption, waste management, greener workplaces and thus leading to a greener ecosystem. The ICT sector helps in efficient management and usage of scarce and non-renewable resources.

Telepresence in work environment as well as home helps in creating a virtual environment for face to face conversations and minimizes the need for travel. Similarly, the flexible work environment where work from home and bring-your-own-device (BYOD) are permitted, can significantly reduce their carbon footprint and operational costs by not only reducing the electronic waste in the form of laptops, desktops, etc. but also by reducing the need of large fixed office space for businesses. A program in the UK found that an employee can save 1,175 driving miles each year, amounting to a 364.5kg reduction in carbon emissions

when he works from home 1.5 days per week. M2M enabled devices and technologies like smart meter, smart grid, smart logistics and smart building help in many different ways by efficient energy management.

Cloud computing technology minimizes carbon emissions by improving mobility and flexibility. The energy consumption can be decreased from 201.8 terawatt hour (TWh) in 2010 to 139.8 TWh in 2020 by higher adoption of cloud data centers causing a 28% reduction in carbon footprint from 2010 levels. Digital media for paper intensive services such as governance, ticketing, newspaper, etc. could not only result in efficient delivery of services but at the same time would lower the use of paper, thus preventing deforestation.

### The Impending Challenges

The Digital India initiative is an ambitious project of the Government and is, by far, the biggest ever conceived. There are many challenges discussed below that could come in the way of successful completion of the project.

**High cost of implementation:** Approximate cost of implementing this mammoth project is ₹1.13 trillion (including ongoing and new schemes).

**Time overrun:** The NOFN project which is the backbone of the Digital India project has been delayed several times and is suffering two years' time overrun. The delayed project may lead to delay in other dependent projects and meeting the budget limit will be difficult.

**Lack of coordination among departments:** It is an umbrella project involving participation of several departments and demanding commitment & effort. Hence, strong leadership and timely support of all the involved entities will play a critical role.

**Poor private participation:** To achieve timely completion of the projects extensive private participation is necessary. The private participation in the government projects in India is poor because of long and complex regulatory processes.

**Uniform and fast adoption of Internet:** About 4 billion people in the world do not have Internet connection and India comprises of 25% of them.<sup>14</sup> India is the 4th largest smartphone market with almost

111 million smartphone users<sup>15</sup>. Average monthly cost of 500MB mobile data plan on prepaid is \$3.4 in India against \$35.8 in Brazil, \$15.5 in China and \$17 in Russia.<sup>16</sup> Despite lowest data tariffs in the world, adoption of internet in India is not encouraging. Faster adoption of Internet will be difficult due to illiteracy, affordability and availability of mobile devices and data tariffs, lack of local language content, lack of regionally relevant Apps. Still the use of Internet is low because of high data tariffs.

**Infrastructure:** Though the National Optic Fibre Network (NOFN) project is aiming to build a nationwide high speed broadband by the end of the year 2016,<sup>17</sup> there are other supporting infrastructure deficits, such as lack of robust and large data centers to hold the data of entire country. In addition, the last mile connectivity and the physical infrastructure at customer premises are unaffordable by most of the rural Indians. Infrastructure fulfillment is necessary with the NOFN project.

**Cyber security:** Nation Crime Records Bureau (NCRB) report shows the rapid increase in cybercrime in India by 50% from 2012 to 2013.<sup>18</sup> There have been several incidences of cybercrime on corporate and individual level in the past few years. Putting the data of 1.2 billion people on the cloud could be risky and could threaten the security of individuals and the nation. Hence, the Digital India project demands very strong network security at all levels of operation.

### Global Initiatives

#### High speed optic fibre rollout

Japan, South Korea and the US have led the world in terms of Fibre-to-the-Home (FTTH) penetration. Comcast is the major player in the US providing high speed internet to almost 39 states with more than 145,000 miles and 125,000 optical nodes. AT&T and Verizon are leading in FTTH access networks. NTT in Japan holds most of the optical fibre networks providing Fibre-to-the-Cabinet (FTTC) and FTTH services. The National Broadband Network of Australia is using Public Private Partnership to provide 1Gbps connection to 93% of Australians. New Zealand Government is spending NZ\$1.35 billion on public-private partnerships with Chorus to rollout FTTH connections of at least 100 Mbps to all towns and cities and has awarded \$300 million contract to Vodafone and Chorus to bring broadband of at least 5Mbps to 86% of rural customers by 2016.

## E-Governance

Though the e-Governance project in India was initiated back in 2006 the success rate is not much impressive in comparison to other developed and developing countries. With proper strategy, timeline, digital infrastructure and private participation, Korea, Australia and Singapore top UN E-Governance ranking of 2014.<sup>19</sup>

The Korean e-Governance initiative started way back in 1993 to implement 11 major e-government initiatives.<sup>20</sup> The Western Australia State Government launched its e-Government Strategy in 2004 with the vision of 'a more efficient public sector that delivers integrated services and improved opportunities for community participation.' In 2006, the Australia Federal Government initiated a new e-government strategy "Responsive government – a new service agenda,"<sup>21</sup> with a vision for 2010. Similarly, the Singapore government is successful

in implementing e-governance which was initiated back in 1981 under the Civil Service Computerization Programme (CSCP) with an aim to save manpower, operational efficiency improvement, better information support for decision making and certain pioneer services for the public.<sup>22</sup> The Singapore e-Government Strategic Framework was centered on three critical relationships – Government to Citizens (G2C), Government to Businesses (G2B) and Government to Employees (G2E). The Japan Government developed its e-Japan Strategy in 2001 to provide a basic IT law on the Formation of an Advanced Information and Telecommunications Network Society. In 2002-03, e-Japan Strategy II was put in place emphasizing IT usage and applications development<sup>23</sup>. Likewise, Canada is rated highest in the provision of e-Government services.

# Enabling Technologies



Digital India project is to prepare the nation to be well-connected, efficient, and productive. This initiative aims to reach out to the most-remote corner of the country irrespective of climatic, geographical, political, and land topology to enable two-way interaction with the Government whether central, state, or local Gram Panchayat.<sup>24</sup>

There are 3 vision areas and 9 pillars that provide foundation for Digital India. There are solutions that support these pillars and are enabled by technology that is viable and feasible.

In today's digital world, there is a good mix of technologies that support cost containment, collaboration, security, services-on-the-go, social-connect, and in-built intelligence that provide remote access to any information or service available across the world.

Technologies also bring in a set of complexities that need to be managed and governed to bring in their

strengths and control their weaknesses or lacunae. India with its diversity and geographical layout will need to work with the technologies like cloud-computing, mobility (web-based approach), analytics, social and security in a very well-coordinated and organized structure.

Government of India together with the State government have adopted multiple pursuits and launched programs to connect with people by experimenting with available technology. The success of Digital India will depend on the coordination among these state and central bodies, and they should not work in programmatic silos, thereby increasing the cost and maintenance of the services provided.

New era should bring in lean, agile and productive government run initiatives that reach citizens irrespective of social-economic, geographical or regional diversity. The digital connect should be safe, secured, cost-effective with optimal resources and strategically interfaced.



High-level architecture principles for digital India are:

1. Highly secured – well coordinated to ensure privacy and confidentiality of data
2. Well-structured – data and functions to develop 'System of Engagement' from 'System of Records' need to be categorized for access depending upon the sensitivity of data and information. Data resides within the operation architecture and the patterns that will provide access to be part of the design
3. Interoperability of systems
4. Common standards to collaborate
5. Device-agnostic services – for multi-channel enablement for single user-experience
6. Simple and ease of operations
7. Agile and flexible technology – enabling scaling up and scaling down, adopt new technology with minimal disruption and cost
8. Home-grown technology using internal expertise – this is to be self-reliant and secure (to avoid unknown security breach during design and build)
9. Optimized process automation – to remove redundancy and computation over-kill
10. "Build once and use many times" resources, assets should be re-usable, existing assets will be reused with relevant wrapper/adapters to enable new services

Digital strategy and objective for future India is as follows:

1. Government to enable devices, systems, applications, infrastructure and data that is smart (effective and optimal), secure and cost-sensitive (flexible to change for any new technology migration)
2. Empower citizens of India with data and information that is available with government across all departments. Information to be digitized with government services that are accessible online anytime, anywhere on any device
3. Enable availability of government data and service and hence facilitate innovation to bring several opportunities to general public e.g. farming, education, health-care

## Digital enablers

There are multiple technology enablers that could either work in isolation and/or work in coordination with each other. However, these solutions should be governed by well-defined framework, principles, standards, guidelines, transformation strategy, and roadmap. Architectural artefact would provide structure and behavioural guidelines to different technologies and their inter-relationship.

This section provides an overview of some of the important technology enablers and how they would support the vision areas and pillars of Digital India.

## Cloud Computing

This is a concept where the infrastructure is converged and services are shared. The resources which include application/software (also in the form of an API), platform, infrastructure and also business processes can be shared with multiple users and is dynamically allocated on demand.<sup>25</sup>

To enable Digital India it is necessary to evaluate the type of services that will be provided to citizens. Digital India should have strategy wherein the Government will be providing information and services to internal and external stakeholders. This requires having a strong architecture principle and policy to host data and services to relevant cloud delivery model.

- Highly secured data of classified nature should be hosted within the firewall and available on secured private cloud. This will have multiple security checks on secured network.
- Open information and services from the Government bodies can use public cloud provided by one of the vendors such as Amazon Web Services, Microsoft Azure or Google Cloud. This might not be 100% secure and could be used to broadcast or to collect information from citizens that do not categorize under privacy and confidentiality security policy of the government.
- For few services that would require aggregation, customization and integration with other cloud providers, hybrid cloud could be used. Aggregation is managed wherein secured data within government private cloud is manipulated/stripped-off to provide data to an application on a public cloud.

Figure 2: Vision areas enabled by Cloud Computing

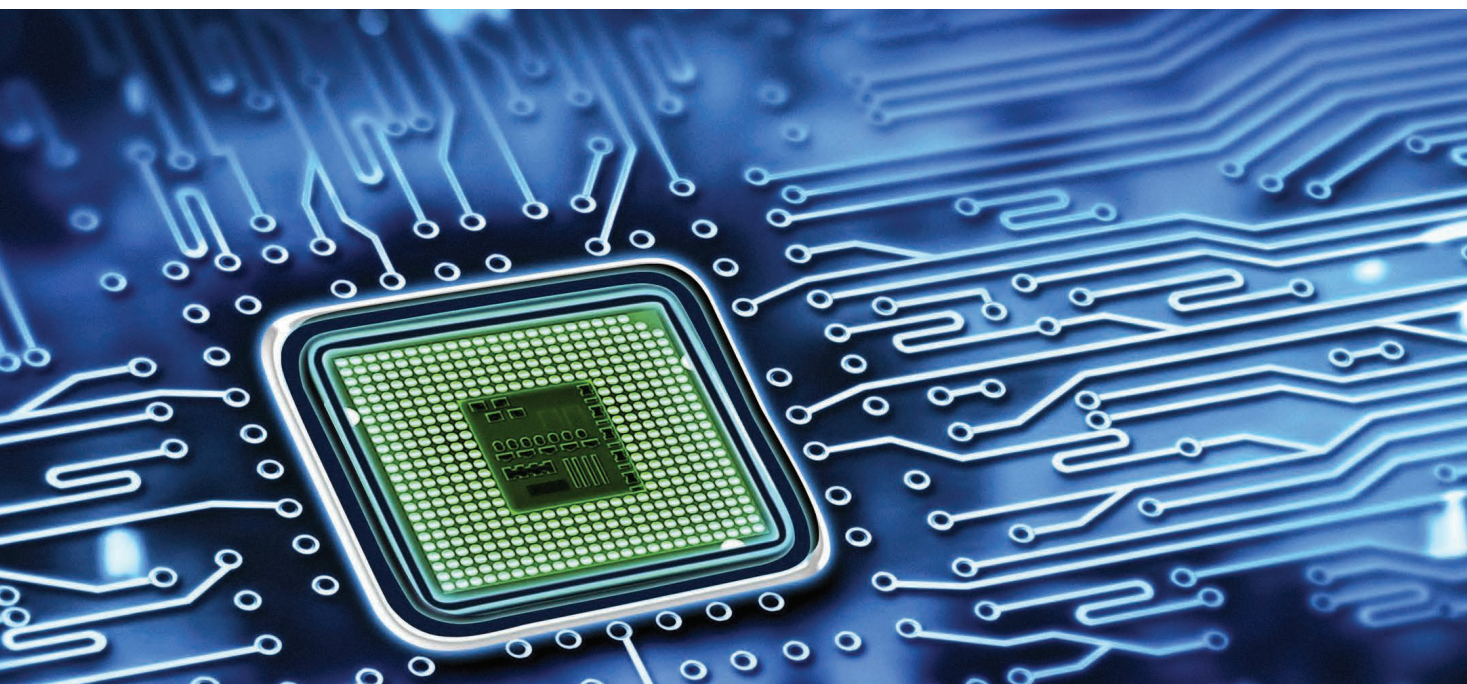
<b>Vision 3</b>	<ul style="list-style-type: none"> <li>• Cradle-to-Grave unique identification – Hybrid cloud / public cloud for information and help in online forms. Data submission and manipulation using Authentication, Authorization and Audit using private cloud. Use on-premise and off-premise aggregator (using cloud solutions such as IBM Caste Iron)</li> <li>• Common Service Centre information and private space on public cloud</li> </ul>
<b>Vision 2 &amp; 3</b>	<ul style="list-style-type: none"> <li>• Information for All</li> <li>• 2-way communication between Citizen &amp; Government</li> </ul>
<b>Vision 3</b>	<ul style="list-style-type: none"> <li>• Individual documents and certificates using hybrid cloud</li> <li>• Collaborative digital platform using public cloud</li> </ul>

#### Service Enablement Support for 2G, 3G and 4G

Depending on the network technology and spectrum, services would be enabled to reach citizens of India. Services built for public utilization should consider the bandwidth limitation that exists across the country. Services should be rendered depending on the underlying network type 2G, 3G, or 4G. This should be part of the architecture design strategy on which services will be deployed. It would be beneficial to provide Wi-Fi connectivity using wireline broadband in Government Service Centres (e.g. Post Office) so that citizens can access services inside the centres without facing bandwidth issues that might exist with wireless networks. <sup>26</sup>

Figure 3: Pillars operationalized by Service Enablement Support

<b>Pillar 1</b>	Broadband Highways
<b>Pillar 2</b>	Universal Access to Phones
<b>Pillar 3</b>	Public Internet Access
<b>Pillar 4</b>	e-Governance
<b>Pillar 5</b>	eKranti – Electronic Delivery Services
<b>Pillar 6</b>	<ul style="list-style-type: none"> <li>• Information for All</li> <li>• 2-way communication between Citizen &amp; Government</li> </ul>



### Mobility – Web-API for Internal and External Consumption

Based on Information Centric Strategy, it is required to understand and build system that will align with 'System of Engagement' rather on 'System of Records'. This will enable collaboration providing context dependent services using mobile apps, social media, and analytics.<sup>27</sup> This approach will require categorizing the data for internal and external consumption. Linking all the information required as well as integrating different views and requirement of the users, making it available anytime, anywhere and on any device should be the principle design to enable all 3 vision areas together with 9 pillars of digital India.

Application and systems should be built and the existing applications to be assessed as the information-centric resource, wherein the data and information are accurate and available in a secured medium anytime, anywhere on any device. Information should be categorized according to the security policy for privacy, confidentiality, classified and open-information and accordingly provided access to retrieve, update, create and/or delete.

Figure 4: Pillars enabled by Mobility Solutions

<b>Vision 1</b>	Mobile phone and bank account for financial inclusion
<b>Vision 2</b>	<ul style="list-style-type: none"> <li>• Real-time service availability, digitally transformed services</li> <li>• Financial transactions going electronic and cashless</li> </ul>
<b>Vision 3</b>	Collaborative digital platforms
<b>Pillar 5</b>	e-Kranti
<b>Pillar 6</b>	Information for All



### Security – Information Categorization

Security plays a major role in designing the digital architecture. Going digital would require:

1. Organizational planning and structuring people, process, infrastructure and data/information
2. Security principles, policies and guidelines in line with regulatory and security compliance perspectives
3. Architecture decisions and standards, design patterns
4. Assessment of backend application and existing assets for re-use and their feasibility to digitize

### Analytics - Unique Digital Identity and Data Linkage with Security

UIDAI or PAN number should be used to connect with citizens' details. A centralized data centre should hold all the details of citizens about their credit worth, background check, address of residence, permanent address, utility consumption details, criminal records (domestic and international) among others. This data should be hosted in a highly secured data centres and hosted in private cloud.<sup>28</sup>

Services within public sectors units should be shared to access details of any citizen. Further, on agreement and limited access could be given to banks, financial institutions, and other sectors for analysis of their customers. The data relationship diagram can be created with all currently available numbers for an individual such as Aadhar number, property tax, utility IDs (gas, water, electricity), Voter's ID, passport, ration card, PAN among others. This provides complete details of any individual that can be used for background checks, tax default, credit worth, usage of electricity, gas, water and telephone, travel history (domestic and international), visa status, payment credibility, voting, education qualifications, bank accounts, assets (tangible and non-tangible), address among others. Analytic objective should be available within the security compliance, confidentiality and privacy laws.

Figure 5: Vision areas enabled by Security

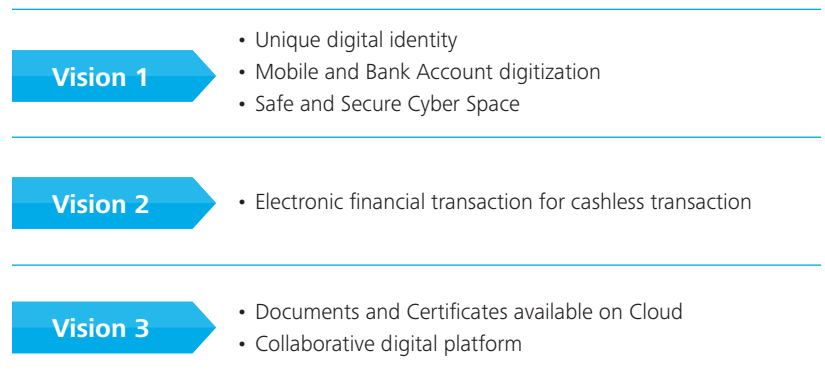
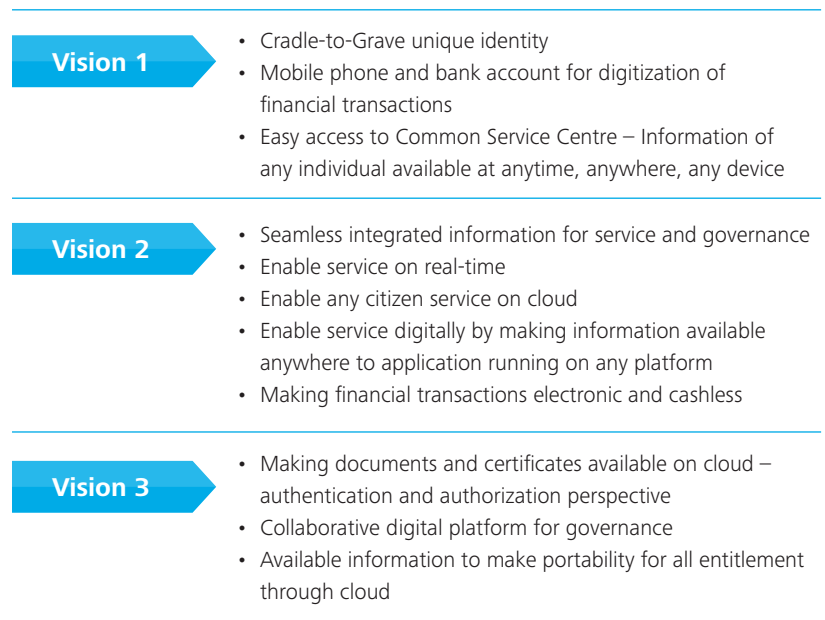


Figure 6: Vision areas enabled by Analytics



## Case Study:

### Application of Analytics by Land Transport Authority, Singapore

The Land Transport Authority (LTA) needs to deliver a land transport network that is integrated, efficient, cost-effective and sustainable in Singapore. The changing environment like growing population and vehicles required a more agile transport system to sustain growth. Wipro provided data warehouse and analytics solution to improve planning and agility of business by making fact-based decisions and taking a long-term view.

#### Approach:

A large central data warehouse called Planet was created which would pool data from various business sources and support queries against three years' worth of public transport transactions. A reporting solution to access bus/train/transaction data and an analytical system to provide the insight into train loading was provided by Wipro.

#### Impact:

Planet uses three years' worth of records for public transport transactions compared to three months' worth with the old system. The time it takes for extraction, transformation and loading has fallen 67% while the time required for queries has dropped 99%. The LTA estimates that it saves 19% per year by using Planet rather than its old data and reporting systems. Planet also uses 13% fewer man-hours every year.

#### Machine to Machine (M2M)

India, with more than 900 million growing mobile subscriber base, holds a huge opportunity for Machine –to-Machine (M2M) communications. M2M communication could be used for smart utility metering, home automation, industry wireless automation, logistic, automotive, transport and supply chain. To increase the efficiency, accuracy and productivity, M2M plays a vital role wherein connected machines/meters/automobiles/logistics are interacting with the central system. Mostly all sectors will see billions of machines interconnected with each other thereby optimizing energy, utility and resource to its best. M2M could help India in resource optimization, revenue generation, and manage revenue leakage (monetary as well as natural resources). This requires digitization of information and connecting machines, meters and resources using either proprietary radio-links, short-range radio signals or cellular-based connectivity provided by Communication Service Providers (CSP). Partnering with CSP will be required where mobility and high-volume data transfer will be required. With seamless integration of information across departments, citizen walking into Government service centre could be identified from their

device (using M2M) and the data about the individual could be automatically processed in the background, thereby increasing productivity as well as ease of doing business.

GIS data will be utilized by mapping user of the device and his/her identity. Similarly GIS together with connected machines, vehicle/transport mode and city layout will provide inputs to decision support systems and development.

A few important applications of M2M technology are discussed below:

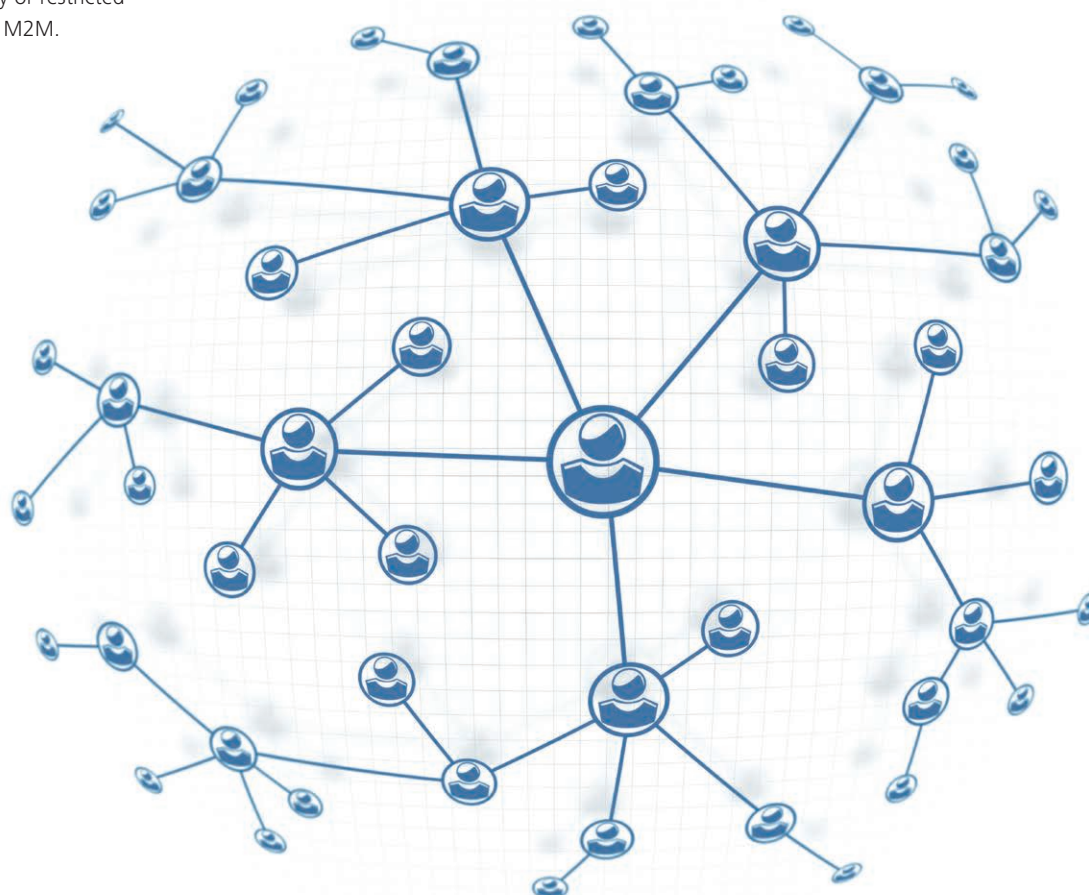
1. Connected Industrial production - will improve production and efficiency by monitoring health of the machine remotely sending alerts to SME (anytime, anywhere on any device) in case of emergency. Connected machine to orchestrate production and assembly of end product.
2. Connected Utility Meter – to monitor tampering of the meters, health, issues, control resource leakage e.g. gas, electricity. Highway toll can be automated with smart devices and sensors and highway authority can monitor movement of the vehicles.

Billing information to the vehicle owner can be sent in real-time on their smartphones. Also, law enforcement can use these smart devices to monitor vehicle speed and any illegal activity.

3. M2M is also used to remotely manage vehicles. Mahindra Reva partnered with telecom operator Vodafone for powering its electric cars with machine-to-machine (M2M) communication services, with which users can remotely lock their car, control air conditioning as well as get emergency boost charge for their vehicle.
4. M2M can be used to broadcast messages across city, state and nation-wide. For example, smart billboards providing exchange rates, oil prices, BSE and NSE updates across the country even in remote terrains.
5. High availability and business continuity - Wireless connectivity in mission-critical applications like nuclear installations, shipping, military equipment and aerospace for continuous updates on status, maintenance, and predict failure situations, thereby providing highest optimization and business continuity.
6. Location awareness of visitors in military or restricted areas also requires major application of M2M.

**Figure 7: Vision areas enabled by M2M Technology**

<b>Vision 1</b>	<ul style="list-style-type: none"> <li>• Safe and secure cyber-space</li> <li>• Cradle to grave digital identity - unique, lifelong, online, authenticable</li> </ul>
<b>Vision 2</b>	<ul style="list-style-type: none"> <li>• Services available in real time from online &amp; mobile platform</li> <li>• Services digitally transformed for improving Ease of Doing Business</li> </ul>
<b>Vision 3</b>	<ul style="list-style-type: none"> <li>• Universally accessible digital resources will provide central management facility at Gram Panchayat level to state and/or national level</li> </ul>



## Case Study:

### Lavasa Smart City Initiative: Extensive use of M2M

Lavasa Corporation Ltd collaborated with Wipro Limited and Cisco Systems to plan, implement and manage ICT services across Lavasa Hill City. ICT solutions are used to provide e-Governance & Integrated services, e-learning, e-Health Care, e-Commerce and digital homes facilities.

#### Solution:

To make Lavasa a connected city, a 42 km long fibre infrastructure is established from Pirangut. The infrastructure contains GPON architecture with 180 kms of fiber network and a sustainability period of 10 years. Telecom towers are set up for mobile and internet trunk service.

The data of the buildings and infrastructure is mapped on to Geographical Information System (GIS) for location based management of services. The intranet GIS website keeps a track of construction status of the buildings, environment, utility and city management services. The smart homes include video door phone, light automation and intrusion system.

Centrally administered seamless Wi-Fi connectivity is provided. Citizen contact center is established to handle large volume customer care requests. Telepresence facility is provided to homes and offices. The city includes interactive information system, tourist information systems, telemedicine, digital security and surveillance, smart parking and traffic management, transportation system supported by technology, smart metering for efficient power management and integrated building management system. The smart city will also have a prepaid payment system to upgrade the experience of shopping.

#### Success factors:

The successful use of Build – Own - Operate model of public private partnership (PPP) helped Lavasa to be a smart city.

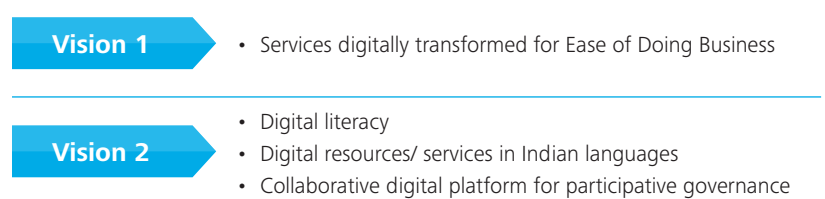
#### Social Media

Social media in India is playing a crucial role in digital transformation. Extensive use of social media was seen in the 2014 election campaign. As per a survey by a major political party, people between 34 and 60 years of age are most active on the social media which helped in gaining votes.<sup>29</sup>

The availability of affordable smartphones and data plans is helping increasing number of citizens to use social networking sites. The social media is not only helping in entertainment but also playing a major role in building knowledge and awareness, bringing people together, helping in a social causes, employment, governance, etc. Social media is helping in a Government to Citizen (G2C) and Citizen to Government (C2G) communication in India. It is providing a platform to raise questions and give feedback on government activities. For example, MyGov is a unique platform for the citizens to share their ideas with the government so

that they could formulate policies with inputs from the grass root. Additionally, social media is not only helping citizens to monitor the activities of government officials but is also helping the government to be proactive and alert. Social media provides a platform to bring the recruiter and applicant closer and raises employment opportunity.

Figure 8: Visions and Pillars enabled by Social Media



# 2015 signals a major inflection point for the Internet of Everything

The Digital India initiative is undoubtedly one of the largest and most exciting initiatives that we have embarked upon in the last decade. The current government's vision to drive country-wide transformation through digital empowerment of citizens means that this is India's greatest opportunity to leapfrog developmental challenges and finally be considered on par with other developed nations.

A Digital India not only means empowerment for citizens but also offers significant scope for economic progress and growth and the opportunity to position India as a global technology hub and knowledge economy that other developing countries can learn from and emulate. In order to achieve this however, there needs to be a concerted effort to drive and follow through with effective change as well as a shift in mind-set from the traditional approach. What is really needed is the development of a larger innovation ecosystem in the country- one that fosters creativity, collaboration, partnerships and shared technical know-how to create disruptive business models, products and services that will fuel India's Digital transformation.

Clearly technology is one of the key pillars that will drive this agenda. Our future will be defined by the Internet of Everything (IoE) which is the intelligent connection of people, processes, data, and things to drive meaningful new connections. Around the world, governments, businesses and citizens are embracing the opportunity of the Internet of Everything and Cisco estimates a potential value at stake of over \$14 trillion for private sector businesses over the next decade. In India, the IoE will become the cornerstone of our smart cities and digital citizen services including infrastructure, utilities and governance on demand. In business terms, we are looking at creating value of upto \$511 billion in value in India over the next decade. This includes roughly \$395 billion for the private sector and over \$115 billion in the public sector as the government uses the Internet of Everything as a platform to digitize cities and communities. Such radical technological change is not bereft of its challenges. These need to be addressed

collectively as a nation however, as the benefits of this change far outweigh the risks. Concerns around security, regulation, business models and processes need to be addressed through a collective ecosystem consisting of private and public enterprises, regulators and policy makers, local administrators as well as technology and applications developers, manufacturers and service providers.

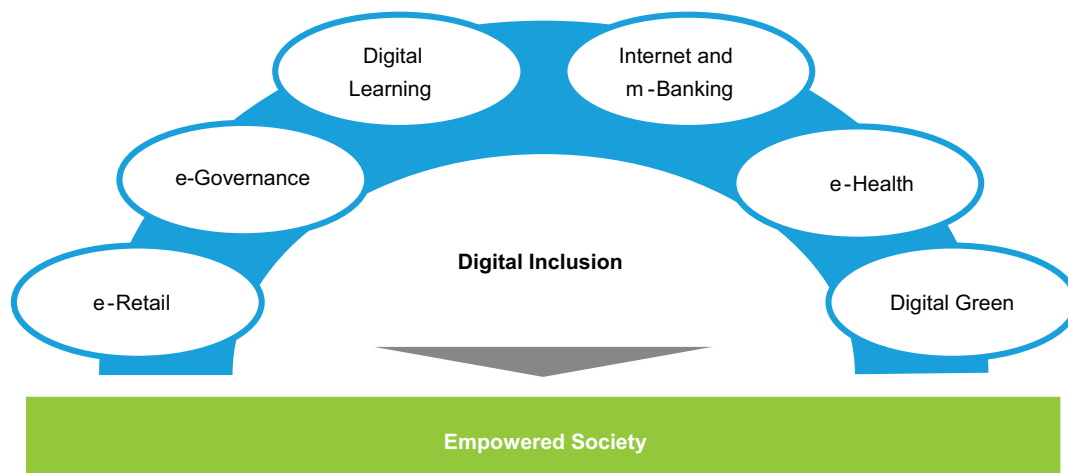
A Public Private Partnership "PPP" approach allows for the sharing of best practices, combining the expertise of the private sector with the public sector's resources and benefits of scale, and we are witnessing the evolution of several new economic models to create the optimum environment for success. I believe that these innovative new business models will facilitate greater co-operation between the government, private enterprise and citizens, allowing us to overcome traditional barriers around regulation, privacy, safety and security, and standardization of technology to transform our cities and communities. A great example of this model is our partnership with the Electronics City Industries Association (ELCIA) to develop Asia's first end-to-end 'Internet of Things (IoT) Innovation Hub' in Bangalore. This involved setting up a 'Living Lab' for ESDM start-ups and other local manufacturers to co-create, develop and test products for the IoT environment. The goal is to make the region a hub for electronics exports and to develop a replicable digital ecosystem for the rest of the country.

We certainly are at an inflection point in our country's growth journey which will determine our standing and global relevance over the next decade. 2015 signals a major inflection point for the Internet of Everything, which will have a much bigger impact on the world and its cities than the Internet did in its first 20 years. We believe India can play a powerful role in the Internet of Everything worldwide and be a leader in the digitization of cities, the economy and the country.

**Sanjay Kaul**

Managing Director – India and SAARC, Cisco

# Empowering Citizens



In the current global scenario, strongly believing in Vasudhaiva Kutumbakam (the whole world is one family) can usher the country into a new world of wisdom and knowledge where digital forces can help to bridge the gap between the elderly western world and the young eastern world of the future.

The growth of a country depends on the socio-economic growth of its citizens. In today's scenario, digital inclusion is the starting point for empowerment. While the digital technologies pervade day-to-day life of urban Indians, the rural India is still digitally illiterate. The rural India has a significant role to play in the growth of the country as it is home to 70% of our population. Almost 75% of new factories in India in the last decade were built in rural areas.<sup>30</sup>

Technology, media and telecom can help to reach the 6 lakh villages of India and address the problems of lack of infrastructure, qualified and trained professionals, lack of awareness through mobile and IT platforms. Going forward, we should not only concentrate on educating the children and women, but also focus on skill development and knowledge management for the youth of tomorrow.

The Digital India initiative which promises to transform India by connecting every part of the country with a high speed knowledge network and offering world class services to the citizens is a critical step for empowering people.

## Digitizing Governance

Efficient governance is a necessary step for empowering citizens in a country. Governance requires an open platform through which the government can reach the citizens easily and efficiently. Digitizing the government services will help in reaching more number of people in a vast geography like India. The e-Governance project depends upon the success of broadband highway and mobile penetration.

Wide use of social media was observed in the 2014 elections (a record 2 million tweets on results day).

The Prime Minister Narendra Modi has over 27 million fans on Facebook and 10 million Twitter followers. He is the 2nd most followed politician in the world. The website India272.com was a great example of involving the volunteers and gaining insights from them that led to the success of the elections. MyGov and PMIndia, unique platforms for crowdsourcing inputs from grassroots to formulate policies, are great examples of participatory governance. Government will further use data analytics for processing ideas generated by various e-governance portals and meaningfully use it for better governance.

### **Digitally Green Agriculture**

India has been known as a land of agriculture for ages. The agriculture sector has been the mainstay of Indian economy contributing about 15% to the GDP in 2013-14. As per the census 2011, the agriculture and allied services sector provides employment to 57% of the working population.

There will be 9 billion people that will need to be fed on earth by 2050. To feed this rapidly-expanding population in the coming years, agriculture must produce more. ICT tools should be utilized for accelerating the growth of agricultural sector which will in turn boost the economic growth of the country. The productivity of farmers is low because of lack of knowledge about new technologies and government initiatives.

Social media can be helpful for connecting farmers all over the country and connecting buyers with sellers directly removing the middleman. Deloitte's study on Facebook's global economic impact found that Facebook enabled \$4 billion economic impact and 335,000 jobs in India in 2014<sup>31</sup>. Recently farmers in Maharashtra have found an unusual ally in Facebook. They formed a group on social media and started inviting farmers from across the region to join the group to meet the supply-demand gap.

M2M can help in optimizing productivity through appropriate usage of fertilizers, pesticides, and other farm resources based on real-time weather conditions, soil property, etc.

Technologies like Geographic Information Systems (GIS) and Global Positioning System (GPS) along with a wide range of sensors, monitors and controllers for

agricultural equipment enable farmers to use electronic guidance aids to direct equipment movements more accurately, provide precise positioning for all equipment actions and chemical applications and analyse this data in association with other sources of data (agronomic, climatic, etc.). Precision farming helps in yield monitoring, yield mapping, variable rate fertilizer, weed and salinity mapping and variable spraying. Under the e-Governance program, Soil Health Card software has been standardized and in collaboration with Indian Institute of Soil Science, Bhopal, web-based software has been developed to provide integrated nutrient management recommendations using 'Soil Test Crop Response' method for 8 states.

### **Commerce to e-Commerce**

Constituting about 10% of its GDP, India's retail sector is emerging as one of the most dynamic and profitable sectors. The e-Commerce market is slowly replacing the traditional brick and mortar sellers in India. The increase in mobile and smart device penetration, the access to internet and entry of numerous online retailers with exciting discount and payment options are the key drivers for e-retail growth in India. With the emergence of non-banking players in the payments industry, the e-commerce market is also growing at a rapid pace. Indian e-commerce majorly depends upon Cash-on-Delivery option of payment as 50% of all online transactions are done in this mode.<sup>32</sup> As per CRISIL report, the online market place holds a mere 18% while online ticketing has 65% market share in the ₹400 billion e-Commerce market in India.<sup>33</sup>

The mentality of "can't touch, won't buy" is changing. Customers can now purchase travel tickets, book movie shows or buy any product via a mobile platform without standing in queues. The entry of many online retailers in the market has taken the competition to a different level. The e-retailers have joined the traditional mall operators and brick-and-mortar retailers to skim the market by providing heavy discounts and attractive offers like exclusive merchandise, cashback schemes and promotional offers during the festive seasons. The recent partnership between Snapdeal & Croma or Amazon & Future Group is no more a partnership between two retailers. It has extended to a vendor and technology partners offering technology and logistics services. This will help in the growth of new brands and private labels.



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“Digital channels for delivery of sales and service are the new normal. While a billion Indians are still discovering the power of Internet and convenience of Digital Services, there are 200 million Indians for whom Online is THE ONLY way to transact. Consumers won’t walk to the store anymore – the store will go to the consumer.”

**Himanshu Kapania**

Managing Director, Idea Cellular

The e-Commerce industry also plays a major role in the revival of the Indian Postal service, which is boosting its infrastructure for real-time tracking of parcels through satellites using new technology. Indian post expects almost \$9 billion opportunity from the booming e-commerce market in India.

E-retailers are now trying to venture into the rural part of India. Snapdeal is going to launch 70,000 kiosks in rural India with the help of FINO PayTech. These kiosks will be managed by village level entrepreneurs with personal computer and tablets, which will provide opportunity to rural people to venture into new businesses. Recently some big e-tailers started selling handicrafts from different parts of India which is empowering the handicraft makers to reach buyers across the country and to get appropriate price for their product.<sup>34</sup>

#### **Rise of Digital Banking**

The steps taken by RBI for financial inclusion need to be supported by digital infrastructure as it is very difficult to cater to the entire population with physical infrastructure like brick and mortar banks and ATM centers. The physical availability of banking can be replaced by digital platform of mobile banking and cashless transactions. The Pradhan Mantri Jan-Dhan Yojana (PMJDY), launched by Prime Minister Narendra Modi in August opened 18<sup>35</sup> million bank accounts within a week which reached 115 million accounts by January 2015.<sup>36</sup> The alternate financial solutions like m-pesa and mobile money are very successful in countries like Kenya and some parts of

Africa. Out of the total population of 43.2 million, almost 18.2 million use m-pesa because of its user friendly features.<sup>37</sup> Even there are other applications like m-Shwari which provides loans and savings through m-pesa and M-KESHO for micro-credit and savings on a mobile platform. With the growing use of mobile phones in India, these services can be availed by rural communities in regional languages, which could in turn empower them financially.

#### **The Smart Way of Education**

Education can be a catalyst for the socio-economic transformation of country with important attributes like knowledge and skill development. The education market in India was worth around \$92.98 billion in 2014.<sup>38</sup> The sector grew at a CAGR of 16.5% during FY05-FY12.<sup>39</sup> The public spending in the Indian education sector was 11.3% in 2012, which is 3.4% of the GDP.

According to a report by IRIS and UNHABITAT, India is going to be the youngest nation by the year 2020.<sup>40</sup> As per the demographics of India almost 49% of the population is below the age of 25 years. By 2025, a majority of young population will enter the workforce. To empower them to contribute meaningfully to the economy, it is imperative for the government to ensure that the most basic criterion of providing education is met.

There are several barriers to the education system in India like inadequate infrastructure, high drop-out rate (40% in elementary education),<sup>41</sup> poor pupil tutor ratio (27:1) and



week gross enrolment ratio (15% in higher education). The digital way of education can help in overcoming some of these barriers.

The growing use of mobile phones in every age-group and the penetration of mobile phone provide an efficient platform to provide education to masses in an economical way. The content could be made available in local language and user friendly interface. The Value Added Services (VAS) industry is coming up with innovative ideas every day to provide education as VAS. E.g. English Seekho, Pragati, iPerform, Fisher Friend and BehtarZindagi. The m-education is going to be a \$70 billion market globally by 2020.<sup>42</sup> Khan Academy and Tutor-on-Mobile are some successful initiatives providing education on mobile platform.

The government has allotted ₹1 billion<sup>43</sup> for building virtual class rooms and online courses. Virtual class-room is backed by an Internet connection. Take for instance, SmartClass and SmartSchool solutions from Educomp provide technology enabled education tools for interactive, collaborative, multi-sensory learning and assessment system.

With the increase in data connectivity and improved IT infrastructure, the education sector is moving towards online courses. The Massive Online Open Courses (MOOCS) is slowly picking up with 8.8% adoption rate in India so far.<sup>44</sup> MOOCS has no restriction on class size and usage of social media and online tools makes accessibility easier from anywhere.

### Transforming Healthcare

As per a report by Equentis Capital, the healthcare sector of India is growing at a 15% CAGR and jumped from \$45 billion in 2008 to \$78.6 billion in 2012 and is expected to touch \$158.2 billion by 2017.<sup>45</sup> Though these numbers look promising but for the second largest populous country - India, the sector needs more reforms.

There are a number of challenges faced by the sector: lack of equal access to healthcare facilities, insufficient healthcare workforce and infrastructure, high healthcare costs among others. Due to lack of quality infrastructure and specialized doctors, rural population depends on urban hospitals and spends most of their income on healthcare. Though healthcare facilities in urban India have developed in the past few years, the supply and

demand gap has widened, despite increase in the spending capacity. Healthcare expenditures exacerbate poverty, with about 39 million people falling into poverty every year as a result of such expenditures.

The digital transformation of healthcare sector could be a solution to some of the barriers. The introduction of a hospital information system (HIS), picture archival and communications system (PACS), and electronic health record (EHR) have led to rapidly increasing volumes of data. The unpredictability of diseases and the rise of life threatening new diseases like Ebola virus call for the patient data to be readily accessible to the healthcare persons. Therefore, IT plays a major role in the healthcare industry.

With the current market size of \$7.5 million and growth rate at CAGR of 20%, telemedicine is going to be the next alternative for rural and remote people.<sup>46</sup> Telemedicine is able to decrease the costs of expensive doctor visits by enabling remote communication between physicians and patients. As e-Visits are proven and adopted in the developed world, and as the necessary infrastructure is deployed in the developing world, they are likely to offer affordable primary medical and diagnostic care to the very large population that does not have access today.

By using cloud technology, doctor can store and access data from anywhere, anytime to provide a real-time solution to patients' problem. Even the patient can get the required check-up data directly from the medical database through internet connectivity.

According to analysts, Indian M2M healthcare device market is expected to reach \$98.38 million by 2016, with a CAGR of 33.81% from 2011-2016.<sup>47</sup> For example, M2M-based heart monitoring device detects heart arrhythmia daily and records it over-time. It then transmits recorded information via mobile network or internet so that care-takers could securely check the status of the person's cardiac condition, providing 24/7 patient support. Many such M2M based devices are being used worldwide which can be used in India as well. Real time location and Global Positioning System (GPS) helps the ambulance to reach the patient quickly and to take the shortest route to hospital. GPS solution for tracking Dementia and Alzheimer patients is one such device.



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“With big data, analytics, mobility and the network of possibility, we will help businesses to create a new world order. But the delta between perception and reality in a world holds the potential to be connected at a much higher level. And so there lies tremendous business potential for all those who want to rule the future, and I see IT solutions and services bridging that gap much more efficiently this year.”

**CP Gurnani**  
Managing Director, Tech Mahindra

# Driving Innovation and Disrupting the Traditional Models

The year 2014 saw a major transition in the industry across all major sectors in the digitalization of business operations. Case studies and points-of-view saw deployment of these innovative platforms reaching the end user. The change was fast and results welcoming for the business stakeholder. At the same time early adopters are threatening the survival of other players. A few industry examples are discussed below:

## Retail:

In retail, mobile and online sales exploded in the year 2014. The traditional business model of physical point of sales and franchise changed at a fast pace to digital stores making their merchandise available using mobile and online-web-based sales channel. This saw some of the high profile CEO exits like American Apparel's Dov Charney<sup>48</sup> and Target's Gregg Steinhafe<sup>49</sup>.

This trend of retail business saw rise of new breed of companies like Alibaba's initial public offerings (IPO) in New York Stock Exchange (NYSE) and FlipKart's valuation. It heralded beginning of an end to traditional businesses around the world. The world is now connected and businesses are done across the world with no boundaries, thus opening up new competitors known and unknown. The entry of many online retailers in the market has taken the competition to a different level. The trend is moving from brand stores and retail chains to online stores and retail aggregators. Traditional business model therefore require revisiting their strategy.

## Insurance:

With traditional risk to catastrophic losses from natural disasters and bad claims, insurance sector is facing one of the toughest challenges of all time - adoption of digital technology. The consumer behaviour is changing thereby forcing Chief Executives to reassess their traditional business models.

Digital world and connectivity is transforming customer behaviour and the insurance companies are struggling to get in pace with the expectations like<sup>50</sup>

- 71% of the consumers used some form of research using digital media like social media and price comparison

- 67% were willing to have sensor attached to their cars or home if it resulted in premium reduction
- 50% consumers are prepared to provide their personal and lifestyle information to enable seeking best deals for relevant services on their behalf

Insurance companies have now started to adapt into digital world by using in-vehicle telematics that will price driver risk better, brand building using social media, build mobile applications that will help agents connect with existing and prospective customers.

## Banking:

Digitization of banking system brings in huge value for the consumers providing real time banking access anytime, anywhere on any device – one view of balance, statements, and transaction status and details. It provides real time monitoring of payments and payment details as well as controls on transaction for cheques, cards and bulk transaction. Electronic invoicing opens up new channel to secure and real-time invoicing. Connecting to international trade service providers has become easier than never before.

The digital trend is forcing banks to focus on online-electronic as core channel rather than the branches. Banks are shutting down branches - Europe closed around 20,000 in last 4 years and the US in thousands. Transforming transactions performed by banks core branch to digital media will be more beneficial as the trend is from 1 branch per 20,000 to 1 branch per 250,000 customers.<sup>51</sup> Bank will require features that are important to build their digital image,

- Ease-of-use (less clutter, complexity, highly responsive) interface with rich content visualization.
- Advances in mobile technology and network to provide higher security, ability to connect from anywhere, competitive rating for international roaming for its customers to access from anywhere in the world.
- Real-time analytics of customers using structured and unstructured data and from social media collaboration to provide personalized services and alerts. This will also help in building brand value.
- Multi-channel single experience to customer to provide seamless service anytime on any device or medium.

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“The digital revolution, underpinned by the rapid growth of ICT, is about fundamental changes in how people communicate, work, learn and earn. It is forging new business practices and means of governance. 20 years from now, the digital revolution, would have had far greater impact than the Industrial revolution did in 200 years. The result of these fundamental changes is interconnected societies and businesses. Physical boundaries no longer are a limitation when almost everyone and everything is a digital handshake away. This interconnection is the basis of the global engine of change that is transforming people from employees to entrepreneurs unshackling the traditional notions of workplace and success.”

**Vinod Sawhny**

CEO, Reliance Communications

#### **Governance:**

The governments across the world focused on providing information and services to the citizen while the platforms that delivered services worked in silos across different government departments. The assessments show that government agencies did not use common framework or methodology to integrate different functionalities and information.

The digitization of government processes and function should bring out responsive, responsible, efficient, effective and accountable information and services to Government-to-Citizen (G2C), Government-to-Business (G2B), Government-to-Government (G2G), Government-to-Employee (G2E) and all back-office processes and interaction within the government framework. <sup>52</sup>

According to UNESCAP “Good Governance” has 8 major characteristics – it is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making. It is also responsive to the present and future needs of the society. <sup>53</sup>

# Digital India – New entrepreneurial opportunities

The Digital India announcement is one that can prove to be truly transformational for the country. Tremendous opportunities lie ahead for creating a huge base for electronics manufacturing in India and introducing digital technologies and skills to change the fortunes of the underserved segments of Indian society. The National Broadband Mission, the National Optical Fibre Network and other digital infrastructure projects have been somewhat delayed but enough optimism exists that these will be completed and extended to all parts of the country and create the base for a digital revolution in the country.

One major outcome of this initiative, apart from the business it opens up for scale players in the IT sector in India, is the vast set of opportunities that can and should open up for the start-up ecosystem in the country. Entrepreneurs in internet services, m and e-commerce, design and manufacturing services in high tech manufacturing and products, services and skills creation for the digital environment will find ample scope for creativity and innovation in the new environment.

There will also be entrepreneurial opportunities in the intersection of “Make in India” and “Digital India” that will see new age manufacturing companies embrace new technologies on the shop floor and transform supply and demand chains in the changing competitive landscape of the manufacturing industry. The empowerment of manufacturing through the Internet of Things (IoT) is creating intelligent shop floors that demonstrate data driven operational excellence and decentralized production control systems within and beyond the physical factory walls. Connected supply chains and collaborative networks are accelerating the movement of physical entities as well as information through the eco-system. Some digital initiatives that are being implemented in manufacturing companies in India include digital warehousing, on-line bidding, mobile field force and supplier collaboration platforms and collaborative manufacturing systems across states and industrial corridors. Much of this is being enabled by the all-pervasive glue of Information Technology and IoT will take the transformation process to a new level of maturity.

One predictable outcome of these changes, both at industry and firm level will be the need for a new approach to managing information technology. The Gartner approach to Bi-Modal IT for the emerging digital world would be the most appropriate for companies to consider, where the marathon approach to building and sustaining mission critical systems for core business processes within and across companies must co-exist with the sprinter’s approach to developing agile and flexible business applications for emerging technology and collaborative business opportunities. The first will call for a technology centric plan and thoughtfully articulated strategy for systems in the enterprise, something that the CIOs and IT Directors have been trained on and are comfortable with. The second will need idea crowdsourcing, empirical and continuously evolving approaches and the willingness to adapt on the fly.

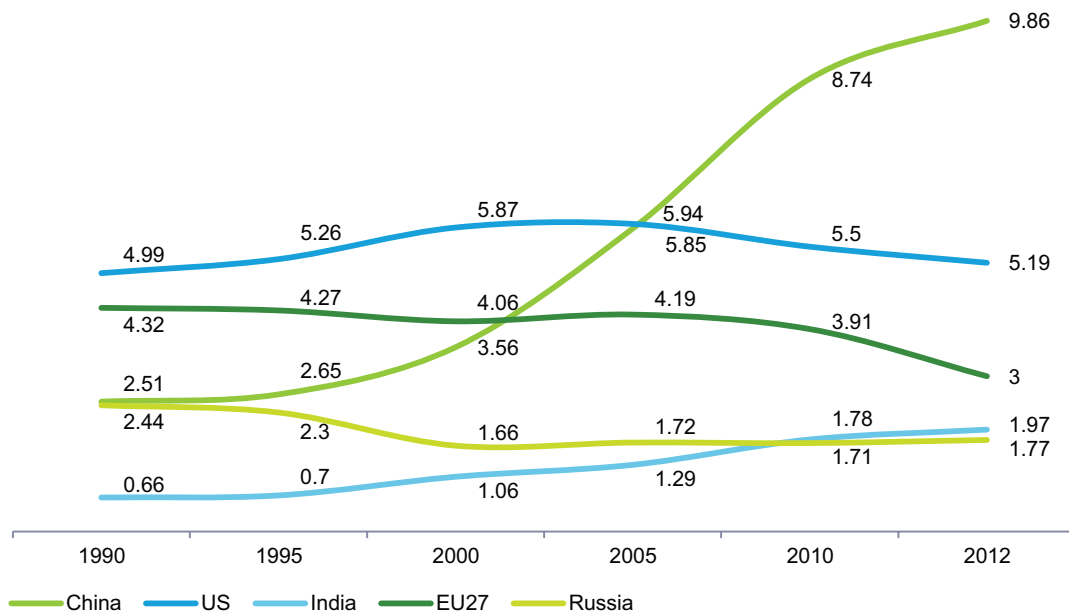
The opportunities in Digital Manufacturing will be multiplied in Digital Healthcare, Education, Financial Services and even just Digital Government. Diagnostics, Needs Analysis and Service Design and Delivery. A fully digital environment will create new value propositions in all sectors of the economy and it will need a new breed of young entrepreneurs, ideally born in the digital era to see the discontinuities in existing services where new companies can be created, scaled and either sold to larger players or taken on to a global destiny. For the new era Google and Facebook wannabes, Digital India will present a wonderful opportunity. The success of entrepreneurship will be the true success of India!

## **Dr. Ganesh Natarajan**

Vice Chairman & CEO, Zensar Technologies  
Chairman, NASSCOM Foundation

# Leading to Low Carbon Economy

Figure 9: CO<sub>2</sub> Emissions by Country/ Region (billion tonnes)



The concentration of carbon dioxide (CO<sub>2</sub>) in the atmosphere is a major cause of global warming. The rate of increase of CO<sub>2</sub> was fastest in the year 2013 when compared to last 30 years possibly due to less uptake of CO<sub>2</sub> by the ecosystem such as forests. The exponentially increasing population demands more residential and agriculture land to support their basic needs causing massive deforestation, which is the major cause of high carbon footprint. The World Health Organization estimates that climate change is already causing over 140,000 deaths annually.<sup>54</sup>

The rising CO<sub>2</sub> level is a concern around the globe. While some countries like the US, European Union, and Russia are putting measures to control the CO<sub>2</sub> level, the emission level is rising exponentially in other countries like China and India, China being the highest contributor of CO<sub>2</sub> in the atmosphere.

The high level of carbon emission has many direct or indirect effects on Earth's atmosphere. As per a climate study done by Carnegie Institute for Science, it takes just 10 years for a single emission of CO<sub>2</sub> to have its maximum warming effect on the Earth.<sup>55</sup> Human activities such as high usage of fossil fuel for transportation, production process, and daily use have raised the atmospheric CO<sub>2</sub> concentration by more than 40% over its pre-industrial level of 280 parts per million (ppm) in the last 250 years. The CO<sub>2</sub> concentration in Earth's atmosphere surpassed a milestone of 400 ppm for the first time in May 2013, which can prove very dangerous.<sup>56</sup> There are many after effects of high CO<sub>2</sub> emissions. The rise of sea level due to the melting ice glaciers and reduced ozone layer are direct impacts while the weather unpredictability taking a toll on agricultural productivity is indirect impact.

### **Emission Reduction and Control: The digital way**

There are many ways to address the problem of carbon emission by reducing it wherever possible or offsetting the emission where the reduction is not possible.

The evolution and adoption of digital technology has a critical role to play in the reduction of carbon footprint moving towards improved lifestyle and a greener planet. The technologies like video conferencing, mobile devices, smart vehicles, cloud computing, digital cinema, smart cars, internet of things, digital sensors, etc. can help in reducing the CO<sub>2</sub> emission in a significant way by reducing travel and efficient consumption of fossil fuels. Today companies are looking for smarter solutions that are not only cost effective but also meaningfully reduce their carbon footprint.

### **Video conference and telepresence – Leading to reduced travel**

With globalization and wider expansion of businesses in several locations across the globe, frequent travelling has become a necessary part of the job. A research by Carlson Wagonlit Travel (CWT) and the Global Business Travel Association (GBTA) found that business travel spending reached \$1.1 trillion in 2013 while the global business travelling is expected to increase 8.6% in the year 2015 in comparison to 6.9% in the year 2014 led by China, India and Brazil.<sup>57</sup> As per Verizon report “Meetings in America”, 53 hours, 24 minutes is the average time participants spend preparing for, traveling to and attending an in-person meeting with five people which is more than three times the amount required for an audio or video-conference.<sup>58</sup>

The above statistics signify the huge contribution of airlines around the world towards CO<sub>2</sub> emission. A significant part of the travelling is the result of business meetings rather than tourism. The huge amount of carbon emission can be minimized by the adoption of telepresence solutions like tele-conferencing, virtual meeting rooms where the meetings can be conducted easily with people from across the world in real-time and with high quality and user friendly interfaces. Telepresence products like Avaya Scopia provide a unique example of leveraging technology to create face-to-face virtual meeting experiences. High speed optical fiber network, satellite communication systems, affordable and secure teleconferencing platforms such as Cisco WebEx, TeamViewer, Avaya Aura are the enablers of modern day teleconferencing solution. There

are other low cost solutions like Google Hangout and Skype which can be used in portable mobile devices for video conferencing needs of individuals. The adoption of telepresence has other benefits like better productivity, work-life balance for employees apart from lowering the operational expenses and carbon footprint of the company. Similarly, e-health or m-health can deliver remote monitoring and telemedicine, which can bring specialized care from across the world at convenient locations and at relatively lower costs, thus reducing the travel of medical professionals. Video-conferencing solutions and other digital technologies will be highly critical in the growing population of baby boomers and the increasing nuclear families.

According to the WWF, electronic conferencing can eliminate 20% of business travel which reduces greenhouse gas emissions by 1.08 million tonnes a year. Carbon Disclosure Project (CDP) sponsored by AT&T has revealed that videoconferencing can cut CO<sub>2</sub> emissions by nearly 5.5 million metric tons and can achieve total economy-wide financial benefits of almost \$19 billion, by 2020 for enterprises<sup>59</sup>. As per Cisco, one of the leading solution providers for teleconferencing, a team can save 27.04 tons of carbon dioxide by moving their training online. A leading telecom player, British Telecom, claims to have reduced its carbon footprint by 97,000 tons of CO<sub>2</sub> per year, which is 15% of its CO<sub>2</sub> use, by using audio conferences and videoconferencing.<sup>60</sup>

### **Mobility solutions – Towards flexible work environment**

Digital technologies can not only help in better communication but also provide better work environment, increase flexibility and efficiency, reduce operational costs, simultaneously leading to reduced carbon footprint. Mobile technology is helping in reducing GHG emissions by providing innovative solutions.

A study has revealed that working from home has the potential to save companies £3 billion and 3 million tonnes of CO<sub>2</sub> emission per annum through reduced commuting.<sup>61</sup> A program in UK found that an employee can save 1,175 driving miles each year, amounting to a 364.5kg reduction in carbon emissions when he works from home 1.5 days per week.<sup>62</sup> Bring-Your-Own-Device (BYOD) can help in cutting capital expenditures and reduce companies' e-Waste.





### Industry

- Smart motors
- Process Automation
- Dematerialisation



### Transport

- Smart Logistics
- Transport Optimization
- Efficient Vehicle
- Traffic Monitoring
- Parking



### Building

- Energy efficient houses
- Smart Buildings
- Dematerialization



### Power

- Smart Grid
- Efficient generation of Power
- Alternate Power Source

## Machine-to-Machine - Progressing towards smart living

The ICT plays a powerful role in tackling climate change by enabling other sectors, such as transport, buildings, power, industry among others, to become more efficient and to reduce carbon footprint significantly.

- **Smart Metering:** Smart metering uses M2M technology to collect data about energy consumption. This data enables consumers and businesses with better energy management in homes and offices. Solutions like Energy Data Management (EDM) used by telecom operators track and regulate the energy consumption across various systems. This helps in reduced energy cost, billing errors and CO<sub>2</sub> emissions.<sup>63</sup>
- **Smart Grid:** Smart grid is a set of software and hardware tools that enables generator to route power more efficiently. It reduces the need of excess capacity and allows real time information of power consumption for better demand side management. Electricity generation currently accounts for 57% of India's total emissions. India has a highly inefficient power network and a great portion of the electricity generated goes waste. Smart grids can help address 67% of the energy lost due to inefficiencies before reaching the consumer and thus help in reducing the CO<sub>2</sub> emission.
- **Smart Logistics:** Smart logistics use different telecom technologies like Global Positioning System (GPS), online tracking, etc. Tracking devices use

M2M modules to communicate vehicle movements to fleet management systems. The central system responds with revised route details that saves fuel and emissions. e.g. TomTom's navigation technology helped Zenith Hygiene Group to track vehicles and monitor driving habits, contributing to slash its average carbon emissions from 15 kg to 11 kg per day.<sup>64</sup>

- **Smart Building:** Smart building solution uses technology for energy efficient design, construction and operation of the building. Sensors are used for automation of devices, which can help in controlling their usage remotely through mobile interface.

## Cloud computing

Carbon Disclosure study supported by AT&T suggested that large companies in the US like the Boeing, Citigroup and AT&T can achieve annual energy savings of \$12.3 billion and annual carbon reductions equivalent to 200 million barrels of oil by the adoption of cloud computing.<sup>65</sup> The increasing adoption of cloud computing can help in reducing 38% of energy usage in the data centers globally by 2020. The energy consumption can be decreased from 201.8 terawatt hour (TWh) in 2010 to 139.8 TWh in 2020 by high adoption of cloud data centers causing a 28% reduction in carbon footprint from 2010 levels.<sup>66</sup>



## Case Study:

### Proposed Smart City in Gujarat

Gujarat International Finance Tec-City (GIFT City) is a ₹ 780 billion project in Gandhinagar city of Gujarat. The connected city will use the ICT technology extensively to efficiently provide a greener environment and advanced services.

Some features of the GIFT city where ICT will be used are:

- Efficient water management and treatment to achieve zero discharge
- ICT connected building and inter operable departments
- Automated Waste Collection System (AWS) through chute system
- District cooling system with reduced energy cost and reduced noise and vibration
- Efficient transportation system
- Better security and safety

The smart city will be capable of minimizing significant amount of Greenhouse gases by using new technologies such as M2M sensors and RFID, high speed internet connection, Wi-Fi, etc.

#### Online platforms – Moving from paper to digital economy

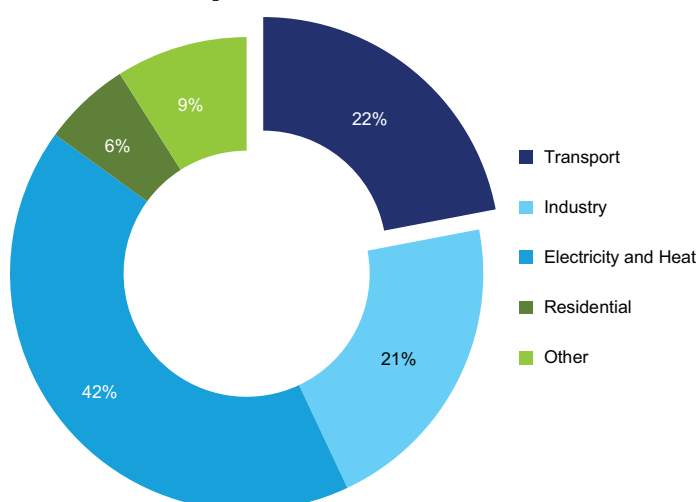
The online portals can help in dematerialization (changing from a paper platform to digital) and can thus help in reduced CO<sub>2</sub> emission. The increased use of e-readers to access news, magazines and other reading material online can help in low paper consumption. Similarly, online procurement can result in significant reduction in paper use and result in efficient supply chain processes. Ticketing industry is undergoing paradigm shift through IRCTC, Redbus and other online ventures allowing customers to book tickets through internet and use SMS or digital tickets stored on mobile devices for verification purpose. E-commerce is helping in reduced paper invoices by connecting buyer and seller in a digital platform and transactions can occur in real-time from anywhere. The e-Governance projects can contribute a lot towards green planet by enabling delivery of governance in a digital medium. Interconnected government offices can exchange documents digitally without the use of paper. Moreover, the citizens will not need to submit repeated documents for every new service as the data will be available centrally for validation and authentication through Aadhar (Unique ID).

The online platforms are helping to connect passengers with car owners for carpooling services, which can help in reduction of traffic congestion.

#### Hybrid and connected cars

Accordingly to the IEA statistics report 22% of the carbon emission by fuel consumption comes from transportation. The road transportation industry shares 74% of the transportation carbon emission around the world. The automakers are introducing new products frequently with the Unique Selling Properties (USP) of low carbon emission, Green car, Hybrid car, etc. Toyota, Fiat are expected to lead the low carbon emission car makers ranking by 2020.

Figure 10: World CO<sub>2</sub> Emission Sector wise



Source: IEA statistics 2012

The scarcity of fossil fuels and the stringent emission norms are forcing car makers to invest more time and money in the research and development of eco-friendly and high fuel efficient cars. Hybrid cars which use both battery and fossil fuel to run are slowly entering the developed markets. Some big car companies are tying up with ICT solution providers for building hybrid and connected cars. Google is investing heavily in electric and driverless cars with an aim to reduce the CO<sub>2</sub> emissions, improve safety and provided connected user experience.

Countries like Japan, China and the US are leading the race of producing higher number of electric and hybrid cars in the world. ICT can help in tracking the fuel consumption, provide driving data to help in efficient usage of the resources and the Global Positioning System can provide efficient route options to drivers with shortest or low traffic path.

### Energy Efficiency and Waste Management

Waste management for recycled energy is a good way to tap CO<sub>2</sub> emission in the atmosphere. The decomposition of solid waste in landfills results in the release of methane, a greenhouse gas 21 times more potent than carbon dioxide. Burning wastes and the transportation of waste to disposal sites further produce CO<sub>2</sub> emissions. ICT solutions like Waste System Management with waste collection automation, waste management information and prognostics, mobile waste collection solutions (GIS and GPS), customer information system, waste accounting and billing, mobile work force management, preventive maintenance and asset lifecycle management are integrated for effective operation and management of the waste management system.

Around 40–50 million tons of e-waste is generated annually, including 30 million computers disposed-off in the US and 100 million mobile phones are discarded in Europe. The US and China are the biggest producers of e-Waste in the world. The ICT products can help in reducing e-waste by decreasing the non-recyclable products. More modular devices in the future can significantly reduce the e-waste thus contributing to reduced carbon emission.

The telecom industry, though provides several solutions to cut back the carbon emission, contributes significantly towards high CO<sub>2</sub> emission. With almost 584,000

mobile towers in India, a significant percentage of towers are backed by diesel powered generator as only 33% of towers are grid powered. The telecom tower sites in India produce almost 11 million tonnes of CO<sub>2</sub> annually.<sup>67</sup> The operators are required by Department of Telecom (DoT) to cut carbon emissions by 17% in the next five years by reducing diesel consumption.<sup>68</sup> Energy efficiency measures like Integrated Power Management System (IPMS) and variable speed DC generators (DCDG) are being used by some leading operators. E.g. Airtel has reduced diesel consumption by 1.2 million litres and saved ₹47 million across almost 900 sites where this has been implemented.<sup>69</sup>

### Forestry and Agriculture

With the growing population, industrialization need for more living space and land for agriculture is also increasing rapidly and thus causing deforestation around the world. According to the United Nations Food and Agriculture Organization (FAO), an estimated 18 million acres (7.3 million hectares) of forest is lost each year.<sup>70</sup> The deforestation causes many different problems like climate imbalance, increased global warming, soil erosion, floods, etc. Digital India can be a savior for the forests and agriculture by providing innovative solutions to minimize the CO<sub>2</sub> emissions. Google, in partnership with the University of Maryland and the UN Environment Program, has developed a tool - Global Forest Watch 2.0 to help in preventing deforestation. It is an interactive, real-time, forest monitoring system, which uses satellite technology, data sharing and human networks around the world to provide information to better manage forests.<sup>71</sup> It uses decades of satellite imagery and analytic tools to extract scientific information of deforestation. Android phones and Global Positioning System are being used to mark trees and monitor illegal logging in Brazil as discussed in the case study.<sup>72</sup>





## Case Study:<sup>73</sup>

# Tracking trees: How M2M is helping to prevent deforestation in Brazil

### Problem Statement:

Deforestation is a big issue in the Amazon. It is difficult to monitor trees in the vast forest area. Many illegal loggers cut down the trees and take them to illegal saw mills without the knowledge of the forest department.

### Gemalto Machine to Machine Module:

Brazilian location-services company Cargo Tracck is working with the Brazilian environmental protection authorities and carriers to stop deforestation in the Amazon through tracking of individual trees. By embedding Gemalto machine-to-machine (M2M) radio modules into specially designed logging monitors, Cargo Tracck is able to detect if trees are being chopped down and moved.

### Solution:

It is a unique approach to M2M because it requires monitoring devices in areas where cellular networks usually don't reach — the depths of the rainforest. The genius of Cargo Tracck's system though is that in an ideal situation the monitoring devices will never have to transmit. If the protected trees remain undisturbed, the modules would just hang unmolested in the forest canopy. But if the tree were cut down and trucked to an illegal sawmill, the monitor would notify the authorities as soon as it got within range of a cellular network. Gemalto's newest low-power M2M modules use radiation exchange data tracking technologies that can extend its range 20 miles, so they can transmit their coordinates even if illegal loggers are skirting cities and highways.

There will be 9 billion people that need to be fed on this planet by 2050.<sup>74</sup> To feed the world's rapidly expanding population in the coming decades, agriculture must produce more. While there is a growing need of agriculture the Green House Gas (GHG) emission from agriculture is a concern. As per a research by Consultative Group on International Agricultural Research (CGIAR) one-third of our greenhouse gas emissions come from agriculture.<sup>75</sup> In high income countries like the UK, post production including storage and transportation contributes a large proportion of the GHG emission while in countries like China fertilizer manufacturing has the biggest contribution. Agriculture is directly involved in deforestation to increase cultivable land and production. Instead, to meet the growing demand of food the agriculture need to be efficient to produce more from the same land.

Digital India can accelerate the growth of agricultural sector which will in turn boost the economic growth of the country. e.g. In precision farming, using geolocation of data and analyzing intra- and inter-field variability in climatic conditions, crop management practices and environmental factors, farmers are able to apply correct

quantities of inputs on a site-specific basis. ICT helps in collection, storage and analysis of data to provide information to the farmers resulting in maximum effectiveness of inputs.

**M2M and sensors:** M2M could save another 1.6 gigatons of CO<sub>2</sub> emission by 2020 in the Agriculture sector by reducing deforestation, managing livestock, and increasing the efficiency of planting, seeding, harvesting, fertilizer application and water use—allowing more food to be grown with fewer resources and saving money for farmers.<sup>76</sup> M2M and sensors are of great help in agriculture as automation can not only save money and labor but also can make the process more efficient. e.g. John Deere uses M2M modules in their latest equipment to help farmers decrease downtime of their tractors, thus saving on fuel.<sup>77</sup>

**RFID tags:** RFID tags that allow for better management of cattle herds and grazing practices, along with other ICT tools, could together be key enabling factors in preventing the deforestation that results from cattle ranching. Ear tags containing SIM cards can provide information on cattle herd locations and movement.

**Farmer portals:** Government portals such as Farmer Portal, Kisan Call Center, mKissan provide free information to farmers for efficient farming and utilization of products post production. These portals can help farmers to take informed decisions due to the weather unpredictability with more precision. The

analytics tools can provide demand forecasts to enable farmers to produce as per the requirement, thus cutting down on wastage. Farmers can reach the nearest buyers directly and sell their products easily and thus can avoid post production storage and transportation.

## Case Study:

### Improving efficiency: How M2M is helping to prevent seeding problems

#### Problem Statement:

Farmers always face different problems during manual or semi-automatic seeding. The uneven seeding leads to crop failure, more fuel consumption and ultimately wasted time for farmers.

#### Solution:

John Deere, the leading manufacturer of agricultural equipment globally, has begun offering a suite of M2M products called i-Solutions. This system uses three components - modules specifically programmed for a variety of tasks, a GPS receiver accurate to 0.78 inches, and a monitoring device that allows the user to track and control all of the modules in the system. This system improves the efficiency of various farming processes. During planting, the automation of equipment reduces the need for seeds, fuel, and time. The M2M system can be used with other information tools offered by John Deere. It can automatically record and map harvesting data and after further analysis, the tools can suggest adjustments to farming procedures for better crop yields and greater savings in fuel, seeds, and fertilizer costs, at the same time lowering GHG emissions. Since the entire range of modules are built into and fitted to equipment by the company itself, they are fully integrated straight from the factory and are easily interchangeable and replaceable by the user, who can even use another manufacturer's components, making this a truly seamless and standardized solution.

#### Result:

Automating some aspects of seeding has yielded savings of 5% over average per acre costs in one case study, with additional revenue generated by the increased yields that follow. During the harvest, automation of equipment and analysis of crop rows led to reductions in fuel use of 15% and yielded crop increases of 50% in another case study.<sup>78</sup>

# Cyber Security in Digital Economy

Government of India started the Digital India initiative to transform citizens' life through digital medium - to establish robust platform of modern technologies to connect citizens to achieve necessary services at common service centers like training, capacity building, registration, grievance redressed, technical support, enrollment in government schemes. This is the new era in which the Government is looking forward for every citizen to have access to Internet and ensure good governance via e-Governance by implementing the 'Digital India' initiative. Besides this, 'Digital India' also focuses on providing universal access to mobile connectivity for all citizens; selective public internet access across regions and electronic delivery of services (through 'eKranti').<sup>79</sup>

With such ambitious initiatives and growing security concerns, security has become one of the most important focus areas which need to be looked from the perspective of protecting citizen information, government agency details and critical infrastructure. With the advent and popularity of business moving to the cloud, and transcending operations through social media and mobile (Bring-Your-Own-Device (BYOD)), it is very difficult to have a constant and clear picture of what the threats across the environment look like. The question of whether information volume, cost, and risk will continue to grow no longer exists. There is also no question of whether proactive information governance program is required. Indeed, the issue is no longer why an organization needs one, but rather how to strategically design and implement one successfully with sustainable outcomes. With technologies getting implemented at an incremental rate across industries and government (through migration to cloud - project "MeghRaj" and social media avenues) it is challenging to estimate the business's ability to manage the risk of such a complex ecosystem and hence intelligent processes must be aligned in order to curb huge economic impact that this may cause in limited time. In digital age, we need to ensure that ecosystem is secured from various cyber threats and espionage as they are growing at an exceptional rate. With threat landscape fierce as never before, robust framework needs to be established for cyber security and this also motivates the need to understand the root cause, and implement a proactive approach in order to avoid any high impact to the government or organization's vision and business.

## Digital India and Digital Economy

The disruptive technologies and trends including social, cloud computing, mobile and analytics can play a major role in providing governance and services on demand to the citizens. Through this convergence of Digital economy which India is trying to create through the Digital India initiative, Indian economy is transforming towards financial inclusion via provisioning of varied revolutionary services including Mobile money that facilitates cashless or mobile payments, integration of Aadhar with public cloud and general citizen services and use of social media for connecting to citizens. Additionally the paradigm is now shifting from e-Governance to mobile Governance (m-Governance) by enabling one web approach.

Thus, Digital India aims at making technology central to enable change. By creating this kind of economy, cyber security will be one of the key concerns of the initiative since the impact of losing the data gets higher when moving towards a digitized economy. Cyber-attacks at this level would not only affect the public safety of citizens, but also the commercial integrity of organizations and ultimately, global existence and competitiveness of India.

Thus, the cyber space definitely needs to be protected as the services are getting digitally transformed for improving ease of doing business through mobile phone banking, cloud based citizen entitlements, electronic & cashless financial transactions.

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As we move into 2015, cyber-attacks will continue to become more innovative and sophisticated.

### Adapting to Erosion of Security Perimeter

It is not only the number of intrusions getting higher day to day, but also the nature and characteristic of these attacks. In the first five years of the millennium, a rise in propagating worms was seen which indeed were highly published by media and were highly destructive. Later, the motivation of attack changed and emergence of botnets was seen, which were a collection of infected nodes remotely controlled by perpetrators and were used for spam, phishing and so on. Further with time, another sect of attacks generally categorized as 'Advanced Persistent Attacks' were seen, which are highly sophisticated attacks focused on targeting industries and government by utilizing stealthy techniques to exfiltrate data with high value information.<sup>80</sup>

With the evolution and implementation of varied disruptive technologies and the revolutionizing shift over enterprise architecture, eventually moving towards Social, Mobile, Analytics and Cloud (SMAC) in conjunction with technologies like Software Defined Networking (SDN) and Network Functions Virtualization (NFV) goes for a toss, if not aided with a comprehensive security system. Also, consumers are becoming increasingly reliant and dependent on the intelligent and interconnected mobile devices. These devices are being used extensively for social media and for accessing cloud-stored data. This intermingling of access to business data and use of personal software applications in one device makes it a prime target for hackers and provides new entry points for attack, in addition to being easily lost or stolen. In other words, attacks are rapidly propagating; increasing automated use of exploits against upcoming disruptive technologies thereby challenging the response time.

In such a complex environment with correlative tethering of solution sets in the infrastructure, security is more of a dilemma which has to get itself aligned with each type of emerging threats and risks, thus inclining the focus from security to the 'notion of survivability' – i.e. preserving operations in the phase of an attack. Thus, constructing the security frameworks and responses to such dynamic environment needs to be much more efficient.

We are dealing with more persistent targeted attacks and creative mobile attacks that take advantage of new vulnerabilities, social engineering and mobile proximity. They are stealthy and are designed to fly under the radar, undetected, and to steal your valuable data, and the data exists everywhere – in the cloud, virtualized servers and primarily on mobile devices which further need to be protected.

Cyber-espionage is expected to surge in 2015 with India being one of its prime targets; it is expected to implement better methods using sophisticated stealth technologies to exploit the target network. Along with it, these threat vectors are also targeting at the core functionality of Critical Information Infrastructure (CII). The impact of such targets is enormous and could cause nationwide damage or destruction of CII, disruption or degradation of services with loss of sensitive and strategic information thus causing widespread damage in a short time.

Cyber criminals use a seemingly endless array of techniques to compromise and infiltrate nearly every aspect of electronic environment. The global economy has become increasingly dependent on Web-based systems and interconnectivity to operate smoothly. In fact, cyber-attacks have grown so complex and varied that traditional IT system defenses such as antivirus (AV) software and intrusion prevention systems (IPSs) are not enough on their own. Cybercrime thus has become big business with cybercriminal counter intelligence available to the hackers accelerating the volume, variety and velocity of threats we are dealing with.

Businesses of all sizes now are required to prepare for the unknown so they have the flexibility to withstand unexpected, high impact security events. Looking at the nature of ongoing threats, the impact from these threats can have a very long and disproportionate "tail". If a threat impacts the organization, then the organization either deliberately or unwillingly is made to accept it and it certainly can't avoid the loss of reputation, once the news goes wild. Along with this, the threat perimeter is represented by a number of vectors having multiple probabilities of occurrence of operational breakdowns for any organization. The impact of security threats can always be seen on all segments of organizations majorly affecting the governance components of the entire organization.

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“2015 will be the year of positive disruption. I visualize young entrepreneurs across the world developing cost optimized solutions and services on open source platforms to elbow out traditional players. I envisage a higher degree of conglomerations and collaborations of hardware and software players vying for market share. I anticipate the Online-Offline financial and purchase models to blur. On the whole, we can seriously expect the unexpected – that’s for sure!”

**CP Gurnani**

Managing Director, Tech Mahindra

#### Degree of Threat

A highly targeted attack such as an Advanced Persistent Threat (APT) typically follows a multi-step scenario. The attack would start with intelligence gathering to create and execute a socially engineered employee infected with malwares, followed by network infiltration, lateral movement across the organization, and finally data discovery and exfiltration – all the while, command & control communication and backdoor controls are executed via remote control.

These attacks thus are getting more and more:

- Social – targeting and attacking specific people with social engineering and advanced malware techniques
- Sophisticated – exploiting vulnerabilities, using backdoor controls, stealing and using valid credentials, and
- Stealthy – executed in a series of low profile moves that are undetectable to standard security or buried among thousands of other event logs collected every day.

Although these attacks may be rooted in government cyber warfare or only affect certain industries, the same techniques used to execute such social, sophisticated and stealthy attacks are being used to target organizations – to steal consumer’s secrets and critical customer information.





Figure 11: Top barriers State officials and CISOs agree



Source: 2014 Deloitte-NASCIO Cybersecurity Study

As these threats evolve, it is clear that traditional techniques won't be able to prevent all threats. Additional layered security and specialized visibility into these attacks is needed.

There are several challenges faced by organizations which are discussed below:

- The vast majority of businesses do not have the resources and/or the capabilities to properly detect and defend against emerging cyber threats.
- Most businesses are not aware of a breach until it is too late. There is an urgent need to move to a more proactive, "over the horizon" threat awareness posture.
- The regulatory environment around sensitive data protection will become only more rigorous, more diverse, and more complex.
- Cyber intelligence data often lacks the necessary enrichment to make it actionable and relevant
- There are numerous, non-vetted intelligent sources available that have inconsistent levels of accuracy and reliability thus requiring community support from experienced consortiums.

#### The Best Defense

The rapid pace at which technology is changing has provided large opportunities for organizations to develop new business models, services and products.

Figure 12: Cyber security budgets are increasing year over year



Source: 2014 Deloitte-NASCIO Cybersecurity Study

While the digital revolution has transformed the way we do business, it has also created complex and sophisticated security issues. Assets and information that were once protected within the organization are now accessible online; customer channels are vulnerable to disruption; criminals have new opportunities for theft and fraud. With organizations growing organically and inorganically complexity of managing businesses & security operations are also becoming complex.

So what is needed to address these targeted attacks? How can visibility be gained into these attacks and how can they be stopped from causing further damage?

Organizations today thus face a continuously evolving threat landscape where the speed and intensity of attack is incrementing and response time is subsiding. As a result, organizations need to have rapid detection and response capabilities that allow for the synthesis of external and internal threat intelligence in a timely manner. This "situational awareness" is a required component of an organization's overall security posture and critical for maintaining the confidentiality, integrity and availability of its information assets.

Through Cyber Threat Intelligence & Analytics organizations primarily need to focus on restructuring the diverse unstructured security data and information

gathered from all the security entities and devices (recent and past events) to consolidated intelligent feeds, advice or a product, which could be used to make informed decisions in order to mitigate dynamic threats as per their environment. Nations across the world have already taken initiatives and migrated from their traditional security paradigms to the notion of threat intelligence and continuous monitoring.

In India, wherein there are majority of systems in cyberspace, the formulation of practical national strategy should be the first step towards building a cybersecurity defense mechanism. This should be followed by development of cyber security governance, technology and means for implementing the security measures and training of personnel to work with these technologies within the defined strategy.

Since, cyber threats are increasingly becoming more targeted and sophisticated – made worse by the much broader attack surface created through mobility and cloud, Cyber Security Governance would play a key role. It has to fundamentally define what kind of minimal defense, or minimal measures in cybersecurity, has to be taken by each and every entity. This new eroded and elastic boundary means that sensitive information is everywhere and the information needs to be protected wherever it resides.

Considering the importance of cyber security, government has to take the lead and set up Cyber Control and Command Centers to monitor and protect citizens and government agencies information, data & intellectual property. In coming years, this will support in maturing the digital transformation and enhancing ease of living & quality standards of citizens, thus establishing a growth path for the nation as a whole.

Thus, to have a wide adoption of best defense, the key disruptive trends among industry and citizens should be identified to further identify the security risks and corresponding defense mechanisms or precautions for each element, taking notion of security to cyber security threat intelligence – wherein organizations need to have

rapid detection and response capabilities that allow for the synthesis of external and internal intelligence in a timely manner though feeds converged from various sources.

### Cyber Security Governance

IT governance provides outcomes specifically focused on aligning IT with the business while security governance provides outcomes specifically focused on aligning security with the business. In order to operate effectively in cyber space, security governance should be considered as a business enabler with organizations understanding and planning for, that they have to deal with "certain impact" from security threats which can't be predicted or even instantly prevented. Today, mostly all the organizations have the bits and bytes to a security program (policies, standards, security teams and security devices like firewalls) but management is not completely involved and security has not permeated throughout the organization.

What we see instead is these bits and bytes are under the responsibility radar of a small security team that is charged with making sure that security happens / flows throughout the company – which is indeed close to impossible. Security should be implemented throughout the organization having several points of responsibility and accountability. Also, the dependency that exists between organizational components and security requirements; this relation reflects how to / to what extent each component of the system contributes to meeting each security requirement.<sup>81</sup>

Thus, Information Security (governance) is an important part of the overall national and corporate governance model wherein nations and organizations should strive to make a coherent system of integrated security components which exist to ensure that the organization's operations are not hampered with the evolving security threats thus creating a notion of survivability. This would thus assist the 'Digital India' initiative with an umbrella program to prepare India for a knowledge based transformation.

# Taxation in Digital Economy



Digital economy is fast becoming 'the economy' with vast amount of goods and services being transacted online or being in the nature of digitised goods and services. Hence, it has become imperative to understand the specific business models in play and the consequent tax challenges.

Domestic and international tax regimes based on traditional models have made provisions to avoid double taxation of cross border income i.e. the income is taxed either in the country where the receiver of income is a resident ('resident country') or the country from which the income arises ('source country'), with relevant credits for tax deducted being built-in if the income is taxed in both countries. However, what was not envisaged while formulating these tax regimes was a situation of double non-taxation/taxation at a very low rate which is more easily achievable for companies in a digital economy and gives rise to various tax challenges.

There are primarily two methods of taxation – residence-based or source-based. Residence-based taxation means the income of a person is taxed in the country in which the person is a resident (i.e. domicile of an individual, incorporation of a company, etc.). Under source-based

taxation, a person is taxed in the country in which he carries on business. This happens when the business is carried on in a source country to such an extent so as to create a physical presence i.e. a permanent establishment ('PE') in that country. The taxability, however, is limited to the profits attributable to the activities carried out by the PE in such source country. A PE may be created, inter alia, if business activities are carried out in the source country through a physical presence which is at disposal of the overseas entity for a substantial period of time or through an employee / dependent agent. Further, there are certain exceptions to creation of PE such as carrying out auxiliary activities (i.e. activities that do not constitute core functions of a business), maintenance of a fixed place of business solely for the purpose of purchasing goods, etc. One of the tax challenges posed by the digital economy is establishment of the nexus of income in the source country for the purpose of taxing the same.

Traditionally, physical presence of employees/dependent agents in the source country was required for conclusion of contracts, marketing, etc., but in the digital economy the same is now possible through the internet. Similarly, while earlier maintaining a warehouse in a

source country may have been considered an auxiliary activity not creating a PE, but the same may lead to non-taxation in a digital economy where maintaining a warehouse in the market country is a critical activity for an e-tailer which conducts all other activities through automated processes. Also, it is possible to fragment critical functions of a business and locate the same in different countries due to increased communication links and sophisticated, automated equipment from a transfer pricing perspective. This may result in non-creation of a PE or low attribution of profits to the PE.

Another key tax challenge in a digital economy concerns the characterisation of income. Characterisation of income is a determinant of how an income is taxed as per the domestic tax regime as well as the tax treaties – business income is not taxed unless there is a PE in the source country whereas generally, royalty and fees for technical services ('FTS') are subject to withholding tax in the source country irrespective of PE creation. Royalty broadly refers to any payment made for the use of commercial rights (e.g. copyright, trademark, patent, etc.), for information about industrial/commercial/scientific experience, for use of industrial/commercial/scientific equipment, etc. FTS broadly refers to payments for technical/managerial/consultancy services. The definitions of each income type as well as their rates of tax differ in various tax treaties and domestic tax laws.

In 2001, the Technical Advisory Group ('TAG') of the Organisation for Economic Co-operation and Development ('OECD')<sup>82</sup> issued its report on 'Treaty Characterisation of Electronic Commerce Payments' and discussed the classification of payments made by companies in a digital economy to others for purpose of taxation as business income, royalty or technical fees. It also suggested changes to OECD's commentary on its model tax convention. Also, the Indian tax authorities, having been aware of the unique challenges posed by the digital economy, constituted a High Powered Committee ('HPC') on "Electronic Commerce and Taxation"<sup>83</sup> with representatives from the tax authorities, tax experts as well as the industry. The objective of the committee was to examine if the e-commerce and technology transfers should be subject to tax and the current as well as proposed tax treatment of the same. The HPC also examined and commented on the tax positions in the OECD's TAG report.

More recently, in 2013, OECD and the G20 countries adopted a 15-point action plan to address Base Erosion and Profit Shifting ('BEPS') strategies adopted by companies to minimize their tax cost through artificial structures. Action 1 deals specifically with tax challenges in a digital economy and the first deliverable was issued in 2014<sup>84</sup> which may be altered depending on the deliverables issued in 2015. The deliverable also discusses possible solutions that could be adopted for dealing with BEPS in a digital economy.

One of the important cost components of any enterprise in the digital economy is comprised of indirect tax. Since this tax is subsumed in the product/service itself, it affects the competitiveness of the product/service. Some of the important indirect tax concepts in India are discussed below.

- **Service tax:** Service tax was historically levied on specified list of taxable services. From July 2012, there has been a major shift in the service tax regime. Service tax is applicable on all activities except those specifically excluded or covered under negative list of services. Further, the recent 122nd Constitution Amendment Bill ('GST') has defined service as 'anything other than goods'. It is thus evident that the ambit of service tax is getting broadened.
- **Value Added Tax:** Value Added Tax ('VAT') is levied by the State on sale of goods within the State. Central Sales Tax ('CST') is levied on sale of goods from one State to another State. VAT/CST is levied on all types of movable property except those which are specifically excluded. Further, transfer of right to use goods is a deemed sale transaction liable to VAT.

Action 1 of BEPS dealing with the digital economy also discusses VAT and other indirect consumption taxes.

## Direct tax issues

### 1. PE and related issues

1. **Server & website:** There is general consensus in the OECD countries that location of a server in the source country leads to PE creation whereas solely having a website does not create a PE. As per 2014 commentary on OECD's model tax treaty convention<sup>85</sup>, a website hosted by an overseas entity on a server may lead to a PE only if the server is at the disposal (owned or leased) of the overseas entity and it performs core business functions. In case the website is hosted on a third party server over which

the overseas entity has no control, a PE may not be created at all. It may be noted that in the HPC report, the committee states that location of a server hosting the website will not solve PE challenges and this stand could lead to litigation on this issue.

Further, there could be several issues in relation to taxation on the basis of location of the server:

- In case of payments relatable to several servers such as a website hosted on multiple servers, there could be difficulty in tracking economic activity to a specific server.
- If the server is located in a low-tax country, it could lead to a lower tax incidence.
- Low profits may be attributable to standalone servers - this conclusion is drawn by OECD's 2001 discussion draft titled 'Attribution of profit to a permanent establishment involved in ecommerce transactions'<sup>86</sup> and is also acknowledged as true by the HPC report. The reason for such a conclusion is that standalone servers may perform only routine functions and may be dependent on intangible assets provided by other group companies for the same.

2. **E-tailer:** Recently, there has been a rise in India of foreign groups facilitating third-party sale of goods through their websites. The income from sale of goods by foreign sellers is not taxable in India similar to a traditional transaction of mere import of goods. However, these business models exacerbate the situation of no taxation since:

- Contracts may be concluded through website without the need for agent/employees in source country leading to dilution of the need for physical presence and servers also may not be located in the source country. Business income cannot be taxed in the source country since there is no PE.
- Even though such foreign groups may set up subsidiary in the source country to perform marketing services/delivery of goods, such subsidiary also may not create PE of the foreign company. Although there could be an exposure of such a subsidiary forming a PE by acting as a dependent agent of the foreign company while soliciting sellers to list on its website, it may not happen in practice if the subsidiary does not negotiate/conclude contracts on behalf of the foreign company, does not control the website, etc.

- Further, profits in source country can be substantially low pursuant to payments for intellectual property rights. Favorable tax treaties may lead to lower withholding tax on such royalty payments from source country. As per OECD's BEPS Action 1, such rights are unique and hard to value and are in fact, initially itself, transferred to tax havens at low compensation to avoid tax even at the time of transfer.

3. **VAT:** The e-commerce sector operates quite differently from the traditional business. The online based nature of operations, supplies across the country and cross border supplies have posed challenges for both e-commerce companies and Government under existing indirect tax provision. In an e-commerce transaction, market place model is commonly used. E-commerce players offer online platform where retailers and buyers transact in goods. The e-commerce players could offer logistics and warehousing facilities to the sellers. Some States are treating the e-commerce companies as 'agents' of the sellers and therefore directing the e-commerce companies to obtain VAT registration and discharge taxes on behalf of the sellers. When the goods are shipped by the retailer and delivered by the e-commerce companies, there arises a challenge when the destination State demands VAT treating such sale as a local sale in their State.

4. **C2C sales – taxable or not:** In e-commerce transaction, the retailers would pay necessary taxes in a B2B or B2C transaction. However, where the e-commerce company provides the platform for customers to sell goods to customers; who has the onus to discharge tax? It would be difficult for the authorities to track the seller and buyer due to multiplicity of supplier and consumers. Considering the volume of transactions, if authorities propose to demand tax from the online portal (as it is easy to monitor), it would become a huge cost for the company.

5. **Fragmented operations:** Technology has made it possible for fragmentation of business functions in various locations/corporate entities. OECD's BEPS Action 1 discusses a few examples in this regard. Online retailer may have subsidiary in the source country which maintains a local warehouse for delivery of goods or extends marketing support while

as mentioned above, intellectual property rights may be transferred to a low-tax country. Further, profits of the subsidiary may be reduced by making payments to overseas group company for intellectual property rights. Thus, as per OECD's BEPS Action 1, through an artificial delinking of real economic activity from a tax location, a situation of low or no tax is achieved.

## 2. Characterisation of payments

1. **Payments for communication link – royalty or business income:** Communication link refers to bandwidth or links provided by internet service providers so that businesses can communicate with their customers.

Often these transactions assure bandwidth as part of the arrangement and guarantee the transmission of data and voice. These factors have often led to such services being classified as payments in consideration for use of equipment or process and hence in the nature of royalty in India. In addition, in case there are maintenance charges being paid, the same may be considered as being in the nature of payment for services. However, the contention as per 2014 commentary on OECD's model tax treaty convention is that unless there is a right established over the equipment i.e. communication links or process, the payments for the same should not be considered as royalty.

It is interesting to note that there was a retrospective amendment brought about in the definition of royalty under the Indian domestic tax regime which classified payments for use of equipment as royalties irrespective of its control with the payer<sup>87</sup> without corresponding change in the tax treaties. However, the treaty position in this regard may still hold and control may still continue to be an important element in a payment being considered as a royalty.

2. **Payment for use of data:** Data retrieval services provide a repository of information where the principal value is derived by the customers by searching and extracting the relevant data. Instances of such services would be in the case of access to databases or industry specific reports which are of substantially higher value for the customer but do not involve giving any rights over the data. The tax authorities may contend that the payment for such information should be considered as royalty since

there is access being given to the collection of data, which could be regarded as sharing of information concerning industrial, commercial or scientific experience. However, since it is only provision of data and not any rights or control over the same which is being given, the provision of such services should generally be considered as business income as opposed to royalty.

3. **Digitized goods such as music and videos – royalty or business income:** Online transactions may be entered into by customers to download music or data for personal enjoyment or use. Such transactions walk the thin line between being classified as business income or royalty.

These transactions may acquire the color of royalty since they allow the customer to copy the music or data onto their hard disk or other media. It is to be noted that the HPC report considers such a transaction as royalty. However, as per the OECD TAG report since the definition of royalty is 'payment for' the various items listed under royalty, it is the consideration for payment which is important. The intent of the customer while downloading music is to pay for enjoying the music or using the data rather than to acquire a copyright in such music/data and payments for such transactions would not qualify as royalty even though this may involve a customer making copies of such music /data.

Further, as per the OECD TAG report, the argument advanced against a royalty classification is that royalty is in the context of 'use or right to use an industrial, commercial or scientific equipment' and the music or data downloaded cannot be considered to be industrial, commercial or scientific, at least when provided to a consumer for personal use. Further, the word equipment generally refers to a property which can be used in a process and can therefore squarely not apply to properties such as digitized products for personal use.

Another variant to a direct downloading of such data is that of telecom companies providing a download facility to their users. Here, the telecom companies may have a back-to-back arrangement with the copyright owners. The revenue received as a download of the copyrighted music or data is shared by the telecom company with the copyright owner.



This may give such transactions a color of royalty since the copyright is being commercially exploited by the telecom company.

#### 4. Cross border digital supplies - place of supply or place of provision of services:

Service tax, a central levy, applies to taxable territory i.e. whole of India except Jammu and Kashmir. Place of provision of service Rules were framed in 2012 to determine if the services are provided in India or outside India. As per the said Rules, place of provision of service is generally the location of service recipient. It lays down the criteria for determining place of provision of service for performance based services, immovable property related services, event related services, database access services etc., This is viewed as a pre-cursor towards introduction of Place of supply Rules under GST in India. In the case of cross border digital supplies, it would be difficult for the authorities to monitor imports for levying service tax. Where multiple end-users are availing the services and if no charges are levied for the services or lesser amount is charged due to relationship between parties, the value of services could require adjustment to reflect the actual cost of services for levying service tax. Where there is both supply of services and receipt of services, netting off of amount could result in lesser payment of service tax. These challenges could be addressed by the Government by bringing in changes in the valuation provisions under Service tax.

5. **Software – royalty or business income:** The above discussion for digitized goods remains true even in case of software. However, although internationally it is accepted that the characterization for the download of software is not in the nature of royalty, India has had considerable litigation in this area with various courts giving opposing views – while some consider software as ‘copyrighted article/shrink-wrapped software’ and hence giving rise to business income, some others consider use of software as ‘use of copyright’ and hence giving rise to royalty income.

#### 6. Download of software and mobile applications

– **goods or services or both:** There is overlap of powers between the Centre and State to levy tax on deemed sale transactions. One of such cases is software. Software is either specifically included in VAT schedule or the software licenses are taxed as transfer of right to use goods. The development of

software and the provision of right to use software are covered under Service tax as well. This leads to double taxation of software i.e. VAT is levied at 5.5% (rate varies from State to State) and Service tax at 12.36%.

The issue, whether supply of software amounts to sale of goods or provision of service, has been deliberated by different High Courts, and there are divergent views on the issue. While sale of software has been considered as sale of goods in some cases, the same has been considered as provision of service in other cases. The anomaly continues with mobile applications which are gaining prominence in the digital world. While development of application would be subject to service tax, the possibility of demand of VAT on the same treating it as a deemed sale transaction cannot be eliminated.

#### 7. Advertisement collection on Google, Facebook, Twitter, etc. – business income or royalty:

Social media channels facilitate the easy exchange of information, reviews, listings, etc. on various goods and services. The traditional word-of-mouth publicity is now replaced by the social media ‘likes’ and ‘followers’. Advertising revenues on social media websites have rocketed on account of the pervasiveness of social media. The advertising revenue is based on the number of clicks, the extent of highlighting and so on.

The contention in case of advertising on social media is whether the revenues in such a case can be considered as being in the nature of royalty.

However, there is general consensus both as per India’s HPC report as well as OECD that since these revenues are intrinsically linked with the business of the website owner, and in many revenue models it forms the only or the major source of income, the same should be considered as a business income rather than royalty.

#### Transfer pricing issues

##### 1. Identification of intangible assets and key value drivers

Intangible assets play a key role in any business and digital business is no exception. Unlike in a brick and mortar business, in transactions in digital economy identifying the intangible assets and mapping the

contribution of such assets pose a challenge. The intangible asset employed depends upon the business model followed by the enterprise. Primarily, there are three types of intangible assets employed in a digital business: (i) software, (ii) marketing intangibles and (iii) operation of website. Intangibles like software, trademark, web design and other marketing intangibles are relevant to the success of digital business.

Software includes all the software programs required to operate the computer autonomously, linking the computer via communication lines with computers in other locations including warehouse, linking the computer, again via communication lines, into the internet to enable a person access the website, and software to perform the operation of processing transactions with customers including obtaining authorization from banks/financial institutions for payment to be made. The software used in digital business is generally not limited to the commercial software widely available in the market but are custom software created for undertaking all operations on the website, from displaying of goods, to processing of the order and, authorization of payments, to notifying the warehouse or supplier for delivery of the goods.

The most obvious marketing intangible is the brand name or the trade name. The brand name attracts potential customers to the website, resulting in a commercial transaction. An example of the brand name attracting customers is "Amazon". The brand name is created through a combination of factors including advertisement, deals offered, delivery of goods on or before the time promised, and an array of goods available. Another marketing intangible would include supplier contracts. Example, an effective tie up by Motorola with Flipkart for sale of Motorola phone through Flipkart. Similarly, launching of books or marketing books available with specific e-commerce service providers.

The operation of website also plays a key role in a digital business. The manner in which the website is laid out, the ease or fun with which the website can be used, the information available, product review and interview of celebrities/musical groups/musicians, managing purchase of products and, quick and efficient processing of customer orders are key attributes of a successful digital business website.

Functional analysis (functions performed, risk assumed and assets employed) is the backbone for determination of the arm's length price of a related party transaction. The conduct of the related parties and contractual arrangement between them determine the functional analysis.

The related party in a country may act as distributor or a service provider. As a distributor, the related party's functions include decision making regarding ordering of inventory and the level of inventory to be held, negotiating the terms with suppliers, product pricing, local marketing and promotion, concluding contracts with customers, managing logistics including delivery of goods to the customers, and other functions like complying with local regulations, accounting and reporting. Risks of distributors would include credit risk, market risk, and foreign exchange risk while the technology risk is borne by the principle.

A related party as a service provider performs limited functions that include providing market information like customer profile, behavior and preference, information about competitors, and supplier information. The related party service provider may, to a limited extent assist the principle in advertisement of the product in the local market. The risk assumed by the service provider is also limited and typical operates in a cost plus mode.

The functional analysis will result in determination of the nature of the related party and consequently the arm's length return for the functions (including the risk assumed and the assets employed). The functional analysis may reveal that the related party operating as a distributor is akin to a retailer who buys from the supplier and sells goods to the ultimate consumer. Similarly, the functional analysis may reveal that the related party service provider is a low risk contract services provider, providing services for and on behalf of another related party.

## 2. Determining the arm's length price

The fundamental underlying any remuneration model is that returns should be proportional to the functions performed, risks assumed and the assets employed and, should be akin to the remuneration expected to be received by entity acting at arm's length under similar conditions.



In a distribution model, the principle retains significant rights associated with the software. Therefore, in computing the profit attributable to the distributor, the return attributable to the use of the software needs to be considered. The arm's length price for the use of the software may represent the price that a third party would have agreed to pay for the use of the software. Typically, a third party would have paid a specific percentage of the revenue generated as a software license fee. Databases providing licensing agreement could be used for identifying third party license agreements.

For the use of marketing intangible, the distributor may agree to pay like an independent enterprise for utilizing the marketing intangible or for benefiting from the other enterprise expertise. The payment could be in the form of separate royalty or could be embodied in the product pricing for goods purchased from the related party. However, tax authorities may challenge the separate payment by the distributor for the use of marketing intangible, taking a view that the distributor also contributes to the marketing intangible and is also entitled to remuneration. There may be a trend to adopt the profit split method for arriving at the arm's length price.

In case of websites, the value is created by the enterprise that has invested in developing the website

and is engaged in updating and maintaining it. Therefore, the distributor may be required to pay some kind of consideration to the owner of the website. The use of hardware also needs to be factored in. The principle owns and maintains the hardware, therefore, would be entitled to a return for the use of the hardware.

Under the service provider model, the principle performs most of the functions, assumes most of the risks and employs significant assets. The service provider may only be entitled to a return on its costs for providing the services. In case the activities of the service provider create any marketing intangible, it may be entitled to remuneration commensurate to such activities.

### 3. Maintaining documentation for transfer pricing audits

Maintaining documentation is not only required to comply with the requirements of transfer pricing regulations but is also important during transfer pricing audits. The agreement between the parties is the starting point for the field officer to understand the functions performed, risk assumed and the assets employed by the parties. A well laid out agreement, documenting the functions, risks and assets employed will resolve the issues significantly. The conduct of the parties should be in line with the agreement. To demonstrate this, the parties should maintain adequate

documents like email correspondences, minutes of meetings both internal and external and, tour diaries. Documenting the people functions would also enable the parties to demonstrate the conduct of the parties. Any negotiations with third parties by the enterprises or a third party arrangement should form part of the documentation. Similarly, any advance pricing agreement entered into by one of the parties could be part of the documentation.

### Possible Tax Challenges in Future

**Cloud computing:** There are generally three categories of cloud computing services - (1) infrastructure as service (2) software as service and (3) platform as service.

Infrastructure as service offers virtual machines and other resources such as virtual local area networks (VLANs), and software bundles. To deploy their applications, cloud users install operating-system images and their application software on the cloud infrastructure.

Software as a service is a licensing and delivery model in which software is licensed on a subscription basis and is centrally hosted.

Under platform as a service, computing platform is provided to the client who can create application or service using tools/libraries of the provider. The service provider provides networks, servers, storage and other services required to host the client application. Some examples of the same are search engines, social networking sites, storage space, etc. which are provided over the internet instead of providing the same locally. Cloud computing service is generally remunerated on pay-per-use or subscription basis. Various tax implications could arise in case of cloud computing scenarios:

- The use of server by a client could result in creation of PE for the client depending on the nature of control over the server granted to the client and criticality of functions performed by the server.
- Payments made for space on server could lead to income characterization issues – royalty for use of space on the server or business income since it is only rental fee.
- Service tax is applicable on all the models. However, the possibility of demand of VAT on the transaction cannot be eliminated as both hardware (right to use) and software are involved in the models.

- As the customers using the servers and other hardware are located in different jurisdiction vis-à-vis the location of the servers and other hardware and the provider of such facilities, there would be challenges in applying the place of provision of service rules. It could lead to demands of service tax by different jurisdictions.

**3D Printing:** 3D printing refers to the process of producing a three-dimensional object. In 3D printing, additive processes are used in which successive layers of material are laid down under computer control to derive the 3D object. The future could see manufacturers only developing the blueprint or design for a particular product and selling the same to customers. The customers could then use the blueprint or design to produce the product themselves.

Such a case could give rise to various tax questions such as – how should the manufacturer be taxed in the source country where the customer uses the resources and the 3D printer to manufacture the product, whether the payment made to the manufacturer can be attributed to sale of goods or royalty for use of the blueprint or design.

Further, in the case of indirect taxes, currently excise duty is paid by the manufacturer upon clearance of goods and VAT is paid upon sale of goods. The manufacturers and traders are monitored by the tax authorities through the Excise and VAT returns filed. In the case of 3D printing, it would be difficult for the tax authorities to identify the manufacturer or the goods produced/cleared by them. It is due to factors such as non-registration, self-consumption of goods, barter etc., if Government tries to bring in additive manufacturers also into tax net, the same would mandate registration and regular return filing resulting in compliance cost.

**Autonomous vehicles/Machine-to-machine:** Some of the new technologies that are being developed can have interesting characterization and nexus based implications. Autonomous vehicles refer to technology that can range from completely autonomous vehicles which have no human intervention at all to vehicles which are semi-autonomous with some human intervention required. Also, another far reaching technological concept is that of machine to machine. Machine-to-machine is an integral part of Internet of Things and refers to a scenario where machines

are capable of communicating with each other. This would replace a scenario where a network of machines communicates with a central hub which processes the information and then relays the result to a personal computer. M2M would provide a seamless flow of information between a machine which measures certain data, transfers it to software for analysis which again communicates the result with an application which would perform the required action.

Tax challenges in this area could include allocation of tax base amongst multiple machines located in different countries, whether payment for software embedded in autonomous vehicles / machines is royalty or payment for equipment as a whole (and hence business income), whether payment for services provided by machines is FTS (since customized) or regular business income.

### Regulatory Framework

The existing challenges in regulations on digital/e-commerce in India are as under:

1. Foreign Direct Investment (FDI): As per extant FDI policy, FDI, up to 100%, under the automatic route is permitted in B2B "e-commerce activities" and not in B2C i.e. sale to end retails consumer is prohibited.
2. Information Technology Act, 2000 (IT Act) provides legal recognition for transactions carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as "electronic commerce", which involve the use of alternatives to paper-based methods of communication and storage of information, to facilitate electronic filing of documents with the Government agencies. The entities carrying Digital/E-commerce purchase and sale transactions would require strict adherence to IT Act and compliance thereunder as prescribed for digital storage, use, cyber protocols and dissemination of information.
3. The legal requirements for undertaking Digital economy business in India also would involve strict adherence to other laws like Contract Law, Labor laws, Payment laws, etc. Further, online transaction also involves compliance with the banking and financial norms as applicable in India and Foreign Exchange Management Act, 1999 and rules and regulations thereunder for export and import and current account transaction which provides for remittance of assets, manner of receipt and payment, timelines to adhere to receive/make payment etc.

### Conclusion

Digital economy presents unique challenges which require the tax laws as well as the tax administration to be more up to date with the technological advances in the space and to ensure that the digital economy is liable to pay appropriate taxes.

It is necessary in this context to have overall taxation principles for the digital economy which would form the cornerstones of any tax reform. The tax principles which were presented in the 1998 Ottawa Ministerial Conference on Electronic Commerce and which have thereafter been accepted in OECD's 2014 deliverable on 'BEPS Action 1: Address the tax challenges of the digital economy' are:

- Neutrality: Uniform taxation between forms of electronic commerce and between conventional and electronic forms of commerce;
- Efficiency: Minimum compliance costs for taxpayers and administrative costs for the tax authorities;
- Certainty and Simplicity: Clear and simple tax rules to enable predictability of tax consequences of a transaction;
- Effectiveness and Fairness: Right amount of tax at the right time.

The OECD's BEPS Action 1 discusses the following possible solutions for addressing taxation challenges posed by a digital economy:

- Replacing the PE concept with significant presence concept which sale of goods/services through close customer relationship or based on content gathered from persons in the country, etc.
- Progressive tax on the bandwidth usage of websites ('Bit tax') which is creditable against corporate income tax to maintain neutrality with traditional business.
- Modification/elimination of PE exceptions to ensure that taxation is not escaped by artificial splitting of functions of a business.
- Withholding tax by financial institutions while making payments for digital goods/services.

From an Indian perspective, the 2001 report by the HPC concludes that there must be neutrality between the transactions in the traditional economy and the digital economy. It further suggests that the existing concept of PE must be abandoned or suitably modified to bridge the existing gap in the treatment of traditional and digital transactions. Alternatively, it suggests

that a final, lower withholding tax be applied on all foreign payments. The views of the HPC differ in many cases with those of OECD's TAG committee on characterization of income while agree in some cases.

Although the above HPC report discusses various tax challenges at length, there have been significant developments in technology since 2001 when the report was issued. Also, there has been a lot of work done by OECD in terms of BEPS in a digital economy and India, being a part of the G20 countries, has been actively involved in these efforts. In the 'UN questionnaire to countries' experiences regarding BEPS issues'<sup>88</sup>, India has voiced its concerns regarding non-taxation of income of multinational digital companies sourced from India on account of inadequacy of the current international tax regime and emphasizes the need for strengthening source-based taxation by various means such as withholding tax on digital transaction payments.

In case of indirect taxes, OECD's BEPS Action 1 addresses challenges in collection of VAT / GST created by cross-border supply of goods and services in the digital economy. The most challenging supply types identified are: (1) Import of low value goods through online sales on which VAT/GST is not levied (2) Growth of cross-border digital supplies made to end customers, where it is difficult for countries to collect VAT/GST on supplies made by non-residents.

The borderless nature of the digital economy produces specific administrative issues around the identification of business, determination of activities performed etc., several options are considered for addressing these challenges raised by the digital economy. The options include lowering the threshold for low value imports and requiring vendors to register and account for VAT in the country of importation.

The draft also refers to non-resident suppliers of digital B2C supplies to register and account for VAT in the customer jurisdiction as implemented by the European Union in 2015.

In addition, the report addresses remote digital supplies made to exempt multi-location business with reference to prior OECD guidelines. These guidelines seek to address these issues by allocating tax to the country where the services are used for business purposes, irrespective of how the supply and acquisition of these services was constructed.

The Indian Government has proposed to introduce Goods and Service Tax ('GST') by April 2016. It is a destination based consumption tax. Under GST, there is shift of focus from manufacture/provision of service/ sale to supply. Hence, GST should eliminate the anomaly of double taxation on software licenses, right to use goods etc. However, it is not conclusive if there would be separate rate for services. If there are different rates for goods and services, the problem of double taxation could continue even under GST. Also, GST being consumption based tax; the issues faced by e-commerce companies in inter-State movement of goods should be curtailed.

All-in-all the digital economy presents significant tax challenges that require changes in the tax policies as well as tax administration processes. The companies operating in this digital economy have to gear up for the challenges by taking well informed decisions and also ensuring that there is substance in the structures created from the tax perspective for catering to the ever increasing demands in the market place.



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