21. Digital India: How to Make India a Truly Connected Nation

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INTRODUCTION

The 'Digital India' initiative was launched by Hon'ble Prime Minister, Shri Narendra Modi in 2015 and after a lapse of 4-5 years, there have been significant improvements in all of its facets such as, in the creation of digital infrastructure, electronic delivery of public services, financial inclusion and in enhancing digital awareness and literacy.

Further, 5G and new technologies and applications such as AI, AR/VR, IoT/M2M, Cloud computing, big data analytics, machine learning etc can unleash new economic opportunities and societal benefits giving it the potential for being a transformational force for Indian society. It can help the country leapfrog the traditional barriers to development as well as advance the 'Digital India' vision. The cumulative economic impact of 5G on India can reach one trillion USD by 2035.

Mobile has already played a central role in realizing the ambitions of the Digital India initiative, and will also be central to realizing the NDCP-2018 goals to 'Connect India', 'Propel India' and 'Secure India'. The key strategic objectives of NDCP 2018 planned to be achieved by 2022 are:

- Broadband for all
- Creating 4 Mn additional jobs in the digital communication sector
- Enhancing the contribution of the digital communications sector to 8% of India's GDP from ~6% in 2017
- Propelling India to the top 50 nations in the ICT Development Index of ITU from 134 in 2017
- Enhancing India's contribution to global value chains
- Ensuring digital sovereignty

However, a number of challenges need to be addressed if India is to achieve the NDCP-2018 objectives and see the significant investments from telecom sector. The following figure depicts telecom evolution in India over the years:
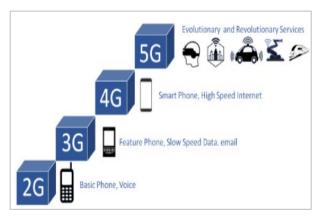

Figure 21-1 Telecom evolution in India

At present, India has around 1.2 Bn mobile and 655 Mn internet subscribers, making it the 2nd largest digital communications market in the world as of Oct'2019. India has witnessed a major technology transformation in the last 4-5 years and has emerged as the 2nd fastest digital adopter among 17 major digital economies. The Indian telecom sector continues to grow rapidly and as per the National Digital Communications Policy-2018, digital communications sector is expected to contribute 8% to GDP by 2022 as compared to 6% to GDP in 2017. As per GSMA Intelligence report, India will top seven countries who will account for half of new subscribers to 2025.

Smartphone users in India use their smartphones frequently to access and consume a range of digital services and content. In a number of areas, Indian smartphone users score well above the global average. While the number of users is significantly lower, there is a clear appetite in India to access government services through apps and online. In the area of digital commerce, India is broadly in line with global averages but lags significantly behind leading markets such as China. The rapid adoption of smartphones means that by 2025 it will be the 2nd largest smartphone market, with almost 1 Bn devices.

The rapid and unprecedented proliferation of the mobile phone, the internet, social media platforms, and the rapid expansion of digital payments, data consumption and generation across India indicate that the data economy and digital technologies and services are no longer the prerogative of the privileged few; but empowering more than a billion Indians.

This rapid growth has been propelled by both public and private sector alike. India's lower-income states are bridging the digital divide, and the country has the potential to be a truly connected nation in next 4-5 years i.e. by 2025. All Indian stakeholders will need to gear up to the opportunities and challenges of being a connected nation.

Higher speed networks and the growing base of smartphones have fueled rapid growth in data volumes in the Indian market; the increased viewing of video content is an important factor in India, as in many other markets. The TRAI has highlighted that mobile data usage per month in India increased from 39 petabytes in June-2016 to 4,178 petabytes in September-2018. Ericsson estimates that in 2018 India generated more traffic than the whole of Western Europe, with total data volumes set to increase 4x by 2024.

	% of global new additions
India	24%
China	8%
Pakistan	4%
Nigeria	4%
Indonesia	3%
US	3%
Brazil	3%

Source: GSMA Intelligence

Figure 21-2 New Users

2025 rank	Country	Smartphone connections, 2025 (m)	Change in rank since 2018
1	China	1,458	=
2	India	983	=
3	Indonesia	410	↑1
4	US	346	↓1
5	Brazil	204	=
6	Russia	190	=
7	Japan	176	=
8	Pakistan	146	↑4
9	Nigeria	143	↑11
10	Bangladesh	133	↑11

Figure 21-3 Global Smartphone Users

Public sector is one strong catalyst for India's rapid digitization. Aadhaar has become the largest single digital ID programme in the world—and a powerful catalyst of digital adoption more broadly in India. Today, more than 1.2 Bn Indians have Aadhaar digital identification, up from 510 Mn in 2013.
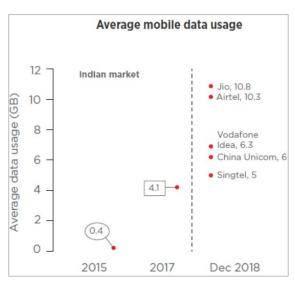
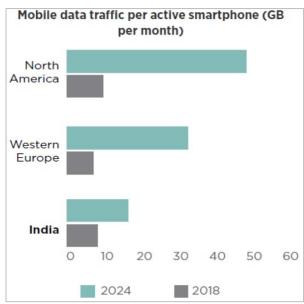*Figure 21-4 Average Mobile Data Usage*
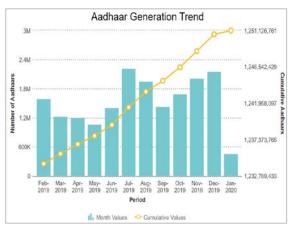

Figure 21-5 Mobile traffic per user
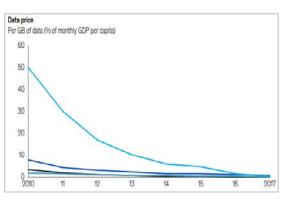

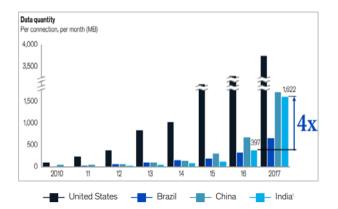*Figure 21-6 Aadhaar Generation Trends*

Figure 21-7 Data Price

Figure 21-8 Data quantity per connection

Also, the Goods & Service Tax Network (GST), commenced from 2017 bringing all business transactions involving around 10.3 Mn indirect taxpaying businesses onto one digital platform, created incentive for businesses to digitize their operations.

Coming to the Private-sector, innovations has helped digital services to reach millions of consumers. Competition in mobile services has triggered further innovation and competitive pricing across the sector. Data costs have dropped by more than 95% since 2013: the cost of one gigabyte fell from 9.8% of per capita monthly GDP in 2013 to 0.37% in 2017. As a result, monthly mobile data consumption per user has grown up to 152% annually, more than 2x the rates in US and China.

With both public and private sector contribution to the digital usage, India's States have also started to bridge the digital divide. Low-income States have shown the fastest growth in digital infrastructure and services. Citizens in such States can now read the news online, order food delivery via a phone app, video chat with a friend, shop at a virtual retailer, send money to a family member through their phone, or watch a movie streamed to a handheld device.

Even after these digital advances, these States have a lot of further scope to grow in digital terms as only around 40% of the population has the broadband connection as of now. Despite the growth of m-banking and financial inclusion, majority of retail transactions are still in the form of cash as many businesses are still reluctant to adopt the digital payments in all their transactions.

DIGITIZATION OF BUSINESSES

India's businesses have a relatively uneven pattern of digitization, as compared to the adoption by consumers. As per the Survey from McKinsey Global Institute, Differences in digital adoption within sectors are greater than those across sectors.

As per the survey, sectors like transportation and construction are considered resistant to technology and sectors such as ICT, education, healthcare, financial services, manufacturing have more digitized firms on average.

Leading digital companies in India adopt strategies that make them stand out from their peers in several ways. They centre their strategies on digital, let digital technologies shape how they engage with customers, and invest more heavily in digital than their peers. Digital leaders also make digital investment a priority.

Small businesses are closing the digital gap with larger firms and are ahead of them in accepting digital payments. While the large companies having high investment capabilities, invest in new technologies such as Artificial Intelligence (AI) and Internet of Things (IoT), growing high-speed internet connectivity and shrinking data costs are opening digital opportunities for many small-business owners and sole proprietors. Infact the small companies/ businesses are ahead of large companies in accepting digital payments.

CHALLENGES FOR DIGITAL INDIA

The Digital India programme, launched in 2015, has made significant progress in implementation of the various initiatives. However, some challenges are being faced during the execution which need to be addressed on priority.

The challenge for Digital India is to provide last mile connectivity to India's smallest towns and villages. Digitizing these inhabitations require massive investments in digital infrastructure. While the government has a role in making investments, bulk of this investment and innovation must come from private sector may be in the form of Public-Private partnerships.

Success of Digital India further depends on the innovative policy and enabling framework that government creates. It is equally important that apart from being an investor, the government must also act as an innovation and investment enabler and plays that role well.

Inadequate Digital Infrastructure: The biggest challenge faced by Digital India programme is slow and delayed digital infrastructure development. India's digital infrastructure is inadequate to tackle growing increase in digital transactions.

Regulatory Uncertainty: The private participation in government projects in India is poor because of long and complex regulatory processes and commercial unviability. Various proposals issued by the Govt. are not picked up by competent pvt. Sector as they are commercially unviable. Some of such projects include providing mobile/telecom connectivity to uncovered villages in LWE, remote areas, Andaman & Nicobar Island etc

Central-State Coordination: There is still a large gap in alignment between Central and State Government in various policy initiatives such as the taxation, Right of Way, restrictions of placement of infrastructure, mandatory provision for availability of Government land and building for installation of telecom infrastructure etc

Rural Investment: There is a wide digital divide between urban and rural India. Till now funds have not been deployed effectively to meet the cost of infrastructure creation in rural areas. There is no incentive for operators to invest in rural and remote areas where the scope of returns is very less.

Unclear Policy Framework: Taxation and regulatory policies have proved to be a major bottleneck, such as M&A and FDI policy in telecom sector. There is no Single Window Clearance process for faster timebound approvals. At present, M&A applications take around 2-3 years for approval by the nodal department due to lack in inter-departmental coordination. Further, there is no clarity on the process and timeframe for processing the applications.

Digitization of Services and Digital Literacy: While the digital services and content are becoming available in local languages, there is still a lot of content and government services which do not support local languages.

Awareness & Education: Creating an awareness about benefits of Digital India scheme among common masses is also a great challenge. There is a need for upskilling/reskilling of existing resources to be able to meet requirement for rollout and operations of 5G and various upcoming technologies.

Breach of Privacy: Fear of cybercrime and breach of privacy has been deterrent in adoption of digital technologies. Most of the technology including cyber security tools are imported. We do not have requisite skills to inspect these for hidden malwares.

ROBUST DIGITAL INFRASTRUCTURE - KEY TO ACHIEVING "DIGITAL INDIA"

Indian Telecommunication Sector has been at the core of social and economic development of this country and telecom infrastructure sector has been the bedrock for a Digital Economy. Telecommunication and Telecommunication Infrastructure is the backbone of 'Digital India', where future technologies like mobility, analytics, cloud, Internet of Things (IoT), Machine to Machine (M2M) Communications are playing a key role in implementing the Digital India vision.

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

A robust telecom infrastructure will play a key role in seamless connectivity, which is the essence of true "Digitization." It is imperative to develop 'state of the art' network architecture just like other infrastructure facilities such as water, sewage, railway, roads and transportation etc. as telecommunication services nowadays have become an integral and essential necessity of our daily lives.

The overall development of telecommunication services in the past few decades has been phenomenal with the help telecom infrastructure supporting these services at the backend. With the government's thrust on Digital India and Smart Cities, it is needless to say that industry will unfold more new business avenues in the forthcoming time.

Creation of a robust telecom infrastructure will help the country to leap-frog in a knowledge driven economy by enabling the requisite telecom infrastructure for future technologies like Artificial Intelligence, Block chain, IoT and M2M etc.

To boost the potential of the Digital India vision, a defined policy framework for digital infrastructure was required. With this vision, the NDCP-2018 was hence formulated and gazette notified by the Department of Telecommunications, Government of India in Oct'2018.

Initiative	Description
Bharatnet	Broadband Access to 2,50,000 Gram Panchayats (GPs) through a network of Optical Fibre Cable
Smart Cities	Creation of 109 Smart Cities by 2022 Rs 5Bn allocated to every city over 5 years for this project
Common Service Centres (CSC)	CSCs through which e-governance and related services will be made available to villages
Post Office Digitization	Digitization including setting up centralized data centres, networking of all post offices & enabling digital payments
Universal Access to Mobile	Mobile access to more than 55,600 villages that do not have mobile coverage
Public Wi-Fi	Creation of public Wi-Fi hotspots in India to enable citizens to access content without depending on mobile data
India Stack	It is a set of open APIs that enables development of payment-enabled applications, using Aadhaar as the base for authentication
National Cyber Coordination Centre (NCCC)	MeitY has planned to set up a center to safeguard India's cyberspace against potential threats

Figure 21-9 Initiatives taken

REFRESHED "DIGITAL INDIA"

The Prime Minister has recently set a new national goal of India becoming a 5 trillion-dollar economy by the year 2025, and there is little doubt that the refreshed 'Digital India' programme will play a critical role in realizing this audacious ambition. What is really exciting is that the realization that India's digital transformation saga has only just commenced. The creation of a nationwide digital infrastructure, allied with potential new technologies such as AI, Big Data, AR/VR, IoT/M2M are expected to raise sectors that affect the well-being of every Indian,

ranging from agriculture, health care, education, transportation, logistics, banking and finance etc. Indeed, there is practically no aspect of modern life that cannot be improved by the application of intelligent digitization. India is striving to become one of the early adopters of 5G technology, and it's rollout is expected to open multiple possibilities and opportunities.

NATIONAL DIGITAL COMMUNICATIONS POLICY, NDCP-2018, A STEP IN THE RIGHT DIRECTION

NDCP-2018 is a truly transformational and comprehensive policy document. It has embarked upon a journey to fulfil the information and communication needs of citizen. The policy has rightly envisaged the achievement of this objective through "Connect India, Propel India and Secure India" missions.

The key strategic objectives of NDCP 2018 planned to be achieved by 2022 are:

- Broadband for all
- Creating 4 Mn additional jobs in the digital communication sector
- Enhancing the contribution of the digital communications sector to 8% of India's GDP from ~6% in 2017
- Propelling India to the top 50 nations in the ICT Development Index of ITU from 134 in 2017
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The NDCP 2018 recognizes the importance and urgency of a strong infrastructure and has recommended to accord telecom infrastructure the status of critical and essential infrastructure. Keeping in view the growing importance of broadband in order to achieve the "Digital India" dream, the NDCP 2018 has set up ambitious goals under "Connect India" mission as:

- Broadband coverage at 50Mbps to every citizen
- 1Gbps connectivity to all Gram Panchayats by 2020 & 10Gbps by 2022
- 100 Mbps broadband on demand to all key development institutions
- Fixed line broadband access to 50% households
- Unique mobile subscriber density of 55 by 2022 and 65 by 2022
- 5 Mn wi-fi hotspots by 2020 and 10 Mn by 2022
- Connectivity to all uncovered areas

KEY RECOMMENDATIONS UNDER THE NDCP-2018

Enhancement of Scope of Telecom Infrastructure Providers: In the converged environment, there is need of independent infrastructure players which will ensure orderly and stable growth of infrastructure. Further, it will also bring in economy of scale and the cost effectiveness due to the sharing of infrastructure at the backend. Infrastructure Players must have an active role in the provisioning of common duct, in-building solutions, pubic Wi-Fi etc. Government has recognized the role of Infrastructure Providers in achieving the Digital India vision and hence, recommends in the NDCP-2018 for the enhancement of Scope of Infrastructure Providers (IP-1) to promote and incentivize deployment of common sharable digital infrastructure.

Fiberization: Tower fiberization will also play a key role for rollout of 5G and other emerging technology and services to achieve Digital India. As of now, 25-30% of towers are fiberized and this needs to be taken up to at least 70% of the towers considering growing demand of data and deployment of 5G, in line with the targets set up by NDCP-2018 up to year 2022. One of the Strategies identified in NDCP for implementing "Fibre First Initiative" under the NDCP is "Facilitating Fibre-to-the-tower programme to enable fiberization of at least 60% of telecom towers thereby accelerating migration to 4G/5G". NDCP has set the stage for achieving full digital inclusion by declaring fiber as a critical public utility.
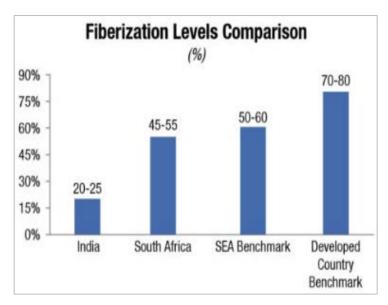
Figure 21-10 Fiberization Levels Comparison

NATIONAL BROADBAND MISSION (NBM)

The recently launched National Broadband Mission (NBM) by Hon'ble Minister of Communications, Government of India on 17th December 2019, has the vision to fast track growth of digital communication infrastructure, bridge the digital divide, facilitate digital empowerment and inclusion and provide affordable and universal access of broadband for all by 2022.

It also includes taking OFC connectivity to 50 Lac Km from the current 22 Lac Km and deploying 10 lac mobile towers from the present 5.8 lac sites, with 70% fiberization in the next 3-4 years. It aims to connect 600,000 villages across India at an estimated outlay of INR 7 trillion including a 10% contribution from the state reserve (USOF) over a period of next 3-4 years.

Annual Implementation Plan of National Broadband Mission as prescribed by the Government is as follows:

Table 21-1Annual Implementation Plan of National Broadband Mission

	Years				
	1	**2**	**3**	**4**	**5**
Connectivity to villages (%)	50	60	100		
Broadband speeds (Mbps)	4	10	25	30	50
Fiberization (Lakh Kms)	24	27	30	40	50
Towers (in lakhs)	7	8	10	12	15
Tower Fiberization (%)	35	45	55	65	70
Mapping of Fiber (%)	10	40	60	80	100

Further, the NDCP-18 also envisages an investment of around USD100 Bn over the next 3-4 years in the telecom sector in order to achieve the objectives of the policy. It is estimated that most of the required investment is estimated to be done in creating the digital communications infrastructure as below:

Table 21-2 required investment is estimated to be done in creating the digital communications infrastructure

Infrastructure Component	Investment (U$ Bn)
Telecom Tower	35
OFC Cable	30
Spectrum, R&D etc.	35
Total	100

This envisaged investment of $100 Bn is to be catalyzed largely by the industry, with Government contributing around 10% of this through the Universal Service Obligation Fund (USOF).

COLLABORATIONS BETWEEN CENTRAL, STATE GOVERNMENTS & OTHER STAKEHOLDERS

NDCP-2018 recommends various other strategies which can be implemented only if all such key players come together to meet the objective. Areas where collaboration is required are as follows:

- Provision of common duct infrastructure in municipalities, rural areas and national highways.
- Amending National Building Code of India (NBC), for making telecom installations and the associated cabling and in-building solutions mandatory in all commercial, residential and office spaces.
- Collaborative institutional mechanism between Centre, States and Local Bodies for Common Rights of Way, standardization of fees, taxes, costs and timelines.
- Recognizing communication systems as essential critical infrastructure at par with other connectivity infrastructure like Roadways, Railways, Waterways, Airlines etc.
- Extending incentives and exemptions for the construction of telecom towers. Promoting and incentivizing deployment of solar and green energy.

SPECTRUM

Effective spectrum management is critical to support the investment required to further expand mobile services once 5G and other new technologies and bandwidth intensive applications such as AR/VR, Gaming comes into the market. Adequate spectrum at right prices is needed to meet the rapid increase in demand particularly for data services and enhance the quality and coverage.

5G needs spectrum within three key frequency ranges to deliver widespread coverage and support all use cases. The three ranges are: Sub-1 GHz, 1-6 GHz and above 6 GHz. The recently concluded World Radiocommunications Conference (WRC-2019) in November'2019 has identified additional spectrum suitable for 5G. These additional frequency bands identified for IMT-2020, includes 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz bands, which will be used to enhance mobile broadband, ultra-reliable and low-latency communications.

For India, these decisions are also consistent with the ambitious goals as pronounced under NDCP-2018 such as providing 1 Gbps connectivity to all gram panchayats of India by 2020 and 10 Gbps by 2022 and universal broadband connectivity at 50 Mbps to every citizen. The strategies to achieve these goals include:

- Making adequate spectrum available to be equipped for the new broadband era:
    - Identifying and making available new Spectrum bands for Access and Backhaul segments for timely deployment and growth of 5G networks.
    - Making available harmonized and contiguous spectrum required for deployment of next generation access technologies
- Promoting Next Generation Access Technologies in India through:
    - Recognizing mid-band spectrum, particularly the 3 GHz to 43GHz range, as central to India's strategy for Next-Generation Networks
- Enabling Hi-speed internet, Internet of Things and M2M by rollout of 5G technologies:
    - Ensuring availability of spectrum for 5G in <1 GHz, 1-6 GHz and >6 GHz bands

The recent announcement of the government to provide a two-year moratorium on the payment of spectrum dues is a positive step, but given the financial stress, issues surrounding the price of spectrum for forthcoming 4G & 5G spectrum auction needs to be resolved by Govt. on priority basis. The operators owe over Rs 3 lac crores in spectrum costs alone. High reserve prices for the impending auctions could raise these costs substantially.

Some of the other policy reforms towards transparent spectrum allocation, optimal pricing of spectrum, allocation of spectrum for microwave access and backbone, allocation of E&V bands and spectrum sharing and leasing regimes to optimize utilization would be critical.

NEW BUSINESS OPPORTUNITIES FOR DIGITAL INFRASTRUCTURE PROVIDERS IN INDIA

Indian Telecom Infrastructure industry has been one of the pioneers in Infrastructure Sharing Globally, resulted in significant operational efficiency and cost saving for industry. Over the years, pooling/sharing of towers and passive infrastructure – providing integrated Neutral Host platforms for service providers, has found success in the market. Currently, Indian tower companies (TowerCos) are amongst the largest telecom infrastructure companies across the globe. The transformation witnessed by the telecom industry is opening new business avenues for TowerCos.

The Tower Industry has witnessed promising growth with no. of towers increasing from ~2,50,000 (2008) to ~5,80,000 (2019). The tenancy ratio had jumped from 0.9 (FY08) to 2.13 (FY18). Sector's overall operating margin was in the range of 43-44% in the past 4-5 years majorly driven by rental and energy margins expansion.
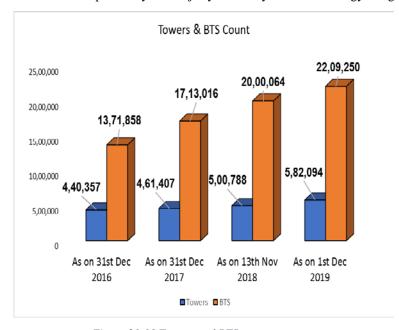

Figure 21-11 Towers and BTS count

Indian telecom market has shrunk from 10-12 player market to a mature 04 player market. Carrier neutral TowerCos business has limited prospects in a market with lower no. of players. Indian Telecom market is expected to witness 5x increase in mobile data traffic during 2018-24, which is giving rise to the demand for new infrastructure and services.

Impeding launch of new technologies such as 5G, AI, IoT/M2M has changed the infrastructure requirement for telcos. There is a need for denser network along with increase in fiber penetration. In the coming years, telecom infrastructure will not only have macro tower sites, but also small cells, fiber, wi-fi and in-building solutions (IBS). Bandwidth intensive applications such as IoT/M2M and VR/AR will demand network densification and deployment of small cells making the network more heterogeneous.

These small cells will also require fiberization of towers due to operational complexities of using microwave backhaul. The Infrastructure demands of the sector are evolving and TowerCos can leverage their expertise to explore adjacent opportunities that fit in their core competencies. Some of the opportunities are Fiber, Small Cells, Wi-Fi, Smart Cities, IoT and Data Centres.

Additionally, TowerCos can also explore other business opportunities from their existing assets, sites and extending their service expertise to other sectors. New Business Opportunities for IP-1 due to monetization of Adjacencies entailing **investment of around U$ 13,285 Mn by IP-1** during the year 2019-2023:

Fiber – Neutral Host/FTTx: Government Programs such as BharatNet and Smart Cities & new technologies such as 5G, AI, IoT are adding to the demand of fiber deployment and also necessitate 100% tower fiberization. An independent TowerCo will be more suitable for deployment in line with global developments.

Small Cells – Telecom networks are transforming towards densification to support the data surge demanding huge no. of indoor & outdoor Small Cells. IP-1 expertise in RoW and Sharing model makes them the best choice for Small Cell deployments.

Wi-Fi – Lack of monetization models hindering the growth of public Wi-Fi in India. Neutral host like IP-1 can provide shared infra supporting multiple operators, make biz model profitable for all stakeholders

IoT – TowerCo can venture into building IoT networks in unlicensed bands. Telco can lease coverage from TowerCos and use it along with their network to support range of IoT use cases.

Smart Cities – Smart City Mission launched in 2015 aims to build 100 Smart Cities which involves setting up of huge ICT infrastructure. TowerCos experience of priority RoW for installing Smart Poles & fiber needs to be leveraged.

Data Centre –The data centre market is poised to witness robust growth at CAGR of 8.4% over 2018-2023 due to exponential growth in data traffic. As data centre is capital intensive biz and depend on leasing capacity to enterprise, IP-1 may be allowed to set-up data centres as well.

Monetization of Existing Assets:

Co-location of Data Centre on tower site for edge computing – Low latency & high throughput applications such as AR/VR, robotics, remote surgery etc leading to requirement of edge computing which enables data processing/computing at distributed locations near the network edge rather than centralized hub at distant location. Tower sites are best suited for co-location of micro data centres.

Advertisement on site structure – The TowerCo site are well-suited to leverage their distributed locations at highways or densely populated areas to co-locate billboards for advertising.

EV Charging Points – In line with global interest, India is actively considering EV to reduce dependency on oil imports and reduce pollution. TowerCos are well-suited to provide EV charging infrastructure on their existing distributed site locations.

Field Maintenance (L1) –Outsourcing L1 support to TowerCos has several benefits to telcos like cost saving on repeated site visits, management of various network elements.

Providing Space for Warehousing & Cold storage – TowerCos can leverage their existing land assets with reliable power supply, security and air-conditioning to provide space for warehouses and cold-storage.

Power-as-a-service – IP-1 have expertise in managing & optimizing costs in different topographies, climate and grid power availability scenarios. Therefore, IP-1 are in compelling position as energy/power management solution provider and providing power-as-a-service.

SUGGESTIONS AND WAY FORWARD

Digital India program will be successful if we are able to achieve the policy changes needed to make the infrastructure, applications and services to reach to all the population and sections of the society. Few of the suggestions to make Digital India a reality is:

- Centre-State Collaboration: Alignment of Telecom Infrastructure Policies of all States with the Indian Telegraph Right of Way (RoW) Rules 2016 notified by the Central Governments.
- Financial Incentive for Investments: Promoting and incentivizing further investment in Digital Infrastructure. Benefits of "Infrastructure Status" needs to be extended to Telecom Infrastructure sector to ensure various financing options for them.
- Rationalization of Taxes: Standardization of Fees, taxes and other levies across the States for creation of infrastructure.
- Enhanced Private Sector participation: Private sector should be encouraged for development of last mile infrastructure in rural and remote areas. To encourage private sector, there must be favorable taxation policies, Single window and timebound clearance of projects and other financial incentives.
- Spectrum availability: Adequate contiguous spectrum needs to be made available by the Government to the industry at reasonable prices in suitable frequency bands for rollout of 5G and new technologies.
- User-friendly Content: Digitization of government services to create content. This mission needs content and service partnerships with telecom companies and other firms.
- Public Awareness: Massive awareness programme to educate and inform the citizens, especially in rural and remote areas, about the benefits of internet services to increase the growth of internet usage.
- Data Protection: Ensuring the maximum connectivity with minimum cyber security risks. Adequate measures and policy interventions to ensure safety and security of online data of citizens.

CONCLUSION

India now represents the 2nd largest internet user base in the world. This provides a significant opportunity to transform the lives of the citizens through digital technologies.

The Digital India program is likely to further benefit the citizens over the next few years by generating employment opportunities, increasing speed and quality of service delivery and enhancing social and financial benefits. Businesses will benefit by realizing higher productivity, an improved ease of doing business and a boost in innovation and investments. The adoption of next generation technologies under Digital India such as 5G, AI, Big Data analytics, IoT and machine learnings will further boost productivity.

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