



Cellular Operators Association of India

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White Paper on Communication and Digital  
Technology – Realm of Possibilities in 2035

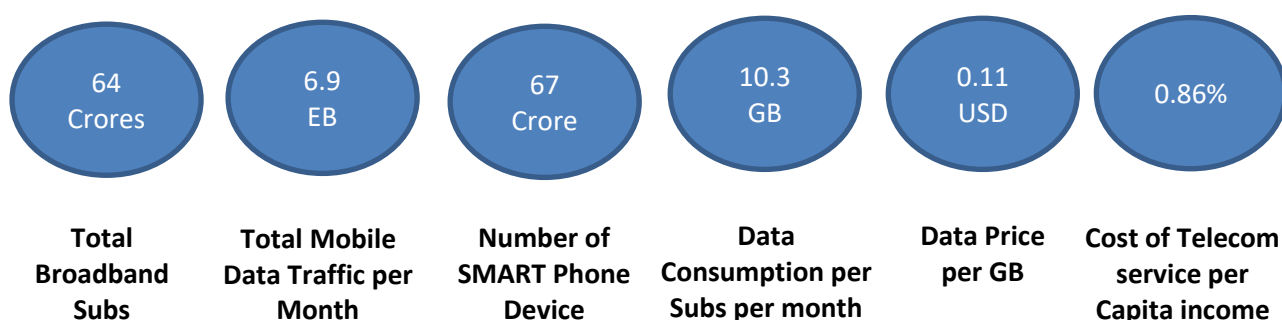
## CONTENTS

| SERIAL NO. | PARTICULARS   | PAGE NO. |
|------------|---|----------|
| A.         | Current landscape of Indian Communication & Digital Technologies                | 2        |
| B.         | India Digital/Telecom trends and Possibilities in 2035                          | 3-4      |
| C.         | Technology trends and Forecast till 2035  | 4-10     |
| D.         | Disruptive Technologies - Indian Trends   | 10-14    |
| E.         | Guiding Principles and Policy recommendations to fulfil the future requirements | 14-20    |
| F.         | Conclusion  | 21       |

## A. Current landscape of Indian Communication & Digital Technologies

The world is in cusp of the fourth industrial revolution driven by the convergence of physical and digital worlds. While India must cover significant ground when compared with the developed world, technology is now fundamentally changing the way its citizens live and work. India is now witnessing digitalization at a rapid pace.

**Fig 1: Current Digital Snapshot of India:**



- **Subscribers:** India has the second largest wireless (**116 Crores**) and Wireless Broadband subscription base (**64 Crores**)<sup>1</sup> in the world. (As of November 2019)
- **Data Usage:** An average of **10.3 GB**<sup>2</sup> of data is consumed per month per data subscriber, exceeding the average of many digitally advanced countries.
- **Total Mobile Data Traffic:** India has the second largest mobile data Traffic per month in the world i.e. **6.9 EB/Month**<sup>3</sup> (second only to China). Migration of data users from 3G to 4G, emergence of bundled packages of OTT content from operators, and falling data tariffs led to increase in 4G traffic
- **Mobile data Traffic by Content Category:** Video streaming continues to remain a major contributor to mobile data traffic constituting **70-80%**<sup>4</sup> of the total traffic
- **Data Price:** The data price in India, which stands at **0.11 USD per GB**, is the lowest in the world and far below the global average of **8.53 USD per GB**<sup>5</sup>.
- **ARPU:** The Average Revenue User for both Voice & Data is **Rs. 72**<sup>6</sup>, which is lowest in the World. ARPU is just **0.86%**<sup>7</sup> of the per Capita monthly income.
- **Smart Phone Devices:** The smart Phone devices in India is around **67 Crores**<sup>8</sup>.
- **M2M Connections:** Total M2M Connections in India is around **22.5 Crores**<sup>9</sup> in 2019.
- **Mobile Banking:** Mobile Banking Transactions were reported to be around **136.23 Crore in Nov 2019** with total value of **Rs. 4,71,295.6**<sup>10</sup> Crores in Nov 2019.

<sup>1</sup> TRAI Subscription Report

<sup>2</sup> TRAI PMR

<sup>3</sup> Ericsson Mobility Report

<sup>4</sup> Nokia Mbit Report

<sup>5</sup> Cable.co.uk

<sup>6</sup> TRAI PMR

<sup>7</sup> COAI Analysis

<sup>8</sup> Ericsson Mobility Report

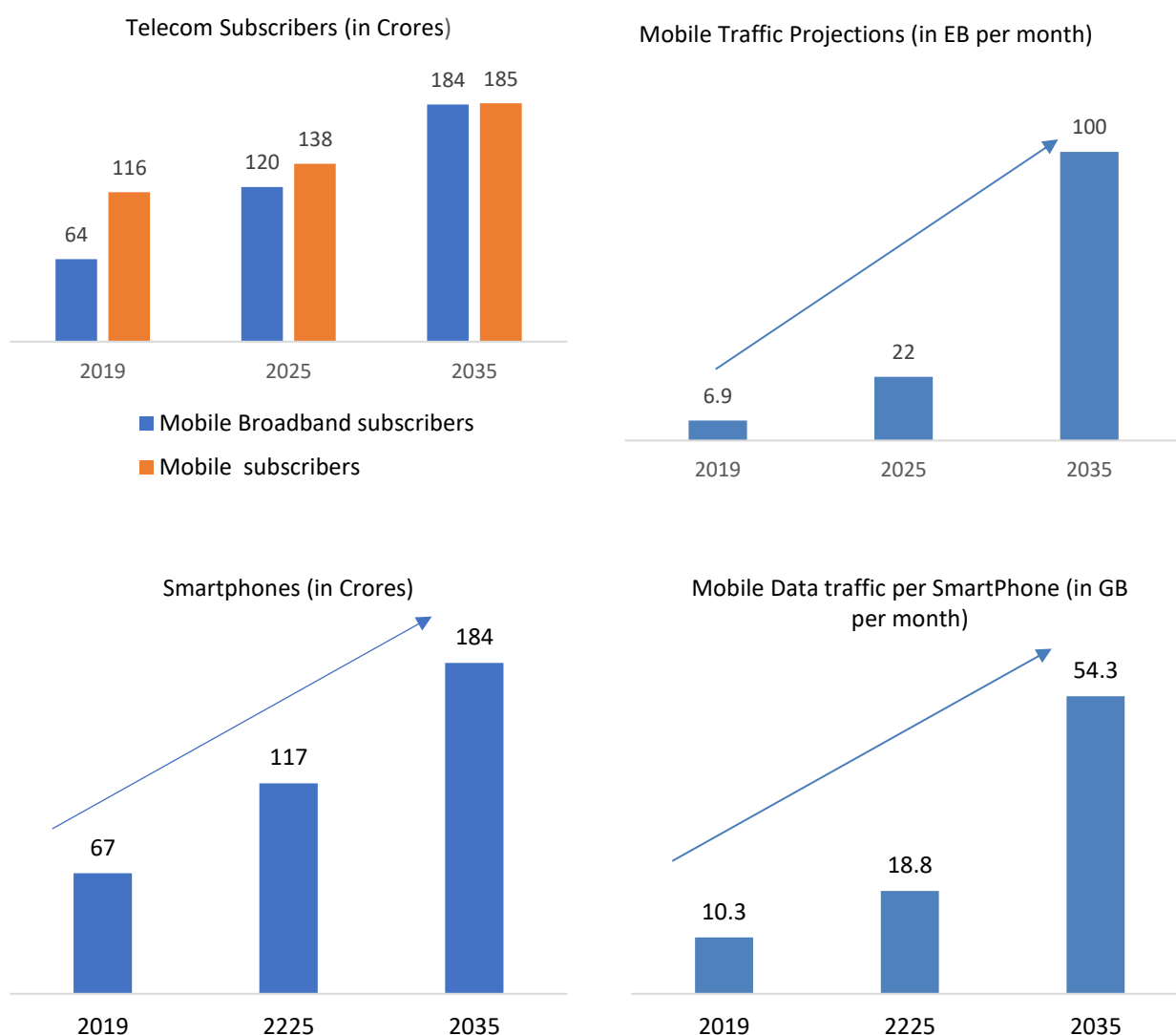
<sup>9</sup> Statistica

<sup>10</sup> Ceicdata.com

## B. India Digital/Telecom trends and Possibilities in 2035:

We are of the view that Driven by the growth in OTTs, data usage will continue to surge. It is expected that the mobile Data traffic in India will increase to **22 EB per month** by **2025**<sup>11</sup>, and will reach around **100 EB per month** **2035**<sup>12</sup>. Total number of the Mobile Broadband subscribers in India is estimated to grow to around **184 Crores** by **2035**<sup>13</sup>, with CAGR of around 7%. Also, it is estimated that Mobile Data Traffic per Smartphone device will reach **54.3 GB per month**<sup>14</sup> with CAGR of 11%.

**Fig 2: Indian Telecom :2035 Key Projections<sup>15</sup>**



<sup>11</sup> Ericsson Mobility report

<sup>12</sup> COAI Estimates

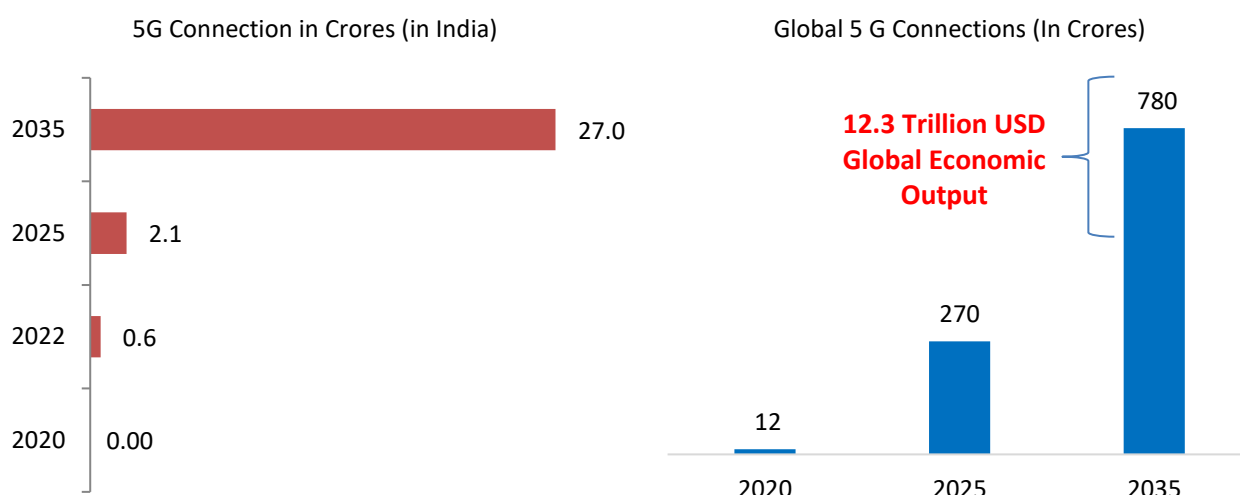
<sup>13</sup> COAI Estimates

<sup>14</sup> Ericsson Mobility report, COAI Estimates

<sup>15</sup> Ericsson Mobility report, COAI Estimates

To meet the growing data demand, roll-out of 5G will also accelerate. It is estimated that there will be around 780 Crore 5G<sup>16</sup> Subscriptions around the world by 2035. For India itself it is estimated that there will be around 27 Crore 5G Connections by 2035<sup>17</sup>. While, TSPs will need to invest in the network to meet the challenge of growing data traffic, the deployment of 5G and the advent of IoT and M2M will provide new revenue opportunities to the TSPs. IoT would play a vital role in development of the Smart Cities project initiated by the Government. It is estimated that 5G will enable around **\$ 12.3 Trillion**<sup>18</sup> Global economic output in 2035, in manufacturing, transport, mining, construction and utility.

**Fig 3: 5G Connections<sup>19</sup>**



Further, the effective deployment of 5G and the implementation of 5G use cases will require huge investment in spectrum acquisition and fiberisation. It is estimated that around **one lakh Crore investment** is required in next three years to meet the fiberisation requirement. To meet these targets of growth and fiberisation, the National Digital Communications Policy 2018 has envisaged attracting investments worth **US\$ 100 billion** in the telecommunications sector by 2022. Further, with 27 Crore 5G Connections by 2035, all the towers would be required to fiberized, hence requiring multi fold investments **NDCP** 2018 makes the right noises and we expect speedy implementation of some of the provisions of NDGP, especially those related to **reduction of levies and automation of processes such Right of Way (RoW) permissions to enhance ease of business.**

### C. Technology trends and Forecast till 2035:

In terms of technology, the sector is seeing a tectonic shift. The old 2G, 3G networks are being phased out in most of the countries. In India as well, telecom service providers are investing heavily in expanding their 4G footprint and more and more subscribers are opting for 4G. It is forecasted that LTE will represent 81 percent of all mobile subscriptions at the end of 2024. While NTT Docomo has been drawing up a strategy

<sup>16</sup> COAI estimates

<sup>17</sup> COAI estimates

<sup>18</sup> “The 5G economy: How 5G technology will contribute to the global economy” by IHS Economics / IHS Technology

<sup>19</sup> CCS insights, GSMA, COAI estimates

for commercial launch of 6G by 2030, in the near to medium term, there is no doubt that 5G will be the predominant technology by 2035.

### Unleashing the power of 5G:

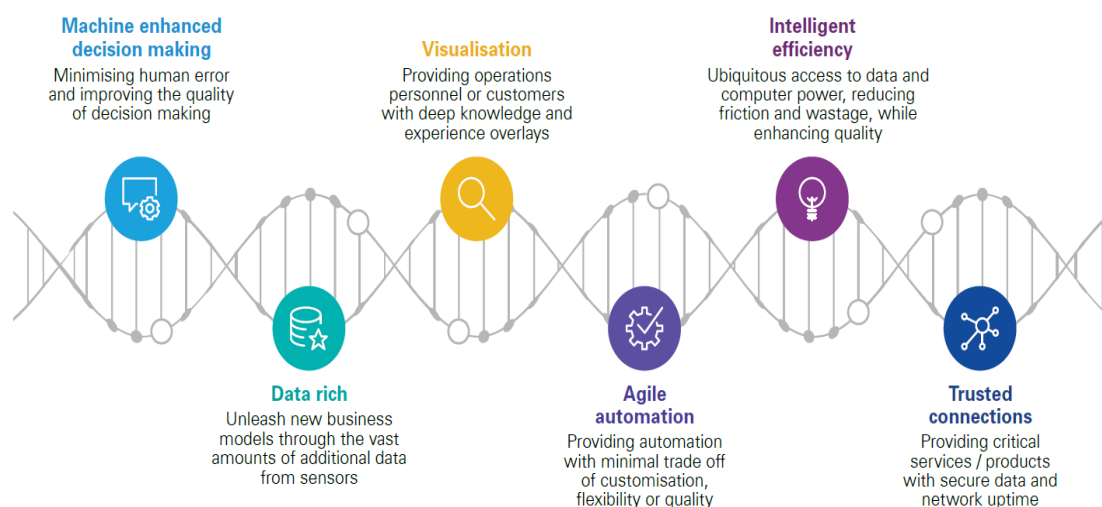
Telecom service providers along with the Equipment manufacturers across the globe are keen to invest in 5G and are moving together for early adoption of 5G technology. 5G will be available in India in 2022 and it is estimated that there will be around 27 Crore 5G Connections in India by 2035. In Global scenario it is estimated that the total contribution of 5G to the annual Global GDP will be around \$3 Trillion USD.

Unlike previous generations of mobile networks, 5G technology is expected to fundamentally transform the role that connectivity would play in society. 5G is also expected to further enable economic growth and pervasive digitalisation of a hyperconnected society, where people, devices, sensors and machines are ubiquitously connected to support a much larger range of applications and services. 5G will act as a catalyst in the way people and machines communicate with each other and amongst themselves.

Fig 4: 4G Vs. 5G<sup>20</sup>

| 5G Vs. 4G             |             |        |           |
|-----------------------|-------------|--------|-----------|
| Aspect                | Unit        | 4G     | 5G        |
| Latency               | ms          | 50     | 1         |
| Peak data rate        | Mbit/s      | 100    | 10,000    |
| Connection Density    | Devices/Km2 | 10,000 | 10,00,000 |
| Mobility              | km/h        | 350    | 500       |
| Area traffic capacity | Mbit/s/m2   | 0.1    | 10        |

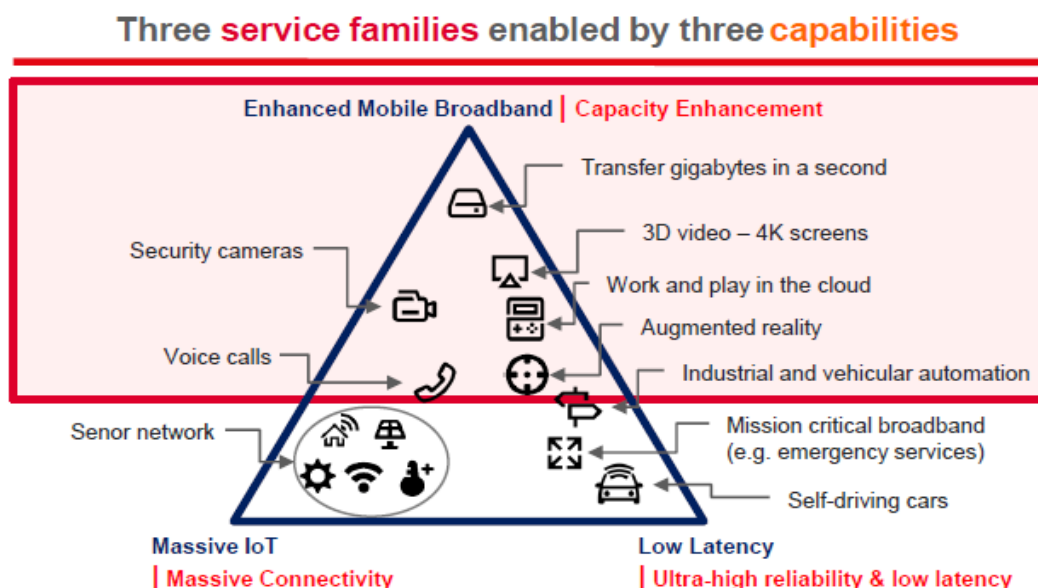
Fig 5: Benefits of 5G will accrue across the following value chain:<sup>21</sup>



<sup>20</sup> CLSA

<sup>21</sup> KPMG Report: Imagine a new Connected World

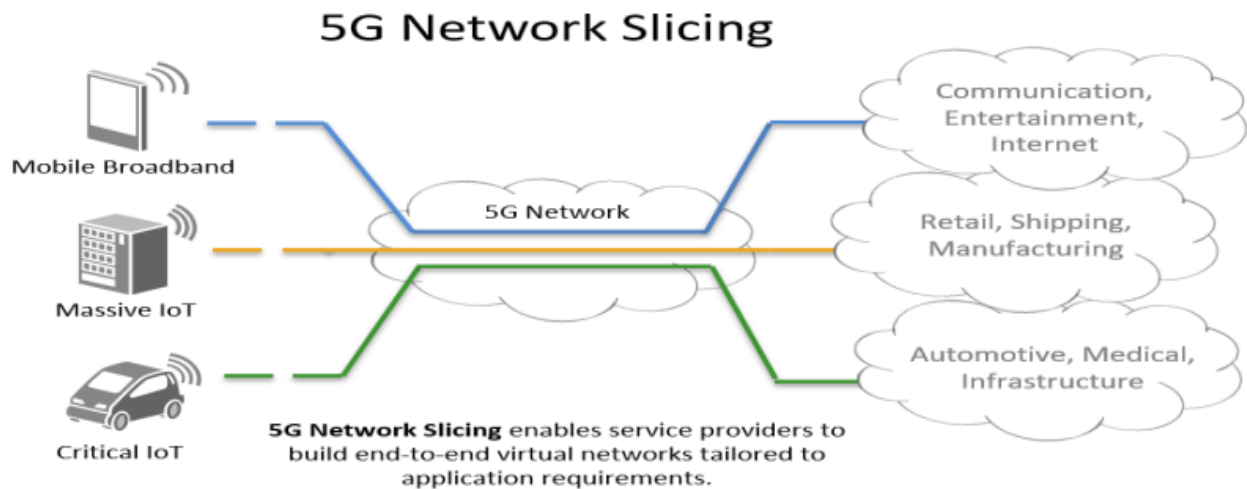
Fig 6: 5G Network is envisaged to accommodate Apps & Services with different Latency, Reliability & Bandwidth<sup>22</sup>



**Network Slicing:** Network slicing, which is fundamental to the 5G architecture, will enable the TSPs to build a single agile and flexible network that can cater to multiple use cases across different industries and different sets of customers. Network slicing, implemented through virtualization, will allow operator to provide different services with different performance characteristics to address specific use cases. Each network slice operates as independent, virtualized version of the network. For an application, the network slice is the only network it sees. Advantage of this architecture is that the operator can create slices that are fine-tuned for specific use cases. One slice could target autonomous vehicles, another enhanced mobile broadband, another low-throughput IoT sensors, and so on. Different slices will have different QoS requirements, inherently invoking traffic management within each slice. Accordingly, changes will be required in the current Net Neutrality norms in India to facilitate this most important concept of 5G.

<sup>22</sup> GSMA, ITU-R WP5D/TEMP/548-E: IMT Vision

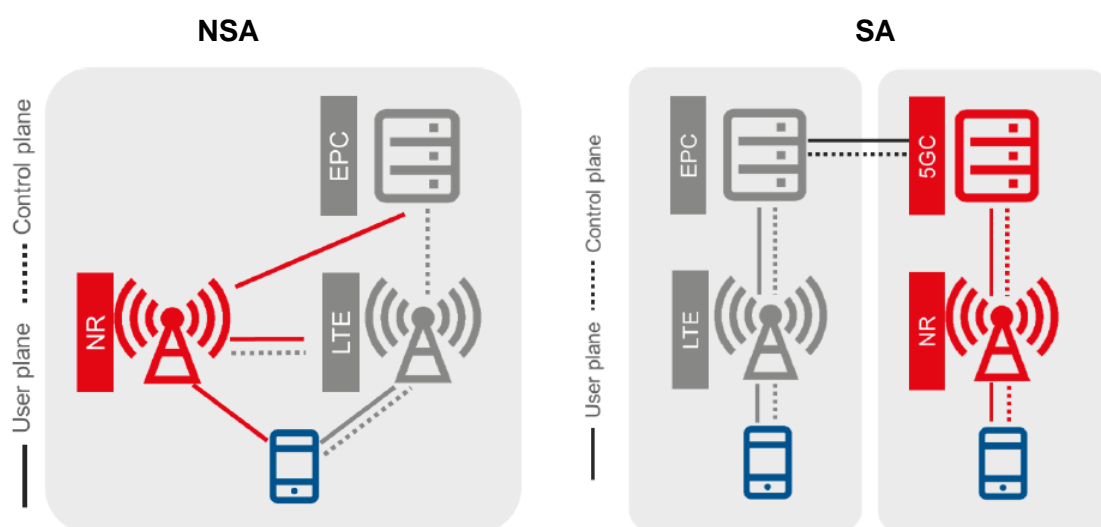
Fig 7: 5G Network Slicing<sup>23</sup>



5G will not only enrich customer experience on personal mobile devices, but also provide a framework for implementation of IoT and Machine-to-Machine (M2M) communications. As the harbinger of exponential changes, 5G promises to be a fundamental enabler of the digital economy, including IoT, AI, analytics, AR/VR, robotics and Autonomous Vehicles (AVs).

**5G Deployment Strategies:** 5G can be deployed in five different deployment options, where Standalone (SA) options consist of only one generation of radio access technology and Non-Standalone (NSA) options consist of two generations of radio access technologies (4G LTE and 5G). NSA is the overlay on the existing 4G network, while SA includes only 5G. The early deployments will be adopting either non-standalone option or standalone option as the standardisation of these two options has already been completed.

Fig 8: 5G Deployment Options<sup>24</sup>



<sup>23</sup><https://www.vanillaplus.com/2017/01/31/24983-network-slicing-unleashes-5g-opportunities-service-quality-can-assured-part-2/>

<sup>24</sup> GSMA



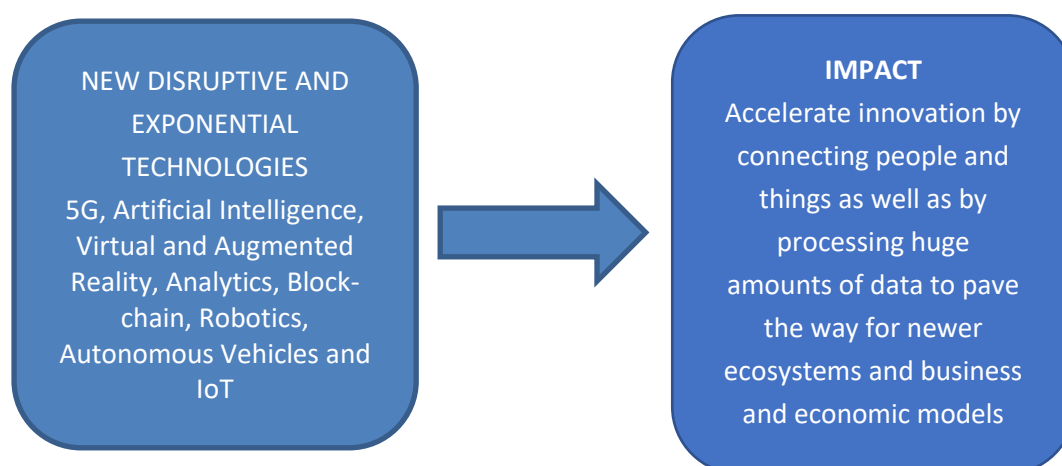
Non-standalone option is where radio access network is composed of eNode Bs (radio node in 4G) as the master node and gNode Bs (Radio node in 5G) as the secondary node. The radio access network is connected to EPC (Evolved Packet Core). Standalone option is where radio access network consists of only gNode Bs and connects to 5GC (5G Core), and the 5GC interworks with EPC.

**Fig 9: Standalone vs. Non-Standalone option for 5G Deployment**

| NSA Option   | SA Option   |
|--|---|
| <b>Advantage:</b> <ol style="list-style-type: none"> <li>1) Quick to Market</li> <li>2) Leverages existing 4G Deployment</li> <li>3) Minor Modification to 4G network Required</li> <li>4) Support Legacy 4G Devices</li> <li>5) 5G Devices only need to support New Radio (NR) protocols</li> </ol>   | <b>Advantage:</b> <ol style="list-style-type: none"> <li>1) Full Support for the 5G services</li> <li>2) Designed to leverage virtualization</li> <li>3) Supports network slicing</li> <li>4) Control and user Plane separation</li> <li>5) Decomposed functional elements offering specific network services (Authentication, Mobility Management etc.)</li> </ol> |
| <b>Disadvantage:</b> <ol style="list-style-type: none"> <li>1) Not Optimized for the use cases beyond the Mobile Broadband</li> <li>2) May not be able to leverage: <ul style="list-style-type: none"> <li>• Low Latency</li> <li>• High Reliability</li> <li>• Network Slicing</li> </ul> </li> </ol> | <b>Disadvantage:</b> <ol style="list-style-type: none"> <li>1) Still under Development</li> <li>2) Further, work required in some areas (e.g. Roaming, interworking)</li> <li>3) Time to Market is slower</li> <li>4) Deployment cost is higher</li> </ol>  |

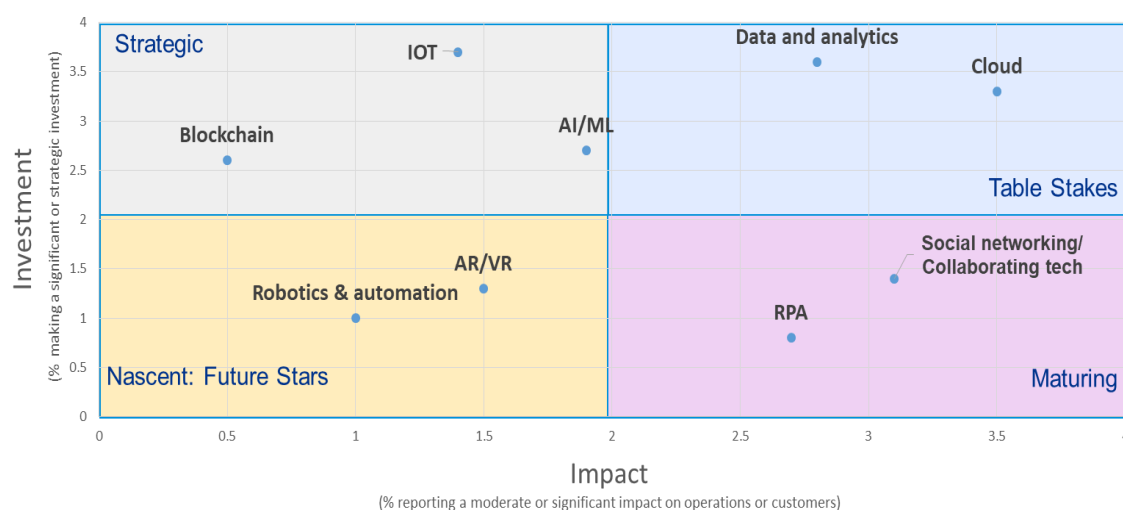
In India, considering the current financial health of the TSPs, huge investment already made in creating the robust 4G infrastructure and the increased demand for the high speed mobile Broadband service, we believe that the TSPs will choose the non-Standalone option for deployment of 5G.

**Fig:10 Leading technologies and how they are likely to shape the next 15 years<sup>25</sup>**



KPMG has evaluated these disruptive technologies using the following metrics: impact on operations, impact on business models and level of investment and have created the disruptive technology value map to help tech sector leaders guide investment decisions on disruptive technologies.

**Fig 11: Disruptive Technologies Value Map and Impact<sup>26</sup>**



#### Table stakes

Receives high investment and generates strong impact today. They have reached an initial phase of business maturity but remain vigorously innovative and challenging to master

#### Strategic

Receives significant investment today in search of strong impact tomorrow. They are high on investment and medium-to-low on current impact

#### Nascent: Future stars

Receives lesser levels of targeted investment and have yet to generate serious impact, but are seen as potential future stars

#### Maturing

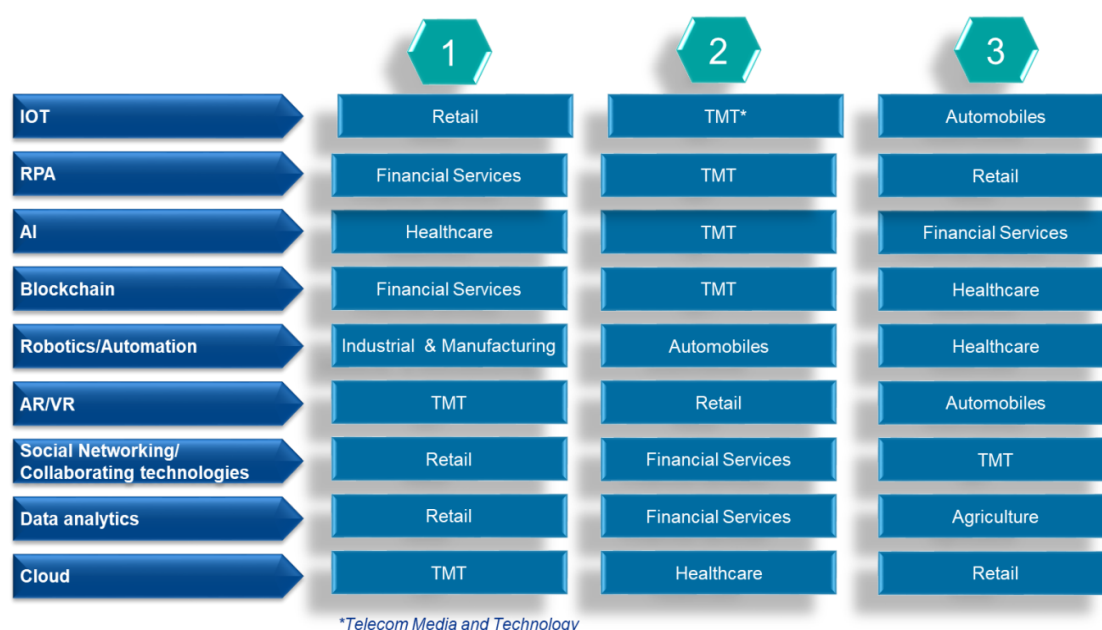
Generates strong impact, but no longer requires high investment. They now receive medium-to-low investment, as systems hum along at producing value

Further, as per KPMG industries like Retail, TMT, Automotive and Financial Services as key sectors having maximum potential to be disrupted by the emerging technologies in next 15 years (till 2035).

<sup>25</sup> CREDAI Report: India 2030 Exploring the future

<sup>26</sup> KPMG Report: Imagine a new Connected World

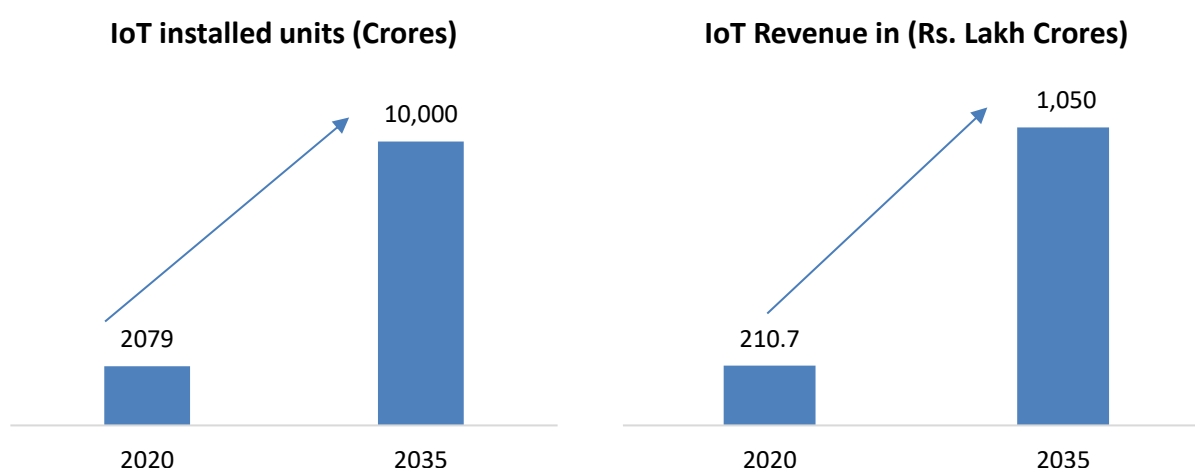
Fig 12: Impact of Disruptive Technologies on various Industries<sup>27</sup>



#### D. Disruptive Technologies – India Trends:

1. **M2M and Internet of things (IoT):** Internet of Things or IoT is touted as the next big thing in the communication technology world and is estimated that there will be around **2,079 Crore IoT units in India at the end of 2020** and that the total will reach **10k Crores by 2035**, producing immense volume of data, generating revenues in multiple of trillions.

Fig 13: IoT Projections: Installed units and Revenue in India<sup>28</sup>

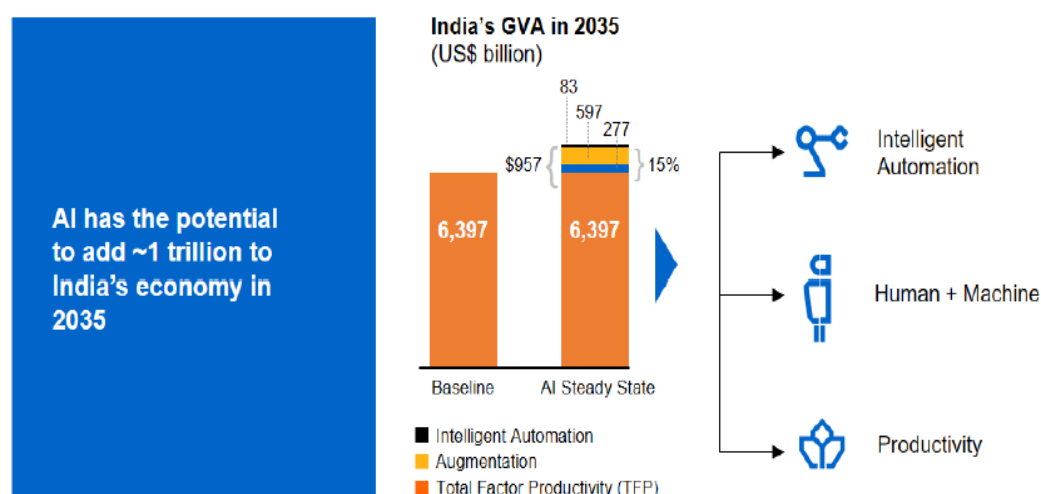


<sup>27</sup> KPMG Report: Imagine a new Connected World

<sup>28</sup> NASSCOM, COAI Estimates

2. **Artificial Intelligence (AI) and Machine Learning (ML):** AI and ML are two of the hottest concepts circling around the world in the past year. Customer service chatbots, speech recognition and voice services for customers as well as predictive maintenance are already in use of some of the biggest telecoms around the globe. The technology landscape for AI is complex and will remain so through 2023, with many IT vendors investing heavily in AI, variants of AI coexisting, and new AI-based tools and services emerging. In India Finance minister has allotted **Rs.3073 crore** on the development of new technologies like AI and IoT in the Telecom sector. We believe that these being highly cost-effective technologies will boost the total revenue of the telecom sector. India, being the fastest growing economy with the second largest population in the world, has a significant stake in the AI revolution. Accenture, in its recent AI research reports, provides a framework for evaluating the economic impact of AI for select G20 countries and estimates AI to boost India's annual growth rate by **1.3 percentage points by 2035**.

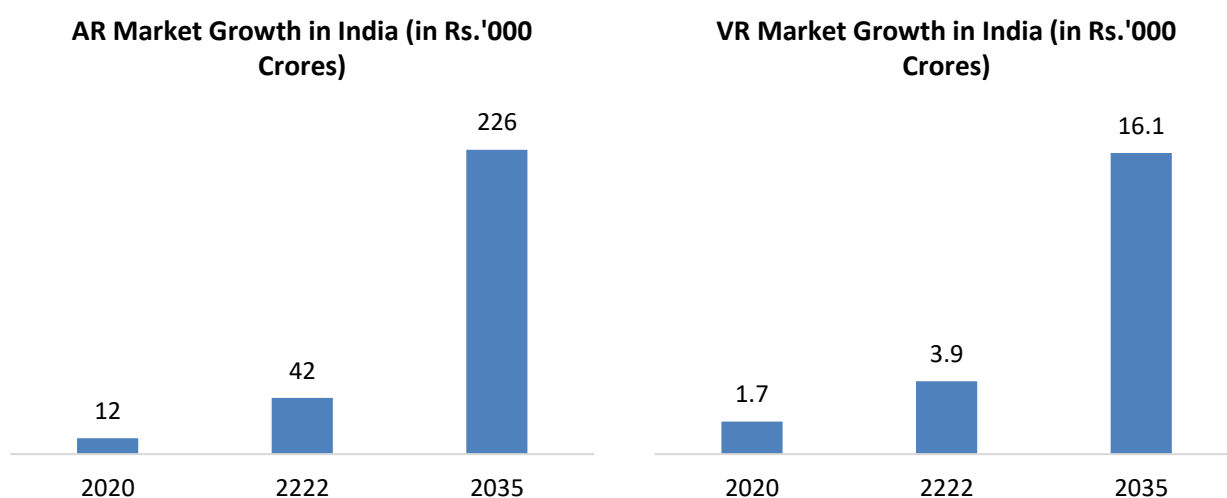
**Fig 14: Framework for evaluating the economic impact of AI<sup>29</sup>**



3. **Augmented Reality (AR)/ Virtual Reality (VR):** AR is already being utilized in industries including manufacturing, healthcare and logistics. Smartphone users will start embracing Augmented Reality more than ever. Telecoms will also start using VR technologies to reinforce their customer experience. VR-powered platforms will assist Telcos in providing unique entertainment experiences and will help them differentiate their products and services. For example, a telecom company could use Virtual Reality to demonstrate its new product/service to customers.

<sup>29</sup> Accenture

Fig 15: AR & VR Market in India<sup>30</sup>



4. **Robotics:** Robotics a rather untapped technology could help offset the major increase in network demand on the horizon by supporting automation initiatives. **Robotics brings benefits of Reliability, Increased productivity, Availability of Product and Scalability.** It is no small task to develop and implement automation/robotics, but with the onslaught of new technologies on the horizon, network engineers would be wise to start that process now or develop partnerships with organizations that have the technology in place to meet scalability demands. In India **Robotic Process Automation (RPA)** market size is expected to reach **Rs. 13,500 Crore by 2035**<sup>31</sup>.
5. **Blockchain Technology:** Blockchain technology ensures privacy of customer through cryptographical codes. This technology has the potential of creating a value addition of **Rs.35,000 Crores**<sup>32</sup> **in telecom sector in India.** Nearly half the states in India have initiated blockchain projects to address different elements of citizen service delivery. While most projects are in the pilot stage, the state governments have taken a progressive approach to ensure that start-ups and niche providers have a conducive framework to participate in these initiatives. In India, the TRAI initiated Project of Implementing Blockchain for the tackling the unsolicited commercial Communication is first of its kind in the world.
6. **Wearable Technologies:** Wearable technology is a young market segment. The growing emergence of wearable technology in the healthcare, pharmaceutical, sports, nutrition, and fashion industries include new and powerful products that have the potential to drive behavioural changes in consumers in order to achieve wellness goals. In 2017, the number of wearable devices with 4G connections in Asia Pacific amounted to 155 million.
7. **Software Defined Network (SDN) & Network Function Virtualization (NFV):** SDN is the Approach to control the Network (switches & routers) through software programming, while NFV is the concept of replacing dedicated network appliances (routers and firewalls) with software running on servers. Telecom

<sup>30</sup> Growth of Immersive media- A Reality Check , NASSCOM , COAI Estimates

<sup>31</sup> COAI estimates

<sup>32</sup> NASSCOM

industry professionals from across the country are in favour of adopting these two technologies for better network virtualization and automation. SDN& NFV are the key drivers for the next phase of network evolution towards a 5G era where connectivity will beyond the immediate boundaries of TSP's and hence they need to be ready to transform accordingly in a timely manner. SDN and NFV will bring efficiency agility and new revenue streams to the world of telecom in India.

8. **Cloud computing:** Business and IT executives are no longer looking at the Cloud solely as a tool; now the focus has shifted towards finding the right way to use it. The advent of the Cloud has created significant changes to organizations in the past few years. Cloud Computing has provided Big Data with a way to store and retrieve an immense amount of information. It has evolved from personal cloud storage to entire organizations moving all their data to the cloud. It is believed that Public cloud platforms, business services, and applications will reach **Rs. 236 K Crores<sup>33</sup> by 2020** and **Rs.390 by 2035**. NDCP, 2018 also aims to establish India as global hub for cloud computing, content hosting and delivery and data communication systems and services.
9. **Quantum Computing:** In 5G, cloud technologies have become a critical part of radio access network (RAN) management e.g. our 5G vRAN solution. The ability to orchestrate both equipment and functions is enabling more automatized and intelligent forms of network management, from network set up to alarm management, license renewal and more. Such tasks, for example, can now be performed more efficiently by intelligent agents that make optimised decisions in real time and under unpredictable circumstances. However, those intelligent agents need to analyze sheer volume of data rates. The compute power required for such tasks surpass the capabilities of even the most state-of-art devices we have today.

Built using a quantum processor, a quantum computer (QC) can potentially reduce execution time to hours and days for problems that would previously have taken hundreds of years to solve on our best supercomputers. The basic element of a QC is the quantum bit (known as a qubit). Quantum bits are the quantum analog of the classical bits and thus the basic unit of quantum information. Whereas in the classical domain, they function as a two-level system, in this case, the qubits must obey the laws of quantum mechanics. One of the phenomena used in quantum technologies is superposition, due to which the quantum bits in a quantum computer can take the 0 and 1 values or a superposition of them, and therefore a quantum computer can process many operations at the same time.

For quantum computing has several potential use cases in telecom such as

- Physical layer processing of the user data plane in the RAN,
- Clustering for automatic anomaly detection in network design optimization project,
- Prediction of the quality of user experience for video streaming based on device and network level metrics
- Database search at the data management layer.

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<sup>33</sup> Forrester, <https://medium.com/@Unfoldlabs/8-trends-in-cloud-computing-for-2018-d893be2d8989>

**We are of the view that the Quantum computing both globally and in India will be at its prime at around 2025 as it has been estimated that the local deployments of quantum computers will be done in the time frame of next 15 Years.**

#### **E. Guiding Principles and Policy recommendations to fulfil the future requirements:**

As the world's biggest democracy, the regulatory framework and the policy decisions by the government of India play a major role in facilitating ICT as a growth enabler. The pace of technology proliferation in the country is directly linked to policy reforms by the Government. Policy intervention related to ease of doing business, RoW clearance, Public Private Partnership (PPP) models for infrastructure development, expanding the roll-out of Smart Cities, Finalising IoT Policy and Data Protection bill and implementation of a national program on AI will accelerate the adoption of Digital technologies in India.

Thus, going forward the Government will have to ensure that policies and practices favourable to the deployment and use of 5G and Broadband are systematically factored into public policy development, in all areas including trade, competition, tax policy, social policy and regulatory reform. An enabling Ecosystem will be the key to growth.

#### **Enabling ecosystem**

To unlock the potential of 5G, stakeholders also need to develop supporting infrastructure to create a fulfilling ecosystem for 5G. This includes distributed network architecture, Cloud infrastructure, and an agile operating model.<sup>34</sup>

As a step in this direction, the government approved a financial grant for indigenous 5G test beds project across Indian Institutes of Technology (IITs) and Indian Institute of Science (IISc) in March 2018. The collaborating institutes include IITs in Bombay, Madras, Hyderabad, Delhi, Kanpur; IISc Bangalore; Society for Applied Microwave Electronics Engineering and Research (SAMEER) and Centre of Excellence in Wireless Technology (CEWiT). With duration of three years and budget of INR2.24 billion, the project has the ability to enhance the country's telecom technology and manufacturing competency and develop intellectual property.<sup>35</sup> Cross sectoral collaboration will also form a critical component of the enabling ecosystem.

#### **Collaboration across various sectors and Govt. Depts**

Telecom sector in future will have a greater impact on the other prominent sectors e.g. manufacturing, Roads & Highways, Agriculture, Urban developments (smart cities), Health, Finance, warehousing, Broadcasting (content) etc. Thus a cross sectoral collaboration across all these sectors will become more prominent and relevant than ever before.

In India, different ministries and departments in the Government work towards development of these sectors. Thus, a collaborative approach across all these departments e.g. Ministry of Electronics and

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<sup>34</sup> India's game plan to switch on 5G connection, Livemint, 04 October 2018

<sup>35</sup> Financial grant approved for 5G test bed project by IITs, IISc: Manoj Sinha, The Economic Times, 28 March 2018

Information Technology, Ministry of Roads and Highways, Urban & rural development Ministries, Health department, Broadcasting Ministry is required with the Department of Telecom. The policies of all these departments need to be aligned with the future policies of DoT so that these sectors unleash the power of future technologies of telecom. The success of ICT deployment in the country will depend upon this cross sectoral collaborative approach.

### Free Open Market

As mentioned above, the advantage of growth in telecom will also accrue to the other sectors. However, any restrictions towards the use of technology in other sector or restriction in the creation of new products/services through collaboration will hamper the overall growth of the economy. Thus, while, the policy needs to facilitate cross sectoral collaboration, it also needs to open the market for consumption of the products/services which emanate from such collaboration.

Since the liberalisation of Indian market in the 90s and opening of various sectors including telecom for private companies, Indian has done a lot to ensure free open market. However, future policies need to be more liberal so that the Industries not only have the free access to everything they need for the development of new products/services, but also have open market for consumption of these products/services. Ensuring participation from anyone and everyone is the key for the future growth.

### Investments

Along with an enabling ecosystem, cross sectoral collaboration and open market, attracting investments will be critical to the roll-out of 5G and ICT infrastructure. To promote investments in ICT infrastructure, the Government could consider creation of Special Purpose Vehicle (SPV) to support international lending organisations and provide substantial investment into digital infra projects at cheaper interest rates.

Funding can also be provided from tax-free bonds, infrastructure debt bonds, central road funds, monetising government-owned road assets, and budgetary allocation. It is recommended that an Optical Fibre Market Development Fund can support the service providers, incentivise product and market development expenses with low cost loans. The specific relief that would boost investments of the Industry are as below:

- a. **Reduction in USO contribution (License Fee):** USO contribution should be immediately brought down to 3%, with an ultimate objective of doing away with the levy in next 2-3 years in line with TRAI recommendations. Reduction of remaining License Fee from 3% to 1% of AGR
- b. **Spectrum Pricing:** It is important to have **future roadmap for spectrum, modest reserve prices and release of spectrum as soon as it is needed**. Further, The Government objective from spectrum auction should not be revenue maximization, rather social benefits should be the prime focus.
- c. **Ensure that complete Spectrum is made available for 5G Technology:**
  - Complete identified Spectrum in 3300-3600 MHz bands is made available for IMT/ 5G technology and not given to other stakeholders.



- Additional spectrum bands identified by 5G High Level Forum including 26, 28 and 40 GHz should also be identified and made available for 5G.

**d. Backhaul Spectrum at Modest Price: Earliest allocation of the E & V bands for Backhaul**

- Both E & V bands should be opened for **backhaul allocation immediately**.
- Allocation should be strictly to Access Service Providers having access spectrum
- **No de-licensing** of spectrum in E & V band, since it has the potential to be used as access spectrum and will create non-level playing field.

**e. Reforms in AGR finalization and other measures:** Simplification of computation of AGR will help Ease of Doing Business, simplify the compliance, reduce the disputes in the sector and make the Industry more business friendly and attractive for the investors. The regime of pass-through charges for admissibility of deductions from Gross Revenue for the levy of License Fee & SUC be reviewed and all payments made for any telecom input resource by one to another TSP should be allowed as a deduction.

**f. Exemption from the levy of basic custom duty:** Customs duty on the 4G/5G related network products **should be immediately brought down to NIL.** Further, there should be no hike in Basic Custom Duties for “Routers” and Routers of all kinds should be exempted from Basic Custom Duties. There should not be any change with respect to the listing of “Routers” in ITA-1.

**g. Resolution of the RoW related Challenges**

- Alignment of all States Telecom Infrastructure Policy with Central RoW Rules, November 2016 i.e. Uniform State Policy with One-time nominal fee, Single-window clearance in a time-bound manner etc.
- Availability of Government Land & Buildings for installation of Mobile towers.
- Need for a Common Duct policy under Dig Once umbrella.
- All existing infrastructure should be regularized as per the state telecom policy aligned with RoW Rule within a stipulated period of time.
- Deemed approval should be obtained from the nodal authority in writing to avoid arbitrary sealing of infrastructure by the local authorities.

**h. Govt. could consider tax incentives to promote investments in domestic manufacturing.**

## Telecom Equipment Manufacturing

India is fast emerging as a global manufacturing hub and has already become the world’s second largest mobile phone producer. Global phone manufacturers such as Samsung and Apple besides Chinese companies such as Xiaomi, Oppo, Vivo and Huawei are targeting India which has over a billion mobile phone subscribers. The Indian telecom equipment manufacturing sector has also come a long way in the past few years. Though it started as an import centric industry, the move right now is towards becoming a global telecom equipment manufacturing hub. Several well-known global manufacturers like Ericsson, Nokia,

Samsung, Motorola etc. have set up their facilities in India for manufacturing of telecom products ranging from mobile handsets, Base Stations and other related electronics hardware. Increasing domestic manufacturing of telecom equipment in the country will help service operators reduce their dependence on foreign sourcing, thereby saving them as well as the country from high import bills. Govt in a bid to encourage local manufacturers had promulgated the policy of PMA for procurements by Govt ministries and departments. To further encourage domestic manufacturing in telecom Govt. can consider giving tax incentives and formation of special economic zones. In the short term, Govt. could consider providing custom duty exemptions on telecom equipment to ensure timely roll out of service

### **Standards: How standards will be a Critical success factor to facilitate ICT / new technologies**

With global boundaries shrinking in terms of cloud and data, the successes or failures in one place affect - people around the globe, this interdependency has profound consequences for international standards. Countries are accordingly evolving strategies to synergize standardization work with technological, social and economic development at the national level as well as for playing influencing roles in global standardization efforts. The rapid growth of the Indian economy, its size and emerging relevance in global trade, makes it essential to establish a robust, harmonized, dynamic, and mature standards ecosystem. The growing influence of standards and technical regulations, and corresponding conformity assessment systems on trade and commerce has been recognized worldwide.

Since technology is expected to be the backbone of the future, positioning standards as a key driver of all economic activities will become extremely important. A comprehensive ecosystem for standards development considering the diversity of interests and expertise available will be developed. Using standards as enhancer of competitiveness of Indian goods and services in domestic and international markets, adopting best practices in standardization and creating roadmaps for effective management will be the key enablers.

Different SDOs (Standard Development Organizations) will emerge with enhanced capabilities and international connects. Coherence amongst these SDOs will be required.

### **Innovation**

Encouraging innovation is critical to fostering digital ecosystem. Providing customers with an immersive and innovative experience ensures the customer's engagement level, resulting in higher customer retention. However, due to the complexity and high cost associated with investments in the immersive technologies, the entire immersive ecosystem still needs to be fully developed and innovation would be critical for the technologies to become main stream.<sup>36</sup>

The Government of India has realised the importance of technology and is playing a crucial role in boosting technological growth in India through several schemes. Schemes such as *Atal Incubation Centres (AIC)*, *Scheme for Scale-up Support to Establishing Incubation Centres*, *High Risk-High Reward Research* and

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<sup>36</sup> Augmented and Virtual Reality: Are Companies Prepared?, Jabil, Accessed on 25 August 2019

*Technology Development Programme (TDP)*<sup>37</sup> have been introduced to enable innovative technology start-ups, including those focused on AR/VR, AI and IoT, to become scalable and sustainable businesses.

An IoT policy framework is also under progress. With this framework, the government plans to develop a connected and smart IoT-based system for the country's economy, society, environment and global needs.<sup>38</sup>

Given these government schemes, India is poised to see a significant rise in the adoption as well as number of emerging tech start-up ventures. In the days to come, immersive technologies will become increasingly market-oriented and accessible as technology continues to evolve and appears to be getting faster and more cost-effective.

### Data Privacy and Security

The increasing focus on digitalisation has led to organisations adopting digital technologies such as AI/ML, AR/VR, IoT, Cloud Computing, and Data Analytics to enhance business functions and offer personalised and immersive services. This also enables organisations to monetise huge amounts of data to create customer profiles in a new and unique way. Such user profiles not only identify the person for whom the content is targeted but also provide insights into their preferences, beliefs and routines. Thus **adopting digital technologies opens up the surface of vulnerabilities for organisations, thus, considerably impacting consumers' privacy and raising concerns. Further, a data breach could ruin the reputation of organisations, and thereby affect their businesses.** The number of data breaches encountered by organisations has expanded steadily since 2008. There were 685 instance of data breaches impacting more than 10 million customers in 2018. The impact of a data breach on an organisation averaged USD3.9 million globally; it was around USD1.83 million<sup>39</sup> in India during 2018.

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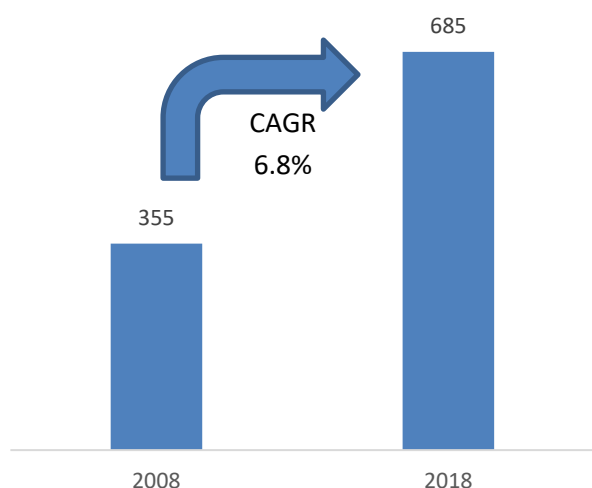
<sup>37</sup> The 49 Startup Schemes By Indian Government, Inc42, 2018

<sup>38</sup> Internet of Things in Smart cities, KPMG, May 2019

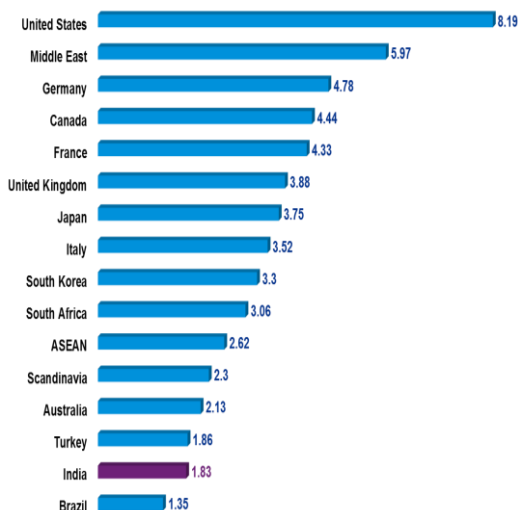
<sup>39</sup> Cost of a data breach report, IBM security, 2019

**Fig 16: Growing Instances of Data Breach and Privacy Risks:**

**Total Number of Data Breaches Globally<sup>40</sup>**  
(Impacting more than 10 million Customers)



**High Cost of Data Breach USD Million<sup>41</sup>**



**Addressing Data Privacy and Security Challenge is key in building a robust Digital ecosystem:** As India speeds up its mission to transform into a truly digital economy, cyber security threats and privacy concerns could impede its success. All stakeholders involved (government, industry, consumers and regulators) should consider implementation of advanced cyber security technologies. They should also look at bridging the skill gap of cyber security professionals through relevant training and support. Since the definition of personal data is becoming broad, it is a positive sign that India is considering data governance around non personal information as well. Considering the rising threats of the digital age, organisations need to have a comprehensive security architecture in place, one which ensures the protection of critical data across varied networks and environments, and technologies that dynamically respond to threats as they emerge. In addition to that, the organisations must balance the personalisation requirements of customer experience with data privacy compliance. While requirements of personalised experience and data privacy may appear counter to each other, they can be both managed by giving control to end user and following a **need-based data governance model**.

#### **Skilling: How skilling will be important to facilitate adoption of new technologies**

Skill development is essential to ensure that India reaps the benefits of emerging technologies. Skill Development and Entrepreneurship development efforts across the country have been highly fragmented so far. Though India enjoys the demographic advantage of having the youngest workforce, skilling is a major challenge.

<sup>40</sup> Biggest data breaches in history, Comparitech, 30 July 2019

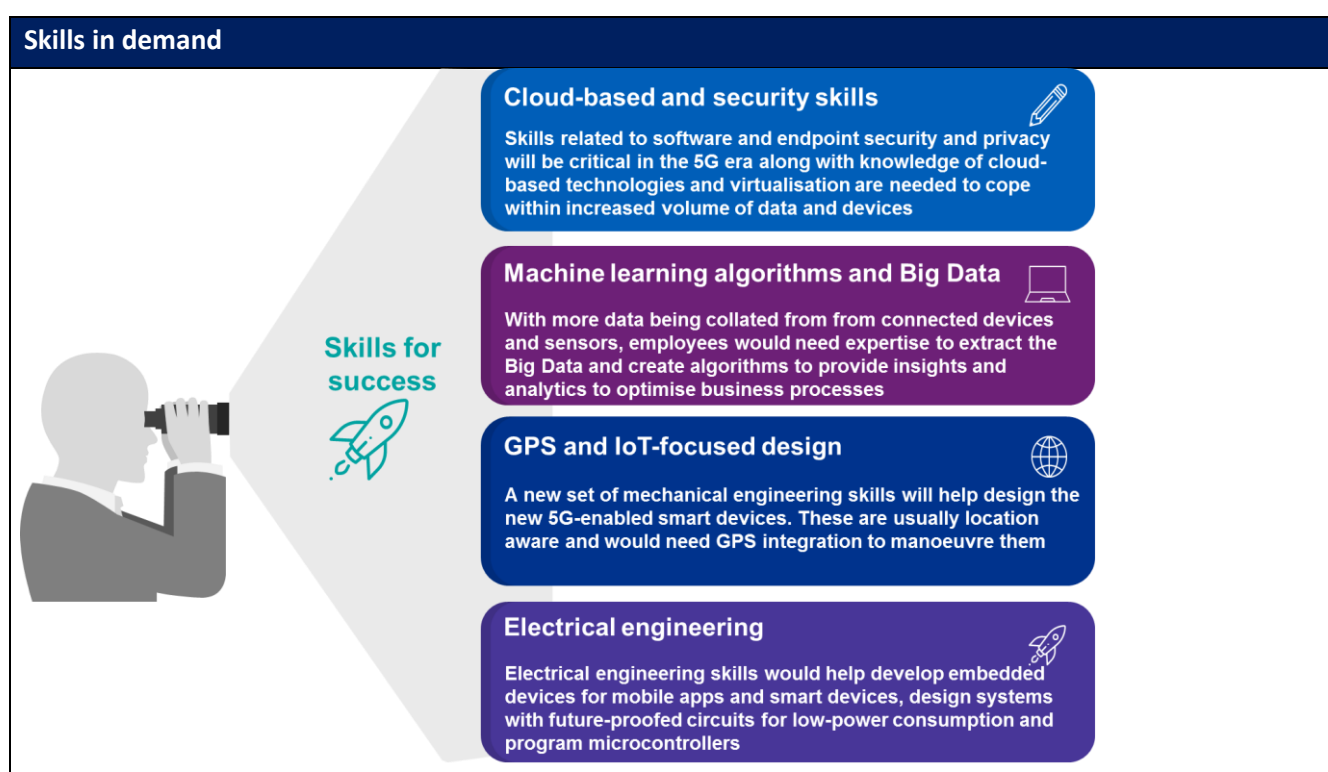
<sup>41</sup> Biggest data breaches in history, Comparitech, 30 July 2019

This challenge becomes enormous as the recent studies indicate that employers found just about 30% of Indian graduates are 'employable' in the ICT sector. The informal sector which comprises 93% of the workforce has no skilling mechanism, as the skill development takes place on the job.

So, there is a need for quick reorganization of the skill development ecosystem. The new generation of networking and digital technologies demands a huge transformation and Indian stakeholders need to acquire suitable capabilities in the form of skills, competence and operating models. The need of the hour is to match the pace of innovation in the telecom industry with the skills required, which can only be achieved through reskilling.

5G connectivity is anticipated to create three million additional jobs globally<sup>42</sup>, and substantially increase the skill demand across four key areas:

**Fig 17: Skilling in India** <sup>43</sup>



India has more than 600,000 digitally skilled talent and this number is expanding year-on-year by almost 30 per cent. <sup>44</sup> However, this is not enough. India will have to reskill nearly 40 per cent of its total workforce over the next five years<sup>45</sup> to cope with emerging trends such as 5G, IoT, networking, AI, machine learning and blockchain.

<sup>42</sup> India: Becoming 5G ready, GSMA, 2019

<sup>43</sup> KPMG

<sup>44</sup> Level up or go home: India faces a skill-gap challenge for 5G, emerging tech, Economic Times, 21 June 2019

<sup>45</sup> Level up or go home: India faces a skill-gap challenge for 5G, emerging tech, Economic Times, 21 June 2019

## F. Conclusion:

Digital transformation is a key enabler and driver of change in the world and the telecommunication industry is at the forefront driving this transformation. The new digital India is a vision of a connected India that empowers millions of people with access to real-time information, avenues for commerce and an enhanced quality of life.

India with **64 Crore Broadband Subscribers** and with the Broadband penetration of around **55%**, must cover significant ground when compared with the developed world. However, things are changing rapidly in the country with the Government push towards digitalisation.

It is expected that the digital economy will account for around **25%** of the total GDP of the country **by 2035**, resulting in more growth and productivity, thereby providing new and improved employment Opportunities. We believe that there will be major impetus for the growth of the digital economy through 5G Technology.

We expect commercial 5G deployments in India by 2022, and the full-fledged 5G subscription is expected to start from 2024. The coming few months are likely to witness many more trials of advanced radio technologies for 5G and their relevant use cases as the 5G standardization process gathers momentum.

It is estimated that there will be around **780 Crore** 5G Subscriptions around the world by **2035**. For India itself it is estimated that there will be around **27 Crore** 5G Connections by **2035**. Driven by spread of 4G and 5G, the total number of the Mobile Broadband subscribers in India is estimated to grow to around **184 Crores by 2035**, with CAGR of around 7%.

We believe that advent of 5G is going to give major push to the adoption of the IoT in India. IoT installed units are expected to reach **10,000 by the year 2035** in India from the current level of around **2,000 units**. With the high data speeds in 5G, we expect more OTT players in the market and collaboration between OTTs and TSPs. This will be driven by new technological developments such as Artificial Intelligence (AI), Machine learning and Blockchain, enabling massive amounts of data to be collected from remote and mobile sensors. AI alone has the potential to add **approx. 1 Trillion** to India's economy by 2035.

However, the effective deployment of 5G and the implementation of 5G use cases will require huge investment in spectrum acquisition and fiberisation. Thus, to ensure deployment of 5G there is a need to boost the financial viability of the Industry.

NDCP 2018 has rightly recognized the requirement of catalyzing the investment in the sector by promoting ease of doing business. This includes review of license fee, SUC, definition of AGR, principle of input line credit to avoid double incidence of levies and making available new Spectrum bands for Access and Backhaul segments for timely deployment of growth of 5G networks.

In this regard, we believe that much will depend on the Government policy as to how the Government prioritizes between the short-term benefits of immediate revenue generation and the long-term dividends that a robust connected economy can create.