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Dissertation

On

Promoting Indian Manufacturing in Telecom Sector: Issues & opportunities

Under the supervision of

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CERTIFICATE

I have the pleasure to certify that **Krishan Kumar Agrawal** has pursued his research work and prepared the present dissertation titled as, ***Promoting Indian Manufacturing in Telecom Sector: Issues & opportunities,*** under my guidance and supervision the dissertation is result of his own Research and to the best of my knowledge no part of it has earlier comprised in other monograph, dissertation or book.

This is being submitted to the Panjab University Chandigarh for the degree of Master of philosophy in Social Sciences in partial fulfilment of the requirement of the Advanced Professional Programme In Public Administration of Indian Institute of Public Administration New Delhi. I hereby recommend that the dissertation of Krishan Kumar Agrawal is worthy of consideration for the award of M Phil degree of Panjab University Chandigarh.

Prof. V. N. ALOK

IIPA, New Delhi

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LIST OF ABBREVIATION

TSDO:	Telecommunication's Standards Development Organization
DOT:	Department of Telecommunication
C-DOT	Center for development of Telematics
NTP :	New Telecom policy
BSNL:	Bharat Sanchar Nigam Limited
MTNL:	Mahanager Telephone Nigam Limited
TRAI:	Telephone Regulatory Authority of India
MPLS-TP:	Multi Protocol Label Switching – Transport Profile
G-PON:	Gogabit Passive Optical Networks
ROADM:	Reconfigurable Optical Add Drop Multiplexer
SAR:	Specific Absorption Rate
NOC:	Network Operating Centre
SOC:	System on Chip
OMC-R:	Operations and Maintenance Centre –Radio
SDH:	Synchronous Digital Hierarchy
SIP:	Session Initiation Protocol
OS:	Operating System
OTN:	Optical Transport Network
TSP:	Telecom Service Providers
VoIP:	Voice over Internet Protocol
WDM:	Wavelength Division Multiplexing
ASIC:	Application Specific Integrated Circuit
DSL:	Digital Subscriber Line
ASON:	Automatically Switched Optical Network
GPS:	Global Positioning System
BSC:	Base Station Controller
HSPA:	High Speed Packet Access

BSS: Business Support Systems or Base Station

IBS: In Building Solution

IP: Internet Protocol or Intellectual Property

BTS: Base Transceiver Station

DAS: Distributed Antenna Solution

KPI: Key Performance Indicators

Chapter 1 - Introduction

1.1. Overview

Telecommunication infrastructure is a critical asset of any country and it is a key growth enabler. It is the delivery vehicle for a large number of IT and IT enabled services including health-care, education, financial services, e-governance etc. both to the urban as well as rural masses. While telecommunication networks could be setup with imported equipment, it becomes a concern when large networks, such as that of India, require continuous large imports, draining the foreign exchange of the country. Besides, a telecom network today is vulnerable to security and espionage threat, compromising the security of a nation. Complete dependence on imported equipment, in which malware could have been designed in and implanted at the component (IC) level or at the level of hardware or at the level of BIOS (Basic Input Output System) or Operating System or at the application level, makes the nation highly vulnerable. The issue of security can be dealt comprehensively only when we have sound manufacturing base, higher order skills in telecom technologies and skills to deal with security related issues, which can be developed only when we start doing R&D, design and development including manufacturing of the equipment indigenously.

On the other hand, the design, development and manufacturing of its own telecom equipment is a big opportunity for India, creating huge value as well as large employment, and it is not that India does not have an option; it certainly has the design capabilities, as reflected in large amount of telecom design and development work that is carried out in India for multinational companies. With the right policies to promote R&D, IPR creation and manufacturing, India can certainly deliver. According to TRAI, the demand for telecom equipment in India was Rs. 54765 crore (US$12 billion) in 2009-10 which was about 5.5% of the global demand.

This is projected to grow to Rs 170,091 crore (US$ 37 billion) in 2020. This large domestic demand may be a perfect launch pad for Indian Product industry. A thriving telecom manufacturing industry would have a large positive impact on many other elements of the electronics manufacturing value chain. This will also provide employment, increased share of manufacturing in GDP and export of equipment and services. Moreover, technical knowledge and IPR creation will also have spill over effects for other industries.

Further, the scenario for telecom equipment design and manufacturing has been fast changing. The Western companies, which did well in the past, are contracting, with many of them going out of business. The void has been filled by the Chinese companies, which have emerged on the scene only in the decade on large scale, and have already acquired leadership in telecom equipment manufacturing. If India does not strengthen its own telecom product industry, it will increasingly depend on importing equipment majorly from one country that is China because of low cost of equipment with high feature. It is imperative that India moves rapidly in nurturing and strengthening its telecom R&D, IPR creation and product industry.

Despite significant growth of the telecom network and the subscriber base over the last decade, the telecom manufacturing sector has not shown corresponding increase. The contribution of all domestic products in telecom total equipment have been around 17% in the year 2016-17 & was less in previous years. It is quite clear that the telecom equipment manufacturing ecosystem has so far failed to adequately spur the manufacturing segment and as a result, the domestic telecom equipment manufacturing segment has not been able to meet the demand forcing the telecom operators to import most of the equipment required for their network.

There are reasons for the Indian manufacturing Industry not being able to meet the demand through domestic equipment manufacture. It includes weak links in the complete chain from

basic research to IPR generation, product design and development, product commercialization and achieving economies of scales so that the product can compete with the imported one. Manufacturing needs support of other components of the value chain to flourish. Manufacture of components and subassemblies in India would help both the Indian Product companies and Indian manufactured product companies. Large global OEM (Original equipment manufacturer) vendors need to be encouraged to setup competitive large scale operations in India. This would not only reduce the input cost but also enable the same infrastructure to be used across the entire electronics sector. It is very important to have a tax structure that encourages manufacturing. Today, import of some components invites custom duty whereas the finished products attract zero duty. Smaller domestic players face the problem of not having economies of scale and availability of long term financing at low interest rates.

China's policies for protecting and nurturing Chinese product industries are well known. But even as it acquires dominance in telecom product manufacturing, it continues to enhance its support to Chinese products and industries.

1.2. R&D, Intellectual Property Right (IPR) and Standardization

India has witnessed an exponential growth in the telecom sector in the last decade. However, despite this significant growth, most of the technology and equipment used by Indian service providers are imported. India's influence in International telecom technology development is practically non-existent, though Indian software companies do a significant level of outsourcing for foreign technology companies. The software companies implement sophisticated and current technologies, but own little IPR. The Indian presence in

International telecom standards is also marginal. There is no thriving R&D ecosystem either leading to a significant outflow of IPR.

IPR are significant values add in today's telecom systems. The top four companies in telecom manufacturing each filed for a significant fraction of the total telecom-related international patents in 2010. Of these, two were Chinese companies. The contribution of IPR could be close to 15% of the sale price, when the systems are first introduced, and goes down as time goes on. This value is realizable, however, only when the IPR goes into standards, based on which the systems are deployed. The design and development of the systems add further value. In the early days of any new standard, significant part of the sale price is thus contributed by the R&D. There is clear need to promote Indian interests, service providers' requirements, and Indian IPR, into International standards and products/services. This will also help to create an ecosystem for telecom equipment manufacturing in India, which today is not a viable business proposition due to significant outflow for IPR licensing

Indian telecom sector: Some facts

In the telecom sector subscriber base has grown steadily over the years and had appx 1,200 million subscribers and over 400 million internet users on 31 sept 2018[1]. The Telecom industry ecosystem comprises of Telecom Service Providers (TSPs), Telecom Infrastructure Providers, Handset Manufacturers and Telecom Equipment Manufacturers. Some of the major achievements of the telecom industry are as under:

- Telecom Industry generates over 4 million (direct and indirect) jobs & contributes 6.5% to India's GDP

[1] Trai.gov.in data

- Many mobile manufacturing units set up in last couple of years under Make in India mission but very few equipment manufacturing units are set up
- FDI in the industry has increased from USD 8.637 billion in 2015-16 to USD 37.435 Billion in 2016-17.
- The Mobile handset manufacturing industry has shown good progress in the past five years, the telecom equipment manufacturing industry has not been able to match the performance of mobile handset manufacturing industry.
- A phased manufacturing program for promoting indigenous manufacturing of mobile handsets its sub-assemblies and parts/sub-parts was notified by MeitY on 28 April 2017, however no such plan/ road-map has been developed for the telecom equipment manufacturing industry.
- According to a report, over 90% of the demand of telecom equipments in India was met through imports in year 2013-14. One of the primary reasons for Increasing Import and decreasing Exports is the relentless competition from China which is known for large scale production and export of low cost telecom equipments besides imports from other countries like Sweden, Finland and USA.

1.3. Statement of the Problem

As a result of government policy, significant progress has been achieved in telecom sector manufacturing in the country. There has been steady growth in telecom equipment manufacturing in XII five year plan period. Although, Telecom policies spelt out in new telecom policy 2012 emphasize the convergences and desirability of encouraging all technologies, a substantial part around 80 %of telecom deployment in the network is still imported.

India is meeting over 80 per cent of its robust demand for telecom equipment (accounting for about 8 per cent of global demand) through imports. Apart from economic reasons, the security concerns arising out of excessive reliance on foreign manufactured products also suggest that India should aim at achieving self-sufficiency in telecom equipment manufacturing. High dependence on import of IT and Telecom products also poses serious challenge to trade deficit. The target of the government to meet net zero imports by 2022 cannot be achieved unless we focus aggressively on design oriented, high value addition (VA) based manufacturing in the country.

Domestic manufactures cannot attain economy of scale and size of global majors like Ericsson, Nokia, ZTE and Huawei until they start investing heavily on R&D,testing, IPR and skill development of human resource. The appropriate Preferential Market policy(PMA) and other incentive from the government in this regard like financial support by way of dedicated funding for R&D, tax breaks on R&D etc and low cost of fund provision are essentially needed in order to catalyze the growth in manufacturing as done by china in last two decades . Need to Strengthen the R&D institution like C-DOT/CDAC &CEERI, creation of Telecomm Research &development Fund(TRDF) as suggested by planning commission in XII plan & many Papers will facilitate Design ,development, testing & manufacturing in the sector

1.4. Literature Review:

Number of studies has been undertaken in the field of indigenous Telecom Equipment Manufacturing in India by many academicians but not many books are available on the subject. The report of the seminar, magazines & websites held during recent times has been relied upon during the course of study. Apart from that report published by department of Telecommunication (DoT), BSNL, planning commission, economic

survey of India, TEMA etc has been referred for analysis . Policy Research TRAI papers have also been reviewed in the above field . Some studies that have been reviewed are as follows:-

i. TRAI Consultation Paper No.17/2010 on encouraging Telecom Equipment Manufacturing in India discussed about FDI in telecomm, Skill development, Tax incentive to domestic industries and IPR/patents. This is quite compressive paper but some recommendation were accepted in NTP 2012 The recommendation of paper on indigenous Design & Manufacturing ,setting of centers of Excellence in R&D and creation of TDF (Telecomm development fund) is done partially .

ii. National Telecomm Policy 2012 of DOT has promoted the ecosystem for design, Research and Development, IPR creation, testing, standardization and manufacturing. To meet Indian telecom sector demand to the extent of 60% and 80% of equipment with a minimum value addition of 45% and 65% by the year 2017 and 2020 respectively and India will become Zero import by 2022[2] . The policy was appropriate but creation of clusters like SEZ/CEZ was not happened to large scale in previous years.

iii. TRAI Consultation Paper June /2018 on encouraging Telecom Equipment Manufacturing in India focuses on FDI in telecomm, Skill development, Tax incentive to domestic industries IPR/patents. Compressive paper but comments of stake holder are yet to be come from different stake holder's .Paper focus less on HR development in Electronics & telecomm. Incentive & fund arrangement for R&D.

iv. In the make in India website (http://www.makeinIndia.com/policy/new-initiatives) FDI, IPR, SEZ/CEZ is discussed. FDI has increased to 100 % in telecomm from

[2] www.dot.gov.in/ntp2012

49% through DIPP route with approval of ministry. There is not much data in website on telecomm equipment for boosting indigenous manufacturing .

v. Dr Banerjee, Geeta 2005 work on "Manufacturing industry in India in telecomm sector-Problems & opportunities" discussed about Telecomm equipment manufacturing, policies & Plan, R&D Policies & Plan and issue in manufacturing. In this dissertation , recommendation on skill development &FDI Role is was not elaborated in details

vi. Telecomm manufacturing Industry needs Tax incentive, Export subsidies & cost effective infrastructure in order to set up industries[3]. The paper describes details of technical &policy requirement for indigenous manufacturing. The focus is more on private sector participation & lack of participation of public sector.

Over and above, the internet and the website published by various telecom companies and government department have provided essential knowledge on the subject matter.

1.5. The Objective

Broadly the objective is to identify various technical & policy issues in domain of R&D, IPR, design & development skill development and making recommendations for an appropriate telecom manufacturing growth. The objective of the study is:

1. To identify the technical & policy issues for the domestic telecom Manufacturing in India in order to become a global hub of telecom manufacturing for meeting domestic demand as well as for export.

2. To identify the opportunity and way forward for the domestic telecom manufacturing in India

[3] https://www.coai.com/sites/default/files/2017-04/-Study-on-Equipment-Manufacturing-Policy

3. To suggest technical & policy measure for catalyzing the design, development & manufacturing in India.

4. To prioritize the design, development & manufacturing technical barriers like R&D, CEZ/SEZ/TEZ Electronics Cluster, Fiscal incentive &Human Resource development.

1.6. Research Methods and Data Sources

The present study is exploratory and descriptive in nature. It is carrying out the content analysis of available literature to understand the present state and policies. The entire study is primarily rely on the analysis of secondary data to examine the capability & capacity of domestic Telecom Equipment Manufacturing in India

1. Quantitative and Qualitative methods have been used for analysis..

2. Deliberation & discussions was conducted with officials in different related ministries and data available on the telecomm manufacturing in NCR (as a sample) was selected for primary data collection – few private & public sector. For the purpose, an open ended questionnaire was canvassed & responses are analyzed.

3. For collection of Primary data regarding performance and challenges in implementation of Domestic Manufacturing questionnaires were prepared and administered to decision makers of telecomm public & private enterprise

4. Secondary **d**ata available in public domain (reports from DOT, MEITY and other Govt portals) of last 5 years have been used for analysis & interpretation.

1.7 Chapterisation:

The research thesis is covered under the following chapters:

Chapter -1 Introduction

The chapter explain the motive of the study, the statement of the problem & methodology being adopted to carry out the study. It gives an overall scenarios of manufacturing sector in India & its current status vis –a-vis with other developed and developing countries.

Chapter -2 Issues and Reforms in Telecom Manufacturing in India

The major issue in domestic manufacturing in telecomm sector were discussed like R&D, IPR, skill Development & National Investment Zone in Manufacturing (NIZM). The NIZM are not fully operationalize in many state though policy exist from many years. India imports around 80% of its equipment from abroad which impacts trade balance & also security concern to nation especially with china

Chapter-3 Telecom Equipment Manufacturing –Polices &Plan

The chapter covers the domestic telecom manufactures various incentives by different policies of Government and also discuss about DIPP policies guideline and DoT performance to make in India guidelines.

Chapter -4 Research & Development –Policies &Plan

The present statues of R &D in telecom sector and policies of Government to promote, design and development of the same have been explained in this chapter. The Role of R&D,IPR and design & development is discussed with special focus on C-DOT

Chapter -5 Telecom Manufacturing Industry in China & other countries

The chapter contains the case study of China, an emerging Asian giant, among the developing nation in Asia. It gives an insight growth of telecom sector in China & different strategies adopted by China Govt to promote the domestic R & D manufacturing. Also discussed how ITA (information technology Act) of WTO help china to grow its economy exponentially in last two decade.

Chapter -6 Study of Indian Telephone Industries & Private companies

This chapter covers the case study of government owned public sector unit ITI limited in telecom manufacturing field. It describe about ITI various project undertaken for development and manufacturing of equipment for some Govt sponsored schemes. ITI financial performance of last few year is also discussed

Chapter -7 Survey analysis

In this chapter, the primary data collected through online Google questioner is interpreted. The questionnaire was prepared diligently in order to take a broader view of stake holder such as telecomm service provider, Original equipment manufacture(OEM) & other stake holders .The responses of questioner are analyzed and it's placed in this chapter.

Chapter-8 Conclusions & Recommendations

The chapter summarises the conclusion arising out of this study. Further recommendations are made based on study and questioners response in order to promote domestic manufacturing in India.

CHAPTER-2 Issues and Reforms in Telecom Manufacturing In India

2.1 Issues in Telecom Equipment Manufacturing in India

A strategic sector like telecom can give a major contribution to GDP of country by enhancing the domestic production. With the expansion of the manufacturing base, development of ancillaries, support facilities like electronic design and manufacturing clusters, there would be employment for hundreds of thousands of skilled, semiskilled and unskilled workers. Similarly Department of Industrial Policy and Promotion (DIPP) has framed a National Manufacturing Policy (NMP) in which it has been envisaged to create National Investment and Manufacturing Zones (NIMZs) which will be developed as integrated Industrial township with the state of the art infrastructure and favourable export import policies. These Zones can play the role of a facilitator for the entrepreneurs who want to set up their business in the Telecom Sector.

Planning Commission has proposed in XII plan (2012-17) that the strategic objectives for the manufacturing sector in the next 5 years should be to bring about a quantitative and qualitative change with following core objectives:

i) Increasing the growth of manufacturing sector to 14% over medium term so as to contribute at least 25% to the National GDP by 2025;

ii) Increasing the rate of job creation in manufacturing to create 100 million additional jobs by 2025;

iii) Increasing domestic value addition;

iv) Enhance global competitiveness of Indian manufacturing through appropriate policy support;

v) Ensure sustainability of growth, particularly with regard to environment.

India has the capability to create global telecom product companies of its own if it can tap the next wave of telecom growth that would happen in the areas of broadband, Next Generation Networks and Next Generation Mobile Networks(5G).

TRAI has recommended to DoT that the telecom equipment manufacturing policy be an integral and significant part of the new Telecom Policy. In the suggested measures for promotion of domestically manufactured products comprising both the Indian Products, which have product IPR in India, and Indian Manufactured Products in which case IPR resides outside India, it has proposed preferential market access for domestically manufactured telecom products of 30% in the first year, which goes up to 80% in 8th year, and also the minimum value addition of 25% in the first year to minimum value addition of 65% in 8th year. It has stated that the products which are merely being assembled based on CKD/SKD /imported components should not be regarded as manufactured in India till they achieve the minimum value addition recommended by them. The recommendation to give market access in telecom licensee (public as well as private) will result in assured market to Indian equipment manufacturers for achieving economies of scales and also units set up by multinational companies in India.

Further, it may be worthwhile to examine what constitutes value addition in telecom equipment today. Time Magazine in its May 16, 2011 issue published the various value contributions that go in today's USD 500 iPhone. The total components and subsystems of the iPhone contributes to USD 174, whereas manufacturing (assembly and testing) consist of mere USD 6. The rest of USD 320 goes to Apple towards design, development, software and IPR as well as sales, distribution, finance charges and profits. This example goes on to show that there is very little value adds in mere manufacturing, or PCB fabrication, test and assembly. The value lies in design, development, IPR and in system software. Without strengthening these aspects, India's gains will be limited.

The main factors impeding the growth of domestic manufacturing are:

- Poor infrastructure and absence of Manufacture of components and sub-assemblies in India
- Absence of large global EMS (Engineering Manufacturing Service) vendors
- Lack of Stable fiscal policies
- Tax structure that encourages manufacturing
- Market pull for domestic manufacturers
- Not having economies of scale and availability of long term financing at low interest rates
- Less R&D facilities, access to low cost funds and testing and certification
- Support for R&D, IPR, Standards and Product commercialization

2.2 **National Investment & Manufacturing Zone (NIMZs)**

NIZM have been conceived as large integrated industrial townships with state of-the-art infrastructure such as land use on the basis of zoning, clean and energy efficient technology, necessary social infrastructure, skill development facilities, etc., to provide a conducive environment for manufacturing industries. To enable the NIMZ to function as a self government and autonomous body, it will be declared by the State Government as a Industrial Township under Article 243 Q (I) (c) of the Constitution. These NIMZs would be managed by a Special Purpose Vehicle (SPV) which would ensure master planning of the zone; pre-clearances for setting up the industrial units to be located within the zone and undertake such other functions as specified in the various sections of the policy. The policy mandates that the SPV in a zone will be headed by a senior government official and will include inter-alia an official expert conversant with the work relating to pollution control/environment protection. The NIMZs are perceived to be different from Special Economic zones (SEZ) in terms of size; level of infrastructure planning; governance structure related to regulatory procedures; exit policies; fiscal incentives, etc. The

proposals in the policy are generally sector neutral, location neutral and technology neutral except incentivization of green technology. Moreover, while the NIMZ are an important instrumentality, the proposals contained in the Policy apply to manufacturing industry throughout the country including wherever industry is able to organize itself into clusters and adopt a model of self-regulation as enunciated in the policy. Nine NIMZs outside the Delhi-Mumbai Industrial Corridor (DMIC) region given in-principle approval are (i) Nagpur in Maharashtra; (ii) Tumkur in Karnataka (iii) Bidar in Karnataka; (iv) Kolar in Karnataka; (v) Gulabarga in Karnataka; (vi) Chittoor in Andhra Pradesh (vii) Medak in Telangana; (viii) Prakasam in Andhra Pradesh; and recently at (ix) Kalinganagar, Jajpur district in Odisha.

Eight Investment Regions along the Delhi-Mumbai Industrial Corridor (DMIC) project nodes have also been accorded in principle approval as NIMZs. The details are as under:

1. Ahmedabad-Dholera Investment Region, Gujarat;
2. Shendra-Bidkin Industrial Park city near Aurangabad, Maharashtra;
3. Manesar-Bawal Investment Region, Haryana;
4. Khushkhera-Bhiwadi-Neemrana Investment Region, Rajasthan;
5. Pithampur-Dhar-Mhow Investment Region, Madhya Pradesh;
6. Dadri-Nodia-Ghaziabad Investment Region, Uttar Pradesh;
7. Dighi Port Industrial Area, Maharashtra; and
8. Jodhpur-Pali-Marwar Region in Rajasthan.

The Progress made in the implementation of the National Manufacturing Policy (NMP) so far is:

- The Government has made progress on the issue of rationalization and simplification of business regulations:

- The States have been requested to identify land banks for setting up of the National Investment and Manufacturing Zones and to initiate the process of rationalization and simplification of state level business regulations.
- Ministry of Labour and Employment has issued the advisory on simplification & rationalization of business regulations and skill development.
- The Manufacturing Industry Promotion Board (MIPB), Green Manufacturing Committee (GMAC) and the High Level Committee (HLC) envisaged in the monitoring and approval mechanism of NMP have been set up.
- A scheme component on Master Planning of NIMZ under the Plan 'Scheme for implementation of NMP' has been approved.
- Guidelines for establishment of NIMZ and proforma for final approval of NIMZ has been prepared and circulated to all State Governments.

2.3 Major Concerns in Domestic Manufacturing:

Though large number of initiatives have been undertaken by the Government since liberalisation in telecom sector for indigenous equipment manufacturing but many concerns still exist, the same areas under :

(a) Heavy Reliance on Imported Equipments : Before the entry of private sector, most of telecom item like Cables, telecommunication towers, batteries and power-supplies, test instruments etc were all manufactured in India. In the pre-mobile era, when PSU"s were the only operators; procurement of telecom equipment from locally manufactured sources was an essential clause in most of the tenders. This clause necessitated even foreign firms to start manufacturing in India may be at SKD (Semi Knock Down) level. However, post the advent of mobile era, mobile phones and telecom equipment were permitted to be imported duty free, while this

has provided the consumers with better choices and bargaining power, it has also restricted growth of mobile phone and telecom equipment manufacturing in India.

(b) Rapid Advancements in Telecom Sector : Indian Telecom sector being dynamic in nature, both in terms of technology and the services, requires sustained heavy investments on Research and Development (R&D) . Major telecom equipment manufacturing companies of the world are therefore rolling out equipments manufactured as per the latest standards and quality to maintain their relevance and dominance in the sector. India being the second most populated nation of the world is also the biggest market for the telecom equipment vendors. Increasing per-capita income, large population of youth and the need to remain connected 24 X7 has fuelled the growth of telecom in India. Rapid growth of telecom in India has attracted foreign telecom players to invest in our country.

Indian manufacturers find it difficult to meet the pace of rapidly changing technologies, expenditure on Research and Development as well as marketing strategies as compared to their foreign counterparts.

(c) Tariff Structure: The Indian electronics industry is caught in a vicious circle of zero duty imports, high domestic production costs and manufacturing ecosystem challenges. The salient features of tariff structure presently applicable to Electronics Hardware Industry in India are as under:

(i) Peak rate of Basic Customs Duty (BCD) is 10%.

(ii) BCD on 217 tariff lines covered under the Information Technology Agreement (ITA) of WTO is 10%.

(iii) All goods required in the manufacture of ITA items are exempted from BCD subject to actual user condition. Special Additional duty of Customs (SAD) has been reduced from 4% to Nil for all goods except populated PCBs, falling under

any Chapter of the Customs Tariff, for use in manufacture of ITA bound goods vide Notification No. 11/2015-Customs dated 01.03.2015.

(iv) BCD on specified raw materials / inputs used for manufacture of electronic components and optical fibres and cables is 0%.

(v) BCD on specified capital goods used for manufacture of electronic goods is 0%.

(vi) To promote indigenous manufacturing of Mobile Handsets and Tablet computers, BCD and Excise Duty has been exempted on all parts, sub-parts, components and accessories for the manufacture of these items.

(vii) Differential Excise Duty dispensation is available to Mobile Handsets and Tablet Computers i.e. Countervailing Duty (CVD) @12.5% and Excise Duty @1% without CENVAT credit or 12.5% with CENVAT credit.

However, the extent of benefit accrued to the domestic manufacturers arising out of these measures needs to be ascertained. As per the inputs available on GST, the GST rate for telephones for cellular networks or for other wireless networks and parts for their manufacture has been fixed at12%.

(d) Performance of PSU‟s: In the absence of large volumes of orders, over years, the PSU‟s like ITI and R&D organisations like C-DOT have not been able to upgrade their capabilities to match the dynamic requirements of the telecom industry.

(e) Intellectual Property Rights(IPRs):

(i) Innovation: There are multiple IPR issues concerning the Indian telecom manufacturing sector. First, there are not many IPRs generated in the electronics segment due to poor state of innovation. It should be noted that electronic equipments include telecom equipments because they consist of electronic parts.12 As per the United Nations Development Program Report, 2016, for the period 2005-14, India‟s total research and development expenditure was only 0.8% of its GDP. Other countries such as the Republic of Korea and

Israel‟s expenditure on research and development are 4.3% and 4.1% of their respective GDPs[4]. Since IPR‟s are not held with the Indian telecom manufacturers, they incur higher expenditures on royalty payments which ultimately results in increase in price of locally manufactured telecom equipments. Further, a recent survey studying the patent ownership for 50 entities noted that 38 were non-Indian while only12 were Indian. The findings showed that out of approximately 23,500 total patents identified, only 18 patent applications have been filed by 3 Indian entities (Spice Digital, HCL, and Videocon), but no successful patents were issued. The data below clearly shows the grim state of innovation in the segment of telecom equipments.

[4] http://hdr.undp.org/en/2016-report

Table 1-Telecommunications Firms,Indian Patents and Patent Applications (2000–2015)

Top 10 firms

S. No	Assignee	Nationality	Patents Issued
1.	Qualcomm	United States	5,954
2.	Ericsson	Sweden	1,843
3.	Samsung	South Korea	1,827
4.	Nokia	Finland	1,744
5.	Microsoft	United States	1,557
6.	Philips	Netherlands	1,460
7.	Sony	Japan	1,235
8.	Alcatel Lucent	France	971
9.	Motorola	United States	842
10.	LG	South Korea	791

Indian Firms

S. No	Assignee	Patent Applications
1.	HCL	11
2.	Spice Digital	6
3.	Videocon	1

(f) Standard Essential Patent (SEP)

European Telecommunications Standards Institute (ETSI) and Institute for Electrical and Electronics Engineers (IEEE) are monitoring Standard Essential Patent (SEP) globally. SEP has a direct bearing on cost of equipments. For example, if Company A wants to manufacture 3G, 4G compliant devices (hand phones, tablets, etc.) it has to obtain license from the SEP holder having patent over the said standards. Therefore, once a patent holder acquires the status of SEP holder, it is bound by the obligation to grant the license on Fair, Reasonable and Non-Discriminatory (FRAND) terms. Presently, calculation of royalty on FRAND basis remains a challenge and is the bone of contention in the ongoing SEP disputes. Therefore, there is a need to devise formula/mechanism to determine the basis on which SEPs can belicensed on FRAND.The term reasonable" used in the expression FRAND is often interpreted differently by a patent licensor as opposed to patent license. While royalty determination is primarily a commercial negotiation, but lack of any guiding

factors and asymmetric bargaining capacity between licensor and licensee often ends up in litigation. Issues pertaining to the basis for determination of royalty i.e., whether on the value of the Smallest Saleable Patent Practicing Component (SSPPC) or on the net price of the downstream product, or some other criterion remains open ended.

i. Information on patents/licenses: Availability of information on the number of patents and licenses required for manufacturing a product, royalties to be paid and the quantum of these royalties etc in a transparent and time bound manner can facilitate the local telecom equipment manufacturers. The Indian Patent Office (IPO), under the Ministry of Commerce and Industry has the administrative authority to examine and grant patents in India. However, there is no single window like structure in place, which can provide clarity in terms of patent licensing requirements at the time of commencement of manufacturing activities.

ii. Non Disclosure Agreements may result in differential in royalties to be paid. Rate of royalty differs substantially from one potential licensee to another. This results in higher costs for the local manufacturers and therefore higher purchase costs for the consumers. A need therefore exists to transparently mention the range of royalties to be paid in percentages wherever feasible.

iii. TRIPS Agreement: TRIPS (Trade Related Aspects of Intellectual Property Rights) agreement) requires that the member countries should provide the power of seizure for Trademark and Copyright infringements at the border, In Indian context, patent infringements have also been included over and above the mandatory Trademark and Copyright infringements under Intellectual Property Rules, 2007. This has resulted in large number of litigations and is seen as a bottleneck for the local telecom equipment manufacturers.

(f) Export Incentives: Currently the only export incentive available to handset manufacturers is 2% incentive under the Merchandise Exports from India Scheme (MEIS) introduced in the Foreign Trade policy 2015-20. Lower incentives are reported to be detrimental to the growth in exports from India.

(g) E-Waste Management Rules, 2016:

India recycles less than 2% of the total e-waste annually19, the Ministry of Environment Forest and Climate Change had issued the E-Waste Management Rules, 2016 with the aim of reducing e-waste production and increasing recycling in the most efficient manner. Under these rules, the government introduced Extended Producers Responsibility (EPR) which makes producers liable to collect 30% to 70 %(over seven years) of the e-waste that they produce. Since the e-waste collection is carried out mostly by the unorganised sector, hence the telecom equipment manufacturers find it difficult to comply with these rules. Non compliance of existing rules act as deterrent for the entrepreneurs/existing players to venture/operate in the telecom equipment manufacturing industry.

2.4 **Government policy for Promotion Domestic Telecom manufacturing**

The telecom market in India has been characterised by a gradual shift from significant governmental regulations and control towards open market competition. This shift has both enabled competition among Indian service providers and carriers and fostered the opening of India's telecom equipment markets to foreign competitors.

Government post liberalisation & Telecomm policies reforms are summarised below:

2.4.1 Reform in New Telecom Policies of 1994, 99 &2012

National Telecom Policy 1994: The first step in this direction of liberalisation of Telecom Sector was announcement of the National Telecom Policy in 1994 (NTP 94). This

provided for opening up the telecom sector to competition in Basic Services as well as Value Added Services like Cellular Mobile Services, Radio Paging, VSAT Services etc. It also set target for provision of telephone on demand and opening up of long distance telephony. NTP 94 spelt out five basic objectives of which two objectives of availability of telephone on demand and universal service (connecting all villages) were targeted to be realized by 1997. Two other objectives were to make the country a major manufacturing base and exporter of telecom equipment and to ensure the country's defence and security needs. The powers of licensing and spectrum management were retained by the Government on the ground that both need to be strictly monitored in order to protect the strategic interests and security of the country.

New Telecom Policy, March 1999 : Objectives laid down under NTP 99 were as under:-

(i) Availability of affordable and effective communications for the citizens was the core of the vision and goal of the telecom policy.

(ii) Provide a balance between the provision of universal service to all uncovered areas, including the rural areas, and the provision of high-level services capable of meeting the needs of the country’s economy.

(iii) Encourage development of telecommunication facilities in remote, hilly and tribal areas of the country.

(iv) Create a modern and efficient telecom infrastructure taking into account the convergence of IT, media, and telecom and consumer electronics and thereby propel India into becoming an IT Superpower.

(v) Convert PCO‟s, wherever justified, into Public Tele-info centres having multimedia capability like ISDN services, remote database access, government and community information systems etc.

(vi) Transform in a time bound manner, the telecom sector to a greater competitive environment in both urban and rural areas providing equal opportunities and level playing field for all players.

(vii) Strengthen research and development efforts in the country and provide an impetus to build world-class manufacturing capabilities.

(viii) Achieve efficiency and transparency in spectrum management.

(ix) Protect Defence and security interests of the country.

(x) Enable Indian Telecom Companies to become truly global players.

National Telecom Policy 2012 ("NTP 2012") : Following objectives for promoting Research and Development, Telecom Equipment Manufacturing and standardization of Telecommunication Equipment were laid down in the NTP 2012:-

i. Promote innovation, indigenous R&D and manufacturing to serve domestic and global markets, by increasing skills and competencies.

ii. Create a corpus to promote indigenous R&D, IPR creation, entrepreneurship, manufacturing, commercialization and deployment of state-of-the-art telecom products and services during the 12th five year plan period.

iii. Promote the ecosystem for design, Research and Development, IPR creation, testing, standardization and manufacturing i.e. complete value chain for domestic production of telecommunication equipment to meet Indian telecom sector demand to the extent of 60% and 80% with a minimum value addition of 45% and

iv. Provide preference to domestically manufactured telecommunication products, in procurement of those telecommunication products which have security implications for the country and in Government procurement for its own use, consistent with our World Trade Organization (WTO) commitments.

v. Develop and establish standards to meet national requirements, generate IPRs, and participate in international standardization bodies to contribute in formulation of global standards, thereby making India a leading nation in the area of international telecom standardization.

vi. Put in place appropriate fiscal and financial incentives required for indigenous manufacturers of telecom

vii. New Products development and R&D institutions.

2.4.2 National Policy on Electronics (2012)

National Policy on Electronics was formulated in year 2012 for Research, Design & Development & manufacturing of electronics equipment. The electronic industry, at about $1.75 trillion, is one of the largest and fastest growing industries in the world. In 2014-15, imports accounted for around 58% of the total consumption of electronic goods. Important objectives of this policy were as follows:

(i) To set up an Institute for Semiconductor Chip Design to satisfy the demand for skilled workers in the sector, the policy aimed to put special focus on increasing postgraduate education. To incubate a $400 billion in Electronic System Design and Manufacturing (ESDM) sector this would generate employment for more than 28 million people till 2020.

(ii) To build a strong supply chain of raw materials, parts and electronic components to raise the indigenous availability of these inputs from the present 20-25 % to over 60 % by 2020.

(iii) Set up National Electronics Mission with industry participation and renaming the Department of Information Technology as Department of Electronics and Information Technology (Deity).

(iv) To build on the emerging chip design and embedded software industry to achieve global leadership in Very Large Scale Integration (VLSI), chip design and other frontier technical areas and to achieve a turnover of USD 55 billion by 2020.

- **Steps to boost Semiconductor Industry**

(i) In the Union Budget 2017-18, the Government of India increased the allocation for incentive schemes like the Modified Special Incentive Package Scheme (M-SIPS)and the Electronic Development Fund (EDF) to Rs 745 crore for providing a boost to the semiconductor as well as the electronics manufacturing industry.

(ii) The Union Cabinet has approved incentives up to Rs 10,000 crore for investors by amending the M-SIPS scheme, in order to further incentivize investments in electronics sector, create employment opportunities and reduce dependence on imports by 2020.

(iii) The Ministry of Electronics and Information Technology plans to revise its policy framework, which would involve the government taking a more active role in developing the sector by providing initial capital, with the aim to attract more private players and make India a global semiconductor hub.

(iv) The Union Cabinet, on 28 January 2015 had re-constituted an empowered committee on setting up semiconductor wafer fabrication manufacturing facilities in the country.

(vi) Modified Special Incentive Package Scheme(M-SIPS): The scheme was announced by the Government in July 2012 to offset disability and attract investments in electronic manufacturing. The scheme provides incentives on reimbursement basis for investment in capital expenditure i.e. 20% for

investments in Special Economic Zones(SEZ) and 25% in Non-SEZ.It also provides for reimbursements of CVD/Excise for capital equipment for the non-SEZ units.

Govt has established a single Electronic Development Fund (EDF) to cater for the financial requirements for R&D. The EDF has been setup as a "Fund of Funds" to participate in "Daughter Funds" which will provide risk capital to companies developing new technologies in the area of electronics, nano-electronics and IT. The EDF policy was approved by the cabinet on 10.12.2014, notified on 09.01.2015 and launched on 15.02.2016.Twenty two daughter funds have been selected for investment through EDF. The cumulative commitment of EDF in June 2017 was Rs 1227 Crore.

(vii) Joint Task Force on Mobile Manufacturing Eco-System: In December 2014, Deity (now Meaty) had set up a Joint Task Force consisting of representatives from the industry and the government to re-establish and catalyse significant growth in the mobile handset and component manufacturing eco-system. The task force has been mandated to achieve manufacturing target of 500 Million handsets and generation of 15 Lakh jobs by 2019.

(i) The Government of India has allocated Rs. 10,000 crore for rolling out optical fibre-based broadband network across 150,000 Gram Panchayats and Rs.3,000 crore for laying optical fibre cable (OFC) and procuring equipment for the Network For Spectrum (NFS) project in 2017-18.

viii. Skill Development: The Ministry of Skill Development and Entrepreneurship (MSDE) had signed a Memorandum of Understanding (MoU) with DoT (Department of Telecommunication) on 22 January 2016 to develop and implement National

Action Plan for Skill Development in telecom sector, with an objective of fulfilling skilled manpower requirement and providing employment and entrepreneurship opportunities in the sector. MeitY also provides support for skill development in telecom sector. This is at vocational level, graduate level, and PhD level. The skill development programs include Chip to System program, Chip designing etc.

ix. Preferential Market Access(PMA)

Govt in a bid to encourage local manufacturers had promulgated the policy of PMA for procurements by Govt ministries and departments. PMA was notified by Department of Electronics and Information Technology (Deity) vide Notification No. 8(78)/2010-IPHW on 10.02.2012. The Policy was revised and notified by DeitY vide Notification No 33(3)/2013-IPHW dated 23.12.2013. Further, guidelines for operationalization/ implementation of PMA policy were issued by Deity, vide Notification No. 33(7)/2015-IPHW dated 16.11.2015.

In furtherance of the Policy issued by Deity on 10.02.12, the Department of Telecommunications (DoT) laid down the policy for providing preference to domestically manufactured telecom products in Government procurement vide DoT‟s Notification No 18-07/2010-IP dated 05.10.2012. Further, value addition criterion for PMA to domestically manufactured telecom products was notified by DoT vide Notification No 18-07/2010-IP dated 11.01.2017, notified in the gazette of India on 12 .01. 2017.

x. Export Promotion Import substitution policy is a strategy to boost local manufacturing while import substitution is a strategy to tap the international market. The Niti Aayog Report on Make in India Strategy on Electronic Products, 2016 states that Chinese wages are increasing at the rate of 10% (in 2014 annual wage stood at Rs.5 lakh) which is rendering China uncompetitive in employment-intensive

activities. Firms located in China are looking for an option to migrate and India could be one such option, if the Government provides a congenial atmosphere, like stable and certain taxation regime, basic infrastructure etc. The report has suggested dismantling the inverted duty structure and carefully negotiating the terms of free trade agreements (FTAs) to facilitate local manufacturers. While India has taken a stand not to sign the ITA-2, the global increase in demand for ICT products engendered by ITA expansion could boost global Chinese exports of ICT goods by as much as $12 billion annually.

xi. Electronics Manufacturing Cluster :

In October 2012, the Government notified the Electronics Manufacturing Cluster (EMC) Scheme to create and strengthen the infrastructure ecosystem for electronics manufacturing. Under the EMC Scheme, the assistance for the projects for setting up of Greenfield Electronics Manufacturing Clusters is 50% of the project cost subject to a ceiling of Rs. 50 Crore for 100 acres of land. For larger areas, pro-rata ceiling applies. At the lower end, the extent of support would be decided by the Steering Committee for Clusters (SCC) subject to the ceiling of Rs. 50 Crore. For setting up of Brownfield Electronics Manufacturing Cluster, 75% of the cost of infrastructure, subject to a ceiling of Rs.50 Crore is provided. Till March, 2017, MeitY had received 49 applications under EMC scheme, 45 applications for setting up of Greenfield EMCs and 4 applications for setting up Common Facility Centres (CFCs) in Brownfield Clusters, out these, MeitY has accorded final approval to 13 Greenfield EMCs and 2 CFCs in Brownfield Cluster and in Principal approval to 12 Greenfield EMCs and 2 CFCs in Brownfield Clusters. In addition, 11 Greenfield EMCs and 01 CFC in Brownfield EMC have been granted in-principle approval. Studies show that formation of telecom clusters is estimated to result in 15% improvement in

profitability of domestic manufacturers through lower investment in common facilities, cluster financing and marketing expenses. A case study by Organisation for Economic Cooperation and Development (OECD) shows the positive contribution of clusters in boosting both its production and innovation capabilities in mobile telecom cluster.

(xii)Coastal Economic Zone: India is contemplating the option of building coastal economic zones (CEZ) by setting aside a large area near the coast along the lines of special economic zones designated in China. The story of Shenzhen SEZ in China over the past two decades has contributed significantly to local manufacturing including in the electronics segment[5]. The NITI Aayog Report, 2016 has strongly recommended that such CEZ can facilitate a sound ecosystem for healthy growth of export-oriented firms. A CEZ may be up to 200 to 250 kilometres wide from the coastline, approximately equal distance in length and encompassing a modern deep dredge port. The report suggests that such CEZ must have relatively flexible labour and land-acquisition laws, easy entry and exit of firms and international best practices for custom clearances like turnaround time of ships. Within the CEZ, electronic-industry specific zones and clusters will need to be created. Currently, numerous incentives and exemptions applicable to electronic goods in and outside SEZs exist. It is however not known how much impact these incentives have had on investment and output. It is difficult to separate investors who decide in favour of investment as a result of the incentives from those who would have invested anyway even in the absence of the latter. As on April 30, 2017 approvals have been granted for 421

[5] https://myweb.rollins.edu/tlairson/asiabus/sezshenzhen.html

Special Economic Zones (SEZs)[6]. Presently a majority of the SEZs operating in India are in the field of information technology and information technology enabled services (IT/ITES) and there is only a miniscule number of SEZs dedicated to telecom equipment manufacturing.

(xiii) Research and Development : Eight Telecom Centres of Excellence (TCOE) have been setup in Public-Private Partnership (PPP) mode in IITs . Telecom Centres of Excellence, set up in Public Private Partnership (PPP) mode, are an example of the Government, the Academia and the Industry working together for the sustained growth and progress of the country in the Telecom sector. The idea of Telecom Centres of Excellence was initiated with the shared realization, by the Government and the Telecom Industry, that boosting the growth of telecommunications was essential for the overall progress of the country. It was conceptualized in May 2007 and brought into existence by February 2008 with the signing of 7 MoUs between DoT, participating premier Academic Institutes and the sponsors from the Telecom Industry. The eighth TCOE with participation of Railtel came up in Jun 5th 2013.The TCOEs set up in Public Private Partnership (PPP) mode, are an excellent example of the Government, the Academia and the Industry working together for the sustained growth and progress of the country[7].

TCOE‟s have been created for promoting development of new technologies, generate IPR‟s, incubate innovations and promote entrepreneurship to position India as a global leader in telecom innovation and making India a hub of telecom equipment manufacturing.

[6] List of operational SEZs of India as on 30.04.2017
URL:http://www.sezIndia.nic.in/writereaddata/pdf/ListofoperationalSEZs.pdf
[7] http://www.tcoe.in/?q=content/about-tcoe-India

(xiv)Goods and Services Tax (GST) : The GST council has fixed 12 % tax rate on mobile phones. Under the new rule, all phones which are manufactured locally are likely to be costlier and imported phone may get cheaper. The downward price for the imported mobile handsets would be because they are currently attracting higher taxes than the proposed GST.

2.4.3 Information Technology Agreements (ITA) in WTO

The Information Technology Agreement (ITA) is an agreement under WTO whose participants are committed to completely eliminating tariffs on IT products covered under the agreement. ITA-1 was concluded by 29 participants at the Singapore Ministerial Conference in December 1996. Since then, the number of participants has grown to 82, representing about 97 % of world trade in IT products. *India joined the ITA on 25th March 1997.* 217 tariff lines were brought to 0% duty since 2005 which has resulted in acceleration of ITA imports. Under the ITA-1, each member has agreed to eliminate custom duties and other duties and charges of any kind, within the meaning of Article II, Clause 1(b) of the General Agreement on Tariff and Trade 1994.

(i) The ITA Agreement was based on *Harmonised System* classification 1996. Major changes in HS Codes for telecom products have been effected in the year 2007 by World Custom Organisation (WCO). The change was primarily in the description for 8517 which was modified as follows in the light of technological progress in the telecom sector:

"Telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data, including apparatus for communication in a wired or

wireless network (such as a local or wide area network), other than transmission or reception apparatus of heading 8443, 8525, 8527 or 8528".

The scope of heading (HS code) 8517 was expanded to include all the items of wire lines as well as wireless equipments. With revision of scope of 8517, products more than those committed initially by India have now been covered under 0 % duty. This results in rise in import of these items.

(iii) WTO has been strongly advocating including several items (like HS 851761-Base Station etc) under ITA 2. Incidentally, *India is not the signatory of ITA-2 that was signed by the 24 members countries on 16 December, 2015* hence items covered under ITA-2 are treated differently by India.

Chapter 3. Telecom Equipment Manufacturing –Polices &Plan

3.1 Background

Department of Information Technology (DlT) has issued a Notification No. 8(78)/2010-IPHW dated lOth February, 2012 for providing preference to domestically manufactured electronic products as a part of procurement process for the electronic products that have security implications for the country, and are to be utilized in Government own use while ensuring that no commercial resale is involved. As per the notification, telecom products which are procured across sectors were notified by the Department of Telecommunications (DoT). . In furtherance of the Policy notified vide reference cited above, the Department of Telecommunications has, accordingly, laid down the following policy for providing preference to domestically manufactured telecom products in Government procurement for its own use and not with a view to commercial resale or with a view to use in the production of goods for commercial sale and the policy shall come into force from the date of its publication its Gazette of India and shall be in force for a period of ten years thereafter

DIT has has notified in feb 2012 that each Ministry or Department will procure minimum percentage of their telecom product requirement fulfilling minimum value addition prescribed against each item. For all the Ministries or Departments (except the Ministry of Defence) of Government and the agencies under their administrative control and for all Government funded telecom projects (NFS and projects funded by USOF like NOFN etc.), the list of telecom products indicating preferential market access and criteria to qualify as domestically manufactured product year wise was given to respective units. The Preferential Market Access (PMA) and Value Addition (VA) indicated against each year are minimum and efforts should be made by

domestic manufacturers to achieve higher value addition" The formula for calculation of value addition for telecom products shall also be as notified by Department of Electronics and Information Technology from time to time. All the telecom products which do not meet the minimum value addition criterion for that year shall be treated as imported telecom products and dealt accordingly. Based on the availability of domestic products, the list of products as well as value addition for each product would be reviewed and notified by the Department of Telecommunications on periodic basis.

3.2 Interest Equalization Guidelines for telecom manufacturer exporters.

The Government of India has announced the Interest Equalisation Scheme on Pre & Post Shipment Rupee Export Credit on November 18, 2015 to the eligible exporters with effect from 1st April, 2015. Based on the decision of the Government, Reserve Bank of India issued the operational instructions of the scheme vide circular No. RBI/2015-16/259 DBR. Dir. BC. No. 62/ 04.02.001/2015-16, dated December 4, 2015. Six (6) tariff lines up to four (4) digit level of Indian Trade Clarification based on Harmonized System (ITC-HS) code are also included under the scheme. Further ,Directorate General of Foreign Trade has informed vide its O.M. No. 01/94/180/127/AM16/PC-4/746 dated 3 rd February, 2016 that Department of Commerce had accepted the suggestion from Department of Telecommunications to impose minimum value addition criteria for telecom products for eligibility under the said scheme and had incorporated the same in the above notification, which states that “Telecom products exports would, after notification of the guidelines by the Department of Telecommunications, however, be subject to minimum value addition

as notified by Department of Telecommunications, to be eligible under the scheme[8]. The domestic telecom manufacturer exporters will be eligible under the scheme subject to minimum value addition. Department of Telecommunications hereby notifies following minimum value addition qualifying criteria for Telecom Products to be eligible under the scheme: I. The entire product (including all populated Printed Circuit Boards i.e. PCBs) should be manufactured in India at Completely Knocked Down (CKD) level (i.e. full Electronic Manufacturing Services (EMS) done in India).

3.3 Department of Industrial Policy and Promotion (DIPP)

The Department of Industrial Policy & Promotion was established in 1995 and has been reconstituted in the year 2000 with the merger of the Department of Industrial Development. With progressive liberalisation of the Indian economy, initiated in July 1991, there has been a consistent shift in the role and functions of this Department. From regulation and administration of the industrial sector, the role of the Department has been transformed into facilitating investment and technology flows and monitoring industrial development in the liberalised environment.

The functions of the Department of Industrial Policy and Promotion

Monitoring the industrial growth, in general, and performance of industries specifically assigned to it, in particular, including advice on all industrial and technical matters;

- Formulation of Foreign Direct Investment (FDI) Policy and promotion, approval and facilitation of FDI;

[8] http://dot.gov.in/telecom-equipment-manufacturing

- Encouragement to foreign technology collaborations at enterprise level and formulating policy parameters for the same;
- Formulation of policies relating to Intellectual Property Rights in the fields of Patents, Trademarks, Industrial Designs and Geographical Indications of Goods and administration of regulations, rules made there under;
- Administration of Industries (Development & Regulation) Act, 1951
- Promoting industrial development of industrially backward areas and the North Eastern Region including International Co-operation for industrial partnerships and
- Promotion of productivity, quality and technical cooperation.

Department of Industrial Policy & Promotion is responsible for formulation and implementation of promotional and developmental measures for growth of the industrial sector, keeping in view the national priorities and socio-economic objectives[9]. While individual Administrative Ministries look after the production, distribution, development and planning aspects of specific industries allocated to them, Department of Industrial Policy & Promotion is responsible for the overall Industrial Policy.

Department of Industrial Policy and Promotion monitors the industrial growth and production, in general, and selected industrial sectors, such as cement, paper and pulp, leather, tyre and rubber, light electrical industries, consumer goods, consumer durables, light machine tools, light industrial machinery, light engineering industries etc., in particular. Appropriate interventions are made on the basis of policy inputs generated by monitoring and periodic review of the industrial sector. The Department studies, assesses and forecasts the need for technological development in specific industrial sectors. On

[9] https://www.india.gov.in/official-website-department-industrial-policy-and-promotion

this basis, it plans for modernization and technological up gradation of the Indian industry so that, it keeps pace with the international developments in industrial technology on a continuing basis.

The Department is also responsible for facilitating and increasing the FDI inflow in the country. Foreign Investment Promotion Board (FIPB), now located in Department of Economic Affairs, Ministry of Finance, provides a time bound, transparent and pro-active FDI regime for approval of FDI investment proposals. The Department also plays a pro-active role in resolution of the problems faced by foreign investors in implementation of their projects through Foreign Investment Implementation Authority (FIIA), which interacts directly with the Ministry/State Government concerned.

The Department is responsible for encouraging acquisition of technological capability in various sectors of the industry through liberal foreign technology collaboration regime. Foreign technology induction is facilitated both through FDI and through Foreign Technology Collaboration (FTC) agreement. FTC agreements are approved either through the automatic route under the delegated power exercised by the RBI or by the Government.

In tune with its role as a facilitator of industrial development and investment, the Department plays an active role in investment promotion through dissemination of information on investment climate and opportunities in India and by advising prospective investors about licensing policy and procedures, foreign collaboration and import of capital goods etc. The information about policy and procedures is also available at internet website DIPP of the Department.

Department of Industrial Policy and Promotion is also responsible for Intellectual Property Rights relating to Patents, Designs, Trade Marks and Geographical Indication of Goods and oversees the initiative relating to their promotion and protection. These

include the outlining of policy and its implementation through the Office of the Controller General of Patents, Designs and Trade Marks. It promotes awareness regarding protection of the Intellectual Property Rights inherent in industrial property in conjunction with the World Intellectual Property Organisation (WIPO) and apex industry organisations apart from similar initiatives involving regional industry associations. It also provides inputs on various issues relating to the Agreement on Trade Related Aspects of Intellectual Properties (TRIPS) related to World Trade Organisation (WTO) in these fields.

The Department undertakes technical cooperation programmes with the World Intellectual Property Organisation (WIPO), Geneva for the modernisation and up gradation of intellectual property administration relating to patents, designs, trademarks and geographical indications and the organization of Human Resource Development and awareness generation activities in the country.

The Department is the nodal point for the promotion of productivity in the industrial sector. It undertakes programmes of technical cooperation with the Asian Productivity Organisation (APO), Tokyo by sourcing experts to advise on productivity related projects and by deputing officials from the private and public sector to programmes conducted by the APO in the industry, agriculture and service related sectors. It also promotes the adoption of quality standards relating to the ISO 9000/14000 series through the accreditation services provided by National Boards for Certifying Bodies and Auditors and Trainers under the Quality Council of India, which has been certified by international accreditation bodies.

International cooperation for industrial partnerships is achieved through both bilateral and multilateral arrangements. At bilateral level, in addition to being nodal Department for Indo-Swedish, Indo-Libyan, Indo-Hungarian and Indo-Belarus Joint Commissions, the Department is represented on joint commissions and joint working groups for promoting

industrial, technical and scientific cooperation with select countries serviced by other Ministries/Departments. Similar initiative is also in place with the European Union. This Department is the nodal agency in the Government of India for various instruments of the Asia-Invest Programme of the European Commission. This Department also coordinates with apex Industry Associations such as FICCI, CII, ASSOCHAM in their activities relating to promotion of industrial cooperation and to stimulate foreign direct investment into India besides participating in the Joint Business Councils and other interactive sessions organised by FICCI, CII and ASSOCHAM etc.

Department of Industrial Policy and Promotion is the nodal Department in Government of India for coordinating and implementing programmes with United Nations Industrial Development Organization (UNIDO) in India. UNIDO is a specialised agency of United Nations with a mandate to act as the central coordinating body for industrial activities within the United Nations system. India has been an active Member of the Organization since its inception. Under the country service framework, UNIDO's activities in India are primarily focussed in the fields of strengthening competiveness of the industry through technology upgradation, promoting investment and promoting cleaner and environmentally sustainable technologies.

With liberalisation of the industrial licensing regime, only 6 categories of industries require industrial licensing under the Industries (Development and Regulation) Act, 1951. These sectors have been kept under compulsory licensing considering their significance from environment, public safety and strategic considerations. All industries, which do not require an industrial license, are required to only submit an Industrial Entrepreneurs' Memorandum (IEM).

The Department monitors the industrial sector through information on Industrial Entrepreneurs' Memorandum (IEM), Letter of Intent (LOI) , Foreign Collaboration (FC)

approval and inflows and industrial production returns. The Department also coordinates the progress of 'infrastructure sectors' approved for investment/technology transfer, promotion of private investment including foreign investment in the infrastructure sector. The Department also compiles sectoral policies, strategies and guidelines on infrastructure sector.

The Department administers the following Central Legislations through its attached/subordinate offices and statutory organizations:

Central legislations relating to Intellectual Property Rights (IPR's), namely, the Patents Act, 1970, the Trade and Merchandise Marks Act, 1958 and the Designs Act, 2000 and their associated rules are administered through the Office of the Controller General of Patents, Design and Trademarks (CGPDTM). Balanced regional development through locational dispersal of industries has been one of the principal objectives of the successive Five Year Plans and Government's Industrial Policy. The Industrial Policy of 1991 aims, inter-alia, to spread industrialization to backward areas of the country through institutions, appropriate initiatives and infrastructure investments that would facilitate private investment. The Department also promotes industrial development of industrially backward areas through its various schemes and incentives and the new Industrial Policy Package for the North Eastern region, Jammu & Kashmir, Himachal Pradesh and Uttaranchal is step in that direction. The Department of Industrial Policy & Promotion is the nodal agency for development of industries through research and development institutions. It is also taking initiative for enhancing competitiveness of Indian industry through its up gradation of Industrial Clusters and Technology Modernisation Scheme, to be implemented in the 10th plan period.

3.4 Preference to Make in India : The Government has issued Public Procurement (Preference to Make in India) PMI Order 2017 vide the Department of Industrial

Policy and Promotion (DIPP) Order No. P-45021/2/2017-B.E.-II dated 15.06.2017 which is further revised vide No. P-45021/2/2017-PP (BE-II) dated 28.05.2018 to encourage 'Make in India' and to promote manufacturing and production of goods and services in India with a view to enhancing income and employment.

i. DIPP has identified Department of Telecommunications as the nodal Department for implementing the provisions related to procurement of goods, services or works related to the telecommunication sector.

ii. Accordingly, in furtherance of the aforesaid Public Procurement (Preference to Make in India), Order 2017 (hereinafter called as PPP-MII Order), and in supersession of notification of this Department's Policy for Preferential Market Access (PMA) dated 5th October 2012 and notification for value addition criterion dated 11th January 2017, the Department of Telecommunications, hereby notifies that the aforesaid Order shall be applicable for telecom products, services or works in full except as specified in this notification .

iii. It is clarified that this notification shall be applicable to all Central Schemes (CS)/ Central Sector Schemes (CSS), for which procurement is made by States and Local Bodies, if that project or scheme is fully or partially funded by the Government of India including Universal Service Obligation Fund (USOF) projects.

iv. In terms of clauses 2, 3 and 11 of PPP-MMI(Public private partnership under make in India) Order, the Department of Telecommunications has prepared a list of telecom products, services and works for their purchase preference from local suppliers for public procurement. The list of telecom products, services and works along with their ***Preference to Make in India*** (***PMI) and their Local Content (LC)*** are in **TABLE-2A.** The local supplier has to manufacture equipment from

component level in India and also develop local vendors for procurement of raw materials, components and parts for increasing local content. The Department has identified conditions for the inputs to be qualified as Local Content and maximum ceiling for design as LC out of total LC which are in **TABLE-2B** and **TABLE-2C** respectively[10].

v. In terms of clauses 3(a) and 11 of the PPP-MII Order, it is declared that list of telecom product, services and works in **TABLE-2A** have sufficient local capacity and local competition. It is hereby notified that the procuring entities will procure a minimum percentage as indicated under Preference to Make in India (PMI) of their telecom products, services or works requirements fulfilling Local Content (LC) criterion prescribed against each item as in **Table A**.

vi. Clause 14 (a) of PPP-MII Order regarding powers to reduce the minimum local content below the prescribed level stands withdrawn from Ministries/Departments of Government of India and the Boards of Directors of Government companies or autonomous bodies.

vii. This power vests only with Standing Committee as constituted under clause 16 of PPP-MII Order.

i. In terms of clause 9(a) of PPP-MII Order, the local supplier at the time of tender, bidding or solicitation shall provide self-certification in **Form-1** specifying that the item offered meets the minimum local content and shall give details of the location(s) at which the local value addition is made.

ii. Each identified products, services or works as in **TABLE-2A** shall comply with the latest TEC GR/IR, if such GR/IR has been issued. The procuring entity may

[10] http://dot.gov.in/sites/default/files/2018_11_02%20DOT%20PMA.pdf

ensure that prior experience clause is not too restrictive to exclude all local suppliers of telecom product, services or works. All Procurement Officers may be required to certify compliance of this order before uploading tenders on Central Public Procurement Portal (CPPP). Disciplinary action will be taken against erring officers who insert restrictive tender conditions against local suppliers with malafide intent or otherwise flout the provisions of PPP-MII Order.

iii. For compliance of GR/IR or any national standard, certification from Indian bodies i.e. TEC/TSEC, STQC, BIS or any accredited lab by them, is a mandatory requirement to be submitted by the bidder. For any telecom product, service and work as in **TABLE-2A**, the procuring entity should not specify to bidder to mandatory qualify any foreign eligibility specifications or certification(s) issued by any foreign testing/security lab(s).

iv. In case a complaint is received by the procuring entity or the concerned Ministry/Department against the claim of a bidder regarding local content in telecom products, services or works or in case of a question whether an item being procured is a telecom product, service or work to be covered under the notification or any doubt in respect of telecom products, services or works, reference shall be made to Telecommunications Engineering Centre (TEC), Department of Telecommunications or technical auditor as accredited by the Telecommunications Engineering Centre (TEC), Department of Telecommunications, New Delhi.

Table 2A

List of Telecom Products, Services and Works with PMI and LC

[Preference to Make in India (PMI) and their Local Content (LC)]

Sl. No.	Telecom Products, Services and Works	Year 2018-19		Year 2019-20 onwards	
		PMI	LC	PMI	LC
1.	Encryption/UTM platforms (TDM and IP)	100	65	100	65
2.	IP/MPLS Core routers/ Edge/ Enterprise Router	50	55	50	60
3.	Managed Leased line Network equipment	50	55	50	60
4.	Ethernet Switches (L2 and L3), Hubs	50	55	50	60
5.	IP based Soft Switches, IMS, Unified Communication Systems	100	55	100	60
6.	Wireless/Wireline PABXs / IP PBX & / Media Gateways	100	65	100	65
7.	CPE (including Wi-Fi Access points and Routers, Media Converters), 2G/3G/4G/LTE Modems, Leased-line Modems, NFV/SDN CPE	100	45	100	50
8.	Set-Top Boxes	50	50	50	55
9.	SDH/Carrier-Ethernet/MPLS- TP/ Packet Optical Transport equipment/ PTN/ OTN systems	100	65	100	65
10.	DWDM/CWDM systems	50	55	50	60
11.	GPON / XGS-PON, NG-PON2 equipment (including ONT and OLT)	100	55	100	60
12.	Optical/SDH/PDH Cross Connects/ OTN Cross-connects and optical MUX,OADM	100	55	100	60
13.	Small size 2 G/3 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	100	55	100	60
14.	2 G/3 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	50	55	50	60
15.	Small Size LTE/LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNodeB, Small Cells, EPC, NIB C-RAN BBU and RRH ,LTE/LTE-R/4.5 G/ 5 G based broadband wireless access systems (eNodeB, gNB, EPC, etc.)	50	55	50	60
16.	LTE/LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNode B, Small Cells, EPC, NIB C-RAN BBU and RRH ,LTE/LTE-R/4.5 G/ 5 G based broadband wireless access systems (eNodeB, gNB, EPC, etc.)	50	45	50	50
17.	Wi-Fi based broadband wireless access systems (Including Access Point,	50	50	50	55

	Aggregation Block, Core Block), Integrated Broadband system				
18.	Microwave Radio systems (IP/Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI)	100	50	100	55
19.	Software Defined Radio, Cognitive Radio systems	50	50	50	55
20.	Repeaters (RF/RF-over-Optical), IBS, and Distributed Antenna system	100	55	100	60
21.	Satellite based systems –Hubs, VSAT Disaster Communication Systems etc.	50	35	50	40
22.	Copper access systems (DSL/DSLAM), high-speed xDSL (G.fast)	50	50	50	55
23.	Network Management systems (NMS) with its various derivatives	100	65	100	65
24.	Security and Surveillance Communication Systems (video and sensors based) including Perimeter Security Systems	100	35	100	40

25.	Optical Fiber	50	50	50	50
26.	Optical Fiber Cable	75	50	75	55
27.	Telecom Power System (Including Solar Power)	50	50	50	55
28.	Telecom Batteries (Lead Acid & Li-ion)	50	50	50	55
29.	IP audio phones / IP video Phones / Analog adaptor	50	35	50	40
30.	SDN Software Controllers, NVF and CNF software	50	50	50	55
31.	Telecom Cloud infrastructure, Telecom Data centers	50	35	50	40
32.	2 way Analog/Digital radio including Walkie-Talkie & Mobile Radio	50	50	50	55
33.	Batteries of 2 way Analog/Digital radio including Walkie-Talkie	50	40	50	45
34.	Fiber Monitoring System	50	50	50	55
35.	M2M/IOT Subsystems	50	50	50	55
36.	Telecom Services/Works	100	70	100	70

PMI =Minimum preference in % (of total quantity being procured) for Make in India Telecom Products, Services or Works as indicated against each financial year.

LC = Minimum Local Content as a percentage of total Bill of Material (cost of production) to qualify as Make in India Telecom Products, Services or Works as indicated against each financial year.

TABLE-2B

Main Inputs /stages for manufacture of telecom products & conditions for the inputs to be qualified as Local Content

Main Inputs /stages for manufacture of telecom products *	**Conditions for the inputs to be qualified as Local Content**
(1) Design (a) Hardware design (b) Software Design & Development	The maximum Local Content (LC) percentage for Design which can be claimed by a Local manufacturer for the telecom products based on in- house/in country R&D costs incurred/amortized to create IPR in India are as per **TABLE-2C** subject to the condition that: (a) The Intellectual Property Right (IPR) resides in India for Hardware Design, (b) The Copyright is in India for the

	software Design & Development.
(2) Components (a) Integrated chips (ICs) – Processor, Memory etc. (b) Active components – Transistors, Diodes etc. (c) Passive Components – Resistors, Capacitors, Inductors etc.	Manufactured in India
(3) PCBs (a) PCB Fabrication (b) PCB population using components	Manufactured in India
(4) Cables/Chassis etc. (a) Chassis (b) Cables (c) Racks (d) Heat sinks (e) Enclosures	Manufactured in India
(5) RF Components/Subsystem (a) Duplexers/Filters (b) Antenna	Manufactured in India
(6) Assembly/Integration/Testing#	The upper ceiling limit of Domestic Local Content (LC) for Assembly/ Integration/ Testing in respect of the telecom products listed in **TABLE-2C** would be 10% of the total product Bill of Material (except S. No. 25,26 and 36)
* The product may include some/all of the input/stage as mentioned above. While calculating only those inputs/stages will be calculated which are involved in the manufacturing of these telecom products. # In case a system of its subsystem is merely assembled / integrated / tested, then actual Local Content shall be taken as up to 10% only of the cost of system / subsystem.	

TABLE-2C

Maximum ceiling for Design as Local Content out of total LC for Telecom Equipment

Sl. No.	Telecom equipment Description	Maximum ceiling for Design as Local Content out of total LC
1	Encryption/UTM platforms (TDM and IP)	55
2	IP/MPLS Core routers/ Edge/ Enterprise Router	40
3	Managed Leased line Network equipment	40
4	Ethernet Switches (L2 and L3), Hubs	40
5	IP based Soft Switches, IMS, Unified Communication Systems	40
6	Wireless/Wireline PABXs / IP PBX & / Media Gateways	45
7	CPE (including Wi-Fi Access points and Routers, Media Converters), 2G/3G/4G/LTE Modems, Leased-line Modems, NFV/SDN CPE	30
8	Set-Top Boxes	35
9	SDH/Carrier-Ethernet/MPLS- TP/ Packet Optical Transport equipment/ PTN/ OTN Systems	45
10	DWDM/CWDM systems	40
11	GPON / XGS-PON, NG-PON2 equipment (including ONT and OLT)	40
12	Optical/SDH/PDH Cross Connects/ OTN Cross-connects and optical MUX,OADM	40
13	Small size 2 G/3 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	40
14	2 G/3 G GSM based Base Station Systems, with its various derivatives including rural & disaster response, Macro & Micro BTS, Small Cells, NIB, C-RAN BBU and RRH	40
15	Small Size LTE/LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNode B, Small Cells, EPC, NIB C- RAN BBU and RRH ,LTE/LTE-R/4.5 G/ 5 G based broadband wireless access systems (eNodeB, gNB, EPC, etc.)	40
16	LTE/LTE-R Based Mobile Systems, with its various derivatives including rural & disaster communications, Macro & Micro eNode B, Small Cells, EPC, NIB C-RAN BBU and RRH ,LTE/LTE-R/4.5 G/ 5 G based broadband wireless access systems (eNodeB, gNB, EPC, etc.)	35
17	Wi-Fi based broadband wireless access systems (Including Access Point, Aggregation Block, Core Block), Integrated Broadband system	35
18	Microwave Radio systems (IP/Hybrid), Mobile Front haul BBU and RRH (CPRI, eCPRI, FlexE, RoE, NGFI)	35
19	Software Defined Radio, Cognitive Radio systems	35
20	Repeaters (RF/RF-over-Optical), IBS, and Distributed Antenna system	40
21	Satellite based systems –Hubs, VSAT Disaster Communication Systems etc.	25
22	Copper access systems (DSL/DSLAM), high-speed xDSL (G.fast)	35
23	Network Management systems (NMS) with its various derivatives	50
24	Security and Surveillance Communication Systems (video and sensors based) including	30

	Perimeter Security Systems	
25	Optical Fiber	NIL
26	Optical Fiber Cable	NIL
27	Telecom Power System (Including Solar Power)	30
28	Telecom Batteries (Lead Acid & Li-ion)	30
29	IP audio phones / IP video Phones / Analog adaptor	15
30	SDN Software Controllers, NVF and CNF software	15
31	Cloud infrastructure, Data centers	20
32	2 way Analog/Digital radio including Walkie-Talkie & Mobile Radio	30
33	Batteries of 2 way Analog/Digital radio including Walkie-Talkie	30
34	Fiber Monitoring System	35
35	M2M/IOT Subsystems	35

Chapter 4 . Research & Development –Policies &Plan

4.1 R&D Background :

Research and Development (R&D) in telecom would play a key role in achieving the objectives of the NTP99 & 2012 and in the Development of telecom services and other related sectors. At present, the centre for Development of Telematics (C-DOT) is the main R&D Centre for telecom in the country. Academic institutions like the IITs and other public & private sector organizations are also involved to some extent. Though, indigenously developed switching technology has greatly improved the telecom network and connectivity, indigenous R&D could not keep pace with the rapidly changing telecom technologies. Rapid changes in telecom technology, short life cycles of products, lack of indigenous components, slow up gradation of hardware and non adherence to targeted time-frames are nullifying the efforts and achievements of indigenous R&D. In the absence of indigenous technology, manufacturing units are importing SKD/CKD (semi know Down/ completely know Down) kits for manufacturing of telecom equipment from foreign suppliers. Government policy has been to promote develop and strengthen the telecom manufacturing within the country..

The 12th Plan has accorded significant focus to build a national capability to achieve self reliance in telecom/ICT equipment design & manufacturing as economic disadvantage being dependent majorly on foreign telecom/ICT equipment. The Government is intending to prescribe that the domestic industry should start meeting about 30% of the demand from the beginning of the 12th plan

and to reach to a level by 70-80% by the 2020. The volume of this business is estimated to be of the order of Rs 2,50,000 crore by the end of 12th Plan[11].

Further, TRAI recommendations have stressed the need of creating Market Pull for indigenous products while incentivizing the operators for its use. It has also recommended having strong R&D, Product development and commercialization flow; further it has recommended financial support and tax incentives for Indian products, to help them overcome financial handicaps and long term working capital at international rates, for domestic and export sales.

The subgroup noted that as a country having large talent base must leverage its huge domestic market towards strengthening the Indian Product industry. Product industry requires less capital as compared to simple assembling / manufacturing industry, and is therefore ideally suitable for India. There was a considerable discussion on using preferential market access. It was unanimously agreed that government procurement and government funded projects should have clear preference for Indian Products to the fullest extent possible. It was also agreed that telecom operators should have an obligation to buy Indian Products (IP) or Indian Manufactured product (IMP)and work out a plan to gradually increase indigenous product content in their network. The operators should be given incentives (in form of concessions in license fees) as they increase indigenous content in their network. It was however felt that penalties would not be the preferred option and instead the operators should commit to support and nurture Indian products.

[11] Planning commission XII plan recommendation on telecomm sector

4.2 PPP Model Telecom Centres of Excellence (TCOE)

The objective of the IITCOE is to research, teaching, training and advisory role in the field of telecom policy, governance, regulation and management especially marketing and customer care with a view to enable the telecom and related sectors to take up the challenges as they arise.

Telecom Centres of Excellence, set up in Public Private Partnership (PPP) mode, are an example of the Government, the Academia and the Industry working together for the sustained growth and progress of the country in the Telecom sector. The idea of Telecom Centres of Excellence was initiated with the shared realization, by the Government and the Telecom Industry, that boosting the growth of telecommunications was essential for the overall progress of the country. It was conceptualized in May 2007 and brought into existence by February 2008 with the signing of 7 MoUs between DoT, participating premier Academic Institutes and the sponsors from the Telecom Industry. The eighth TCOE with participation of Railtel came up in Jun 5th 2013.The TCOEs set up in Public Private Partnership (PPP) mode, are an excellent example of the Government, the Academia and the Industry working together for the sustained growth and progress of the country.

TCOEs are created for promoting development of new technologies, to generate IPRs incubate innovations and promote entrepreneurship to position India as a global leader in telecom innovation and making India a hub of telecom equipment manufacturing. TCOE were set up with the sole idea of promoting Research and Development and for promotion of entrepreneurship and innovation aspects in the ICT and Telecom sector. TCOEs have opened up their research platform to all the stakeholders of ICT sector for enabling industry driven research through a competitive process. For this purpose, a TCOE may have collaboration with other academic institutions and funding for the

projects would be accessed from Government, industry and VCs etc. on competitive basis.

4.3 The C-DOT development of GPoN, Broadband Tech, Radio Access Network

During the 11&12 th plan period, C-DOT undertook technology development programs in-line with the broad objectives of the planned period, which laid emphasis on the emerging areas such as Next Generation Networks (NGN), wireless broadband, telecom network security, infrastructure sharing to accelerate the penetration of telecom network in the rural sector, and indigenous manufacturing of telecom equipment.

C-DOT made significant progress in the execution of its technology road-map set-out for the 11th plan period. Many of research programs are either in field /pilot technology trial phase or in the advance stage of development. Some of the major technology achievements are summarized as follows.

- MAX-NG - Migration of C-DOT-based fixed-line technology to packet-based Next Generations Networks (NGN). The technology will help BSNL to extend the life of legacy networks based on C-DOT circuit-switched technology and provide services of the next generations networks
- GPON (Gigabit Passive Optical Network) indigenous development, useful for the broadband delivery over Optical Fibre Cable (OFC) network catering to high

bandwidth solution for the business applications in Metros and e-governance solution in Rural areas

- SG-RAN (Shared GSM Radio Access Networks) technology allows mobile active infrastructure sharing to give affordable mobility to rural India thereby expanding the telecom penetration to rural sector.
- C-DOT ATM technology customization / adaptation for defence applications caters to requirements of strategic sector like naval programs for setting-up onboard communication network completely based on indigenous technology.
- CMS (Centralized Monitoring System) technology caters to the requirements of security management for law enforcement agencies for interception, monitoring, data analysis /mining, anti-social-networking using the country's telecom infrastructure for unlawful activities. These technology programs as well as on-going technology enhancements of the deployed technology are yielding desired commercial results more during last decade.

C-DOT: List of Major Technology Development Scheme in the 12th Plan(2012-17)

TABLE 3A

S. No.	C-DOT Major Technology Development Schemes planned in the 12th Five Year Plan period	
	Technology Schemes	Major Project Activities
1.	Communication & Security Research & Monitoring	Centralized Monitoring System (CMS) – Implementation & Roll-out in the field
2.	Broadband Technologies	R&D for Terabit Router
4.	Technology Enhancements / Upgradation and adaptations & Technical Support	Shared GSM Radio, MAX-NG / NGN, ATM Support, NMS Support, Software intensive Applications, etc.
A2	New Schemes proposed for the 12th Plan	
1.	Next Generation Mobile Technology	R&D for emerging Wireless Technologies for Broadband/& Adhoc Mesh Networks - 4G
		Technology etc.
2.	Career Networks' Transport	Optical Technologies –

	Technology	XGPON-1/2, WDM-PON, DWDM, all Optical Network Platform
3.	Secure Wireless & Wire-line Networks	Development for a secure Mobile Communication Network namely WiPS based
		GSM technologies like EDGE & 3G, pan India implementation for fixed-line Secure & Dedicated Communication Network (SDCN) etc.
4.	Satellite based Technology	Satellite based Products to meet the requirements of region having tough terrains, hilly areas, scattered population over different & distant areas of the region, such as, North East, Tribal, etc.
5.	Telecom Services & Applications	R&D for converged NMS, Software intensive Applications for new services, service
		delivery platform to support multiple applications and Value Added Services (VAS)
6.	Enabling Technologies & Telecom Networks	Feasibility studies/pilots/consultancy on emerging telecom technologies & piloting trials to gain operational insights & applications of technologies and related Issues
7.	Power efficient and Green Technologies for Rural	R&D for exploring alternative sources of energy, design optimization to enhance the

		systems' power efficiency and technology trials for rural sectors
8.	Next Generation security for	R&D for enhancing the present interception
	Telecom & Data Networks	techniques, encryption/decryption, data-mining, etc., to enhance the network security to combat the emerging security threats

TABLE 3B

C-DOT Telecom Technology areas for R & D funding

Broad Area	**Segment which is addressed**	**Products that can be developed**	**Core technologies involved**
Wireless	Wireless Broadband Access / Backhaul	HSPA+ 4G/5G systems IBS/DAS systems Pico cells/femto cells based Products Multi protocol low range compact base stations IP/Hybrid microwave radios E Band Radios in 60/70/80GHz	Smart Antennas Cognitive radios Software Defined Radios Advanced DSP Coding &Modulation Techniques mm-Wave wireless systems Switching/packet processing
		for 1/10Gbps links	

	Active Infrastructure sharing	Shared small size GSM Radio Access Network	Sharing of BSS (BSC, BTS, TRAU and OMCR)
	Wireless Network Planning	Software tools for wireless network planning and Optimization	Wireless RF propagation models for Indian terrain (keeping in mind high
		Software tools for Wireless service assurance and network	density, vegetation & spectrum allocated)
		Performance monitoring/reporting	Algorithms for KPIs keeping in mind Indian regulatory Requirements Spectrum efficiency Optimization
Optical	Broadband Access	10G/40G PON systems WDM-PON systems Hybrid WDM-TDM-PON systems Carrier Ethernet	Burst Mode optical transmitters and receivers at 10G/40G Injection locked optical Sources Broadband light sources Cyclic AWGs Switching/packet processing
	Backbone networks	Ultra dense WDM systems All optical network platform ASON software platform for ROADM	Raman amplifiers Coherent optical transmitters/receivers Integrated optical devices

			like switches All optical wavelength Convertors
	Metro/Aggregation network	Next-Gen SDH with packet transport & OTN compliant interfaces Packet Optical Transport Platform	IP cores for packet & OTN compliant interfaces leading to FPGAs, ASICs, TDM and IP switching, Mappers, Framers etc.
IP	Ethernet transport/aggregation – carrier grade	PBT based on PBB-TE and MPLS-TP SIP application servers and soft-Switches Session border controllers Terabit routers	IP Switching, Cores leading to ASICs, protocols, algorithms and software stacks
	Multi service platform	MSPP with MEN/xDSL/XPON interfaces with Gbps backhaul supported by MPLS-TP profile	IP Cores leading to ASICs, protocols, algorithms and software stacks
Telecom Security	Network Security	Lawful intercept monitoring systems supporting voice/video/data services Location based monitoring Systems Secure IP communication devices and equipments, Hardware-	Algorithm for interception of connection oriented networks, Algorithms for interception of VoIP , Video over IP, GPS based monitoring Systems
		based Encryptors	Encryption technologies

	Common criterion certification lab	NE level security conformance testing from cyber attacks Application level security conformance testing from cyber	Telecom Product testing & infrastructure building
		Attacks	
Telecom Services & Applicati Ons	Converged Network Managemen t System	Service Provisioning and Management System Decentralized Mediation Systems	Mediation support for both legacy and standard based NEs Core architecture to support Multi-vendor, multi technology, multi-browser, multiple platforms
	Virtual data centres		Virtualization and cloud Computing
	Account settling for	Data Clearing House	TAP procedures
	TSPs		
	Service Delivery Platforms for supporting multiple applications and VAS	North and South band interfaces to TSPs NOC to support OSS & BSS Future proof solution supporting education, entertainment, enterprise applications for delivery over wireless	

		infrastructure to the smart-phones/tablets/ embedded laptop devices	
Public safety	Bio engineering studies on EMF radiation impact	Base stations with less than 1W emissions Handsets with few microwatt SAR	
Mobile hand-Held devices and CPEs	3G/4G handsets CPEs	Indian OS to replace Android, Symbion Low power consuming rugged handsets with innovative charging stations Smart phone, tablets & other handheld devices Mobile VAS Customer Premises Equipment	Algorithms for conversion to vernacular languages Charging with Embedded solar cells, low power electronics etc. SoC, DSP algorithms
		for broadband	
Telecom related electroni Cs	Network powering	Solar Hybrid power solution systems Enhanced high capacity and efficient batteries for networking equipments and devices	Reliable, efficient and cost effective solar cells Battery design; material engineering

4.4 Testing & Standardization

The Indian Telegraph (Amendment) Rules, 2017, provides that every telecom equipment must undergo prior mandatory testing and certification. The detailed procedure for Mandatory Testing and Certification of Telecom Equipments (MTCTE) under these rules are notified by Telecom engineering centre (TEC) of Govt of India .The testing is to be carried out by Indian Accredited Labs and based upon their test reports, certificate shall be issued by TEC[12].

Type Approval and Interface Approval of telecom products against TEC issued Generic Requirements (GRs) and Interface Requirements (IRs) are given by TEC after due testing procedure.

Also, Internet Protocol Version 6 (IPv6) Lab setup by Telecommunication Engineering Centre (TEC) has earned a unique distinction of being approved by IPv6 Ready Logo Committee under IPv6 Forum which is an International body. This achievement is significant for TEC and the country, as very few other labs in the world have achieved this milestone. India has thus joined Europe and a select group of countries, which include USA, Japan, China, Taiwan, France and Korea. This test lab caters to Conformance as well as Interoperability testing of various software/ equipment, which have implemented IPv6. It has also the capability of examination of test results sent by other IPv6 Ready Logo approved labs.

Major IT/telecom products being used across markets are primarily based on global standards. For example, mobile/ broadband devices and network infrastructure products are based on global standards like GSM, LTE, Wi-Fi etc. Harmonization of these standards to work across networks is critical. India being a large market for such products, it may

[12] http://www.tec.gov.in/certification-approval-procedure/

therefore be necessary that India specific requirements / specifications are incorporated considering our local needs. In view of the same, need for domestic specification factoring these requirements in the national standards becomes critical.

"Procedure for Certification of Telecommunication Equipment" was published by TEC (Telecommunication Engineering Centre) on 24 May 2017. Hence, the issues pertaining to certification of Telecom Equipments has been resolved up to some extent.

The equipment Testing Lab shall be setup in large scale so that Public & private companies can avail that facility on lease or payment basis for their manufactured telecom Products.

Chapter 5. Telecom Industry in China & other countries

5.1 Background

Before 1994, the Ministry of Posts and Telecommunications (MTP) provided telecom services through its operational arm, China Telecom. Pressured by other ministries and dissenting customers, the Chinese government officially started the telecom industry reforms in 1994 by introducing a new competitor: China Unicom. China Unicom could hardly compete with the giant China Telecom.

The Chinese telecommunication sector's growth rate was about 20% between 1997 and 2002. China fixed-line and mobile operators have invested an average of US$ 25 billion on network infrastructure in the last years, which will be more than all western European carriers combined. As a result, with 1.4 billion citizens, China has the world's largest fixed-line and mobile network in terms of both network capacity and number of subscribers.

China's accession to the World Trade Organization (WTO) on December 11, 2001 resulted in the gradual opening of the telecom services market to foreign companies.

In 1998, due to a ministerial reorganization, the MTP was replaced by the new Ministry of Information Industry (MII). In 1999 the first restructuring split China Telecom's business into three parts (fixed-line, mobile and satellite). China Mobile and China Satcom were created to run, respectively, the mobile and satellite sectors but China Telecom continued to be a monopoly of fixed-line services.

The second restructuring in 2002 split China Telecom geographically into north and south: China Telecom - North kept 30% of the network resources and formed China Netcom (CNC) and 70% of the resources were retained by China Telecom - South or simply the new China Telecom.

The Chinese telecom industry has changed from a state-run monopolistic structure to state-run oligopolistic structure.

The MII is responsible, among other duties, for elaborating regulations, allocating resources, granting licenses, supervising the competition, promoting research and development and service quality as well as for developing tariff rates. The MII has built up a nationwide regulatory system composed of Provincial Telecommunications Administrations (PTA) with regulatory functions within their respective provinces. A number of other significant institutions also influence the industry, such as the State Development and Reform Commission (SDRC).

5.2 Foreign participation

Foreign equipment vendors were allowed to invest in China after its accession in WTO in 2001 . Authorization for the investments was conditioned on technology transfer. International telecom carriers (service provider)were banned from accessing the market.

As part of the WTO commitments, the Chinese government is opening gradually the carriers market to foreign investors. In 2005 foreign investors were authorized to form joint ventures, investing up to 50% in Internet services in the whole country, up to 49% in the mobile sector in 17 major Chinese cities and up to 25% in fixed-line basic services in Beijing, Shanghai and Canton (Guangzhou).Finding a Chinese partner to form a joint venture with, preferably a major carrier is mandatory for a foreign company wishing to access the Chinese market.

Foreign investments come, in order of importance, from the United States, Canada, Sweden, Finland, Germany, France, Japan and South Korea. Main companies from these countries already have one or more Joint Ventures, not all of which are ultimately successful.

5.3 Market overview

As of 2009, the telecom operators in China are exclusively Chinese: two fixed-line operators with nationwide licenses - China Telecom and China Unicom - three mobile carriers - China Telecom (CDMA and CDMA2000), China Mobile (GSM and TD-SCDMA) and China Unicom (GSM and WCDMA). As of March 2012, China has 284.3 million fixed-line subscribers and 1.01 billion mobile customers.

China Telecom is one of the largest telecommunication in China, including 31 semi-autonomous provincial enterprises in mainland China. It runs land-line and mobile phone networks, operates PAS system and provides telecom network-based voice, data, multimedia and information services. In 2008, the company acquired CDMA network from China Unicom. In Jan 2009, China Telcom was one of the three companies having 3G license, CDMA2000.

- China Mobile operates basic GSM services and value-added services such as General Packet Radio Service (GPRS) data transfer, a TD-SCDMA 3G network, IP telephony and multimedia. It ranks the first in the world in terms of network scale and customer base.[9]
- China Unicom merged with China Netcom in October 2008 and obtained WCDMA license in Jan 2009. The company offers mobile phone services, operates domestic and international landline network, and provides broadband multimedia services and IP telephony and value-added services. China Netcom was acquired by China Unicom in October 2008.

5.4 Network equipment suppliers in China

The leading international suppliers of network equipment - Alcatel-Lucent, Cisco, Ericsson, Huawei, Nortel and Siemens - as well as the major international suppliers of portable phone sets - Ericsson, Motorola, Nokia, Samsung, and also Siemens - are well known in China.

A large number of Chinese companies compete now with foreign corporations not only in the Chinese market but also in other countries. Datang is the main TD-SCDMA manufacturer, and UTStarcom, the main PAS/PHS manufacturer. Huawei leads the SMS market and Great Wall stands out in the broadband sector. Other recognized Chinese equipment suppliers are Shanghai Bell and Zhongxing Telecommunications Equipment (ZTE). Furthermore, Amoi, Konka, Ningbo Bird and Kejan are the most representative Chinese mobile phone manufacturers.

5.5 The Information Technology Agreement (ITA) in WTO &ICT Industry

The Information Technology Agreement (ITA) in WTO has been one of the most commercially successful trade agreements ever undertaken, for the global economy, for the information and communications technology (ICT) industry, and for nations that signed the agreement—particularly China. Exports of ICT goods of China's have grown 30 percent annually,far outstripping the average 7 percent annual global increase in ICT goods exports, reaching $554 billion in 2012.1 Just as the ITA has tremendously benefitted China's economy, ICT industries and enterprises, and workers and consumers, so will an expansion of the ITA such as by making multi-component semiconductors (MCOs) and other key goods are part of an expanded ITA.

In December 1996, 29 World Trade Organization (WTO) members launched the Information Technology Agreement, a novel trade agreement in which participating nations eliminated tariffs on eight core categories of ICT products (including semiconductors, computers, and

telecommunications equipment). The ITA's architects made the benefits of tariff elimination available on a most-favored nation (MFN) basis, meaning that ICT goods exporters from all WTO-member nations could enjoy tariff-free exports on the covered ICT products regardless of whether they participated in the agreement. Participating countries launched the ITA understanding that the 21st century would be an era of information and communications technology and that an agreement

ITA expansion has reduced tariffs paid by Chinese exporters of ICT products by $8 billion, while also increasing Chinese exports of ICT products by $12 billion due to increased global demand for ICT products generated through tariff elimination.

Eliminating tariffs on trade in hundreds of ICT products could play a vital role in promoting affordable access to these technologies for businesses and consumers. Today, 79 nations are ITA signatories, and throughout its almost two decades, the ITA has had a significant impact on expanding trade in ICT products. Since the ITA came into force in 1997, global exports of ICT products have increased approximately 7 percent per year, as trade in ICT products has grown from $1.2 trillion in 1996 to over $5 trillion in 2014. Over this time, the ITA has facilitated the formation of efficient global ICT supply chains and played a critical role in promoting ICT trade and investment, which in turn has driven innovation, boosted productivity, created new companies and new types of jobs, increased employment, and accelerated global growth.

Semiconductors constitute the largest product category covered by the ITA as from 2005 to 2010, semiconductor products experienced the highest export growth rate of any ITA product category, growing at 7.8 percent annually. By 2010, semiconductors accounted for 33 percent of global exports of ICT products. Because semiconductors represent such a foundational input to ICT products and such a foundational component of the ITA itself it's vital that any expansion of the ITA include all semiconductors, including MCOs.

In fact, it's clear that the ITA was intended to cover all semiconductors and integrated circuits (ICs). In 1996, all semiconductors were classified in (harmonized schedule) HS 8541 and HS 8542.

MCOs account for an estimated 1.5 to 3 percent of the global semiconductor market today, but as an innovative new product category these percentages will only increase going forward. Including MCOs would result in global tariff savings of up to $188 million on trade in these products.

In particular, ITA expansion will benefit China by directly contributing to China's economic growth & promoting the diffusion of affordable ICTs that are vital to boosting across-the-board productivity growth and innovation lowering costs for downstream manufacturing and services industries that rely on ICTs as inputs.

The following summarizes the ICT key findings in China:

- ICT accounts for approximately 20 percent of Chinese GDP growth; while ICT production is important for economies, ICT usage (i.e. consumption) is even more important.
- The Information Technology Act (ITA) has played a catalytic role in expanding global two-way trade in ICT products to over $5 trillion annually.
- China has been a key beneficiary of the ITA as its share of global exports of ICT products has increased from 2.2 percent in 1996 to 30 percent in 2012.
- ITA expansion will result in an $8 billion reduction in tariffs incurred by exporters of ICT goods from China.
- Increased global demand for ICT products induced by ITA tariff elimination will increase China's exports of ICT goods by $12 billion annually.
- Cost reductions for ICT products from eliminating tariffs would increase global demand for ICT products by 8 percent.

- ITA expansion will increase the competitiveness of enterprises that rely on ICT components as key inputs for their exported products—for example, more than half of the semiconductors China imports are inputs into final products for export in Global value Chain (GVC).

5.6 ITA Expansion and Innovation in ICT Services Sectors

ITA expansion benefits a wide range of services industries not only just manufacturing industries. Having access to affordable, best-of-breed ICT products is essential for firms in ICT software and services sectors, including business process outsourcing (BPO), systems integration, ICT consulting, application management, custom applications, infrastructure management, software testing, and Web development. Access to affordable, state-of-the-art ICT hardware for China's ICT services sector through ITA tariff elimination has played an important role in helping China build a competitive ICT services sector. In fact, ICT services as a percentage of China's total services exports rose from nearly 25 percent in 2005 to almost 35 percent in 2012, an increase of 40 percent.

Some in China have expressed two principal concerns regarding ITA expansion, particularly as it pertains to China's economy in general and ICT industries in particular. Their first concern is that ITA expansion by eliminating tariffs and thus making imports of foreign ICT products more cost-competitive in Chinese markets—threatens China's efforts to establish nascent semiconductor manufacturing industries. The second is that ITA expansion will cost China tens of billions in lost revenues from duties collected on imports of ICT products that would come under ITA coverage. While at first glance both concerns might appear to be warranted, closer inspection reveals that they are not really so disadvantageous to china.

Over the past several years, China has invested considerable resources in trying to develop an indigenous Chinese semiconductor industry. For example, in December 2013, China

allocated $5 billion to establish a Regional Semiconductor Investment Fund. The Fund intends to invest in:

1. Semiconductor design, manufacturing, assembly, testing, and core equipment with the aim of creating a complete, interactive, and high-end industry chain.

2. Engineering research centers, engineering labs, corporate research and development centers to improve indigenous innovation capabilities and Industry consolidation, mergers, and acquisitions.

According to a government announcement, the official aim of the investment is to "rapidly raise the competitiveness of the integrated circuit industry and create a new 'northern' growth point for China's IC industry, use capital to accelerate the consolidation of resources and firms, and optimize the industry development environment for key Beijing-based or even nationwide firms in the IC industry or large projects and innovation entities or platforms. Chinese officials view the Fund's launch as the first step toward the creation of three to five regionally based "semiconductor development companies" with state backing for the initiative expected to reach $16.5 billion.

As China attempts to establish these regional semiconductor competitors, some hold that China needs to maintain existing tariff levels on non-ITA covered semiconductor products to give indigenous Chinese semiconductor producers a cost advantage and thus shield them to some degree from foreign competition. For example, Yu Jianhua China's Ambassador to the World Trade Organization recently argued that "many industries in China are still in a critical growth stage" and that "it is reasonable to have some sensitive products which should be allowed for exclusion."

In such dynamic, rapidly evolving high-technology industries as semiconductors, enterprises that are shielded from competition at the global frontier of technology development quickly fall behind, producing inferior devices that swiftly become obsolete. In the 1990s, in the

interest of trying to spur development of an indigenous computer manufacturing sector, Mexico's government imposed joint venture and domestic content requirements on leading computer manufacturers including Apple, Compaq, Hewlett-Packard (HP), and others. But by forcing the computer manufacturers to source components from domestic producers whose components were more expensive and of inferior quality, these requirements contributed to the computers coming off Mexican assembly lines being three to four years behind industry standards and selling for prices 150 to 300 percent higher than the world average.

Economist Mr Kaushik and Singh found that for every $1.00 of tariffs India applied to imported computers, the country lost $1.30 due to spillover effects, particularly the productivity losses that occurred in other sectors of the economy as they used relatively less ICT.As the authors wrote, "High tariffs did not create a competitive domestic [hardware] industry, but [they] limited adoption [of ICT by users in India] by keeping prices high. Thus, in the interest of favoring one industry domestic ICT hardware manufacturers India ended up harming all the other industries in its economy. Thus, India's experience with imposing high tariffs on ICT products as part of its import substitution industrialization policies in the 1970s provides a strong example of how higher costs for ICTs whether as a result of high tariffs or a failure to lower them retards productivity growth in other sectors of the economy as well as overall economic growth.

Infant industry strategies represent a form of import substitution industrialization. But as Georgetown University professor Michael Ryan observers, for countries that have tried to implement them, import substitution industrialization policies generally fail "because they

Maintaining high tariffs on ICT products (i.e. by not supporting ITA expansion) is not a step in the right direction toward fostering an innovation. Chinese economy depends on demand conditions that are too protected to produce globally competitive industries. New industries do not become competitive because of trade restrictions. Rather, protections typically resulted

only in inefficient production of inferior products by insulated state owned enterprises. At the same time, import substitution industrialization policies entailed significant costs and wasted resources, as they required complex, time-consuming regulations; promoted inefficiently small industries; and set high tariff rates for consumers, including firms that needed to buy imported inputs. As Paul Krugman and Maurice Obstfeld conclude in *International* Economics: Theory & Policy, "import substitution industrialization policies [have] failed to promote economic development…countries adopting these policies grew more slowly than rich countries and other countries not adopting them."

In contrast, exposing Chinese ICT industries, including semiconductor manufacturers, to competition from leading global competitors will only strengthen Chinese ICT industries in the long run. As Sang Baichun, Director of the Institute of International Business at Beijing's University of International Business and Economics explains with regard to ITA expansion, "Of course some Chinese companies will be under pressure from intensified competition from their foreign peers. But it would be a good thing for the industry's development as a whole, as it will push them to improve their competitiveness". *Forbes* contributor Panos Mourdoukoutas recently argued, Chinese companies need healthy competition to make great leaps forward, to move from "imitation to innovation."

Further, if China wishes to support the development of more globally competitive semiconductor manufacturing industries, this will require sophisticated semiconductor fabrication facilities, and their construction actually relies on a range of parts and components that are an important part of ITA expansion. These include foundational components such as wafer transport and storage cassettes, vacuum pumps, heat exchange units, liquid and gas filtering equipment, valves, and insulated fittings. Many of these components are produced by specialist manufacturers throughout the world, necessitating import. Even if China ultimately intends to domestically produce all these key inputs, that capacity won't exist for

some time. Thus, if China's investments to seed indigenous semiconductor manufacturing industries are to bear fruit, the fabrication facilities will need to leverage best-of-breed technologies in their construction, else there's little chance that the semiconductors coming off production lines will be able to meet the cost and specification requirements of domestic industries, let alone in global markets.

- ITA Expansion Generates Economic Growth that Replaces Lost Tariff Income

A second source of Chinese concerns regarding ITA expansion relates to the impact of loss of tariff income on public finances. For example, on March 18, 2014, it was reported that Chinese WTO Ambassador Yu Jianhua said that, "At the time when [expanded ITA] negotiations are concluded and duties on these products are reduced to zero, China will lose tariff revenue over $27 billion."103 By definition, while tariff income would fall to some degree as a consequence of eliminating tariffs on several hundred additional ICT products, the reality is that this lost tariff revenue would be made up for through a number of mechanisms that ultimately leave the Chinese economy and Treasury in a better position. The academic logic of this effect is clear in reports such as the International Monetary Fund's report *Tax Revenue and (or) Trade Liberalization*, which finds that high-income countries which China aspires to be are clearly able to offset reductions in trade tax revenues with increased domestic tax revenues, and that middle-income countries which China currently is—are generally able to achieve full recovery of reduced trade tax revenue with increased domestic tax revenue.

Moreover, the reality is that the loss of tariff income from Chinese imports of ICT products that would come under ITA coverage as part of ITA expansion is miniscule compared to China's robust and rapidly growing national public revenues. As Chinese Minister of Finance Xie Xuren recently noted, "Fiscal revenue has kept growing rapidly over the past few years." In fact, China's fiscal revenues have been growing at a rate faster than Chinese GDP growth

for some time. For example, in 2011, fiscal revenues grew 2.7 times faster than GDP growth.108 In 2013, Chinese national public revenues reached an all-time record of 12.9 trillion yuan ($2.09 trillion), an increase of 10.1 percent over 2012 income. With the lost tariff income incurred by ITA expansion amounting to just .31 percent of Chinese national public revenue, the argument that China cannot afford the hit to public income that ITA expansion would cause appears to be rather tendentious

5.7 China telecom sector: some facts

The former telecoms regulator the Ministry of Information Industry (MII) reported in 2004 that China had 295 million subscribers to main telephone lines and 305 million cellular telephone subscribers, the highest numbers in both categories. Both categories showed substantial increases over the previous decade; in 1995 there were only 3.6 million cellular telephone subscribers and around 20 million main-line telephone subscribers. By 2003 there were 42 telephones per 100 populations.

Internet use also has soared in China from about 60,000 Internet users in 1995 to 22.5 million users in 2000; by 2005 the number had reached 103 million. Although this figure is well below the 159 million users in the United States and although fairly low per capita, it was second in the world and on a par with Japan's 57 million users.

By the June 2010, China had 420 million internet users. Incidentally, this is greater than the population of the USA, however penetration rate is still relatively low at just under 32%.[3] See Internet in the People's Republic of China

China's 2.7 million kilometers of optical fiber telecommunication cables by 2003 assisted greatly in the modernization process. China produces an increasing volume of televisions both for domestic use and export, which has helped to spread communications development. In 2001 China produced more than 46 million televisions and claimed 317 million sets in use.

At the same time, there were 417 million radios in use in China, a rate of 342 per 1,000 populations. However, many more are reached, especially in rural areas, via loudspeaker broadcasts of radio programs that bring transmissions to large numbers of radio less households.

In March 2012, the Ministry of Industry and Information Technology announced that China has 1.01 billion mobile phone subscribers; of these, 144 million are connected to 3G networks.[13]

[13] https://en.wikipedia.org/wiki/Telecommunications_in_China#cite_note-engadgetmar2012

Chapter 6. Study of Indian Telephone Industries & Private companies

6.1 Background

ITI limited was established in 1948 as the first government departmental factory of independent India. Starting in the earlier era with the vision on attaining self-reliance in the field of telecommunication needs of the country, the company was set up at Bangalore (Karnataka) and was incorporated on 25-01-1950 under the then Mysore companies act, 1938 and later converted as the first PSU. The government of India holds majority equity stake in the company. ITI has its registered & corporate office located at Doorvaninagar, Bangalore-560016.

With the government of India's plans to meet the growing demand of telecommunication network and to develop backward areas by providing employment to local populace, ITI over a period of time , widened its manufacturing bases in the states of Jammu & Kashmir [one unit at Srinagar], Uttar Pradesh [three units at Naini, Raebareli and Mankapur] and Kerala [at peaked]. ITI has provided livelihood to thousands of employees, directly and indirectly, all over the country. All the manufacturing plants are accredited with ISO 9001-2000 standards.

The company achieved sales of Rs. 1611 cr. During the year 2016-17 against Rs. 1253 cr. the previous year 2015-16 registering a 28% growth. The turnover of Rs. 1611 cr. In 2016-17 is the highest turnover in past six years. Net profit for the period increased by 21% to touch Rs. 305 cr. For the years 2016-17, as against Rs. 251 cr. For the previous year. This is the second consecutive year. When the company has made profit. The company has bagged many mega projects of national importance in the last 2-3 years based on which a turnover of Rs. 2000crs. For FY 2017-18 is expected to be achieved.

6.1 Revival plan: The cabinet committee on economic affairs (CCEA), during Feb. 2014 approved a revival plan of ITI by fund infusion to the tune of Rs. 4156.79cr. This package consisted of Rs. 2264 cr. In the form of equity for financial assistance in all the plants of ITI for implementation of new projects and Rs. 1892.79 cr. As arrant-in-aid. Out of Rs. 2264 cr, government has released Rs. 192 cr. As first phase during 2014-15 and rs. 80 cr during 2016-17. This amount has been utilized for upgrading the manufacturing infrastructure at various units of ITI to cater the need of emerging technologies in telecom industry after detailed study of the market and demand for telecom solutions and products prevailing now and expected in the Indian telecom market and demand in future. With the upgraded manufacturing infrastructure, ITI has successfully reverted to its core strength of manufacturing telecom products & solutions, is now in a position to take up manufacturing of any electronic/telecommunication equipment. In fact, ITI is getting benefits from these as ITI is already manufacturing different products for different customers.

Under the revival plan, the projects implemented are defence encryption products, HDPE pipe manufacturing, solar panels, SMPS, MLLN, smart cards, component screening, business with VSSC, contract manufacturing, business with PSUs etc. with the first instalment of Rs. 192 cr. For the year 2016-17, government has made an allocation of Rs. 80cr. For capex and the projects implemented are manufacturing of GPON, HDPE, OFC, Wi-Fi etc., the third instalment amount Rs. 200cr. Allocated in 2017-18 for the projects are in advanced stages of implementation.

6.2 Projects/products under execution: A brief description of projects being taken up for manufacturing under the revival plan is given below[14]:

[14] Annual report DOT 2017-18

- “Bharat net” – G-PON manufacturing: ITI received contracts for turnkey project for supply & installation of GPON equipment for governments flagship project “Bharatnet”. ITI got contract to provide connectivity to about 40000 gram panchayats. ITI is manufacturing the required GPON products and successfully completed supplies of 33000 ONT and 1100 OLT to customers. Broad band connectivity has been provided to about 13000 gram panchayats. The company has established infrastructure for manufacturing OFC cable HDPE pipe, solar panels, Radio modem, Wi-Fi and VSAT solutions required for Bharatnet project.

- HDPE pipe and OFC manufacturing: Laying of optical cable(OFC) underground is to be carried out through PLB HDPE (permanently lubricated high density poly ethylene) Pipe only. ITI raebareli plant has already established an HDPE manufacturing line. The plant is now ready for Bulk production. Considering the huge market available for this product, two more lines have been commissioned at ITI Raebareli plant in addition to the existing manufacturing line for HDPE. An educational order for 100 kms HDPE pipe to BSNL has successfully completed by Rae Bareli unit. The plant is now ready for bulk production. ITI is in the process of establishing one more line at ITI’s southern unit at Palakkad and will be commissioned shortly.

  There is huge demand for optical fiber cables. Looking to OFC demand exected, the company has established one line of OFC manufacturing infrastructure is also being planned at Bangalore unit.

- Encryption products for defence: the encryption products for defence communication networks are being supplied by ITI since long. There are major requirement of encryption products for defence for their NFS, ASCON network etc. this project has

to e executed on turnkey basis which involves civil works, telecom infrastructure establishment and supply, installation & commissioning of equipments. ITI has got order for NFS and is expecting good business in this year in encryption portfolio from ASCON phase IV.

- NFS OFC cable laying: The company has received contract for 13500 kms OFC cable laying work under NFS (network for spectrum) project for defence forces of India which involves procurement, supply trenching, laying installation, testing and maintenance of optical fibre cable, PLB duct and accessories for construction of exclusive optical NLD backbone and Optical access routed an turnkey basis with AMC in the Eastern and North-Eastern region. ITI has successfully completed 70% of the work and will be completing the entire project by year end.

- Data centre and IT Business: company has planned investment to address the huge growth in the service sector related to information technology. Currently ITI is operating one data centre in its Bangalore plant in partnership with a private company. Considering the high demand for data centre business and the expected growth in India, company is already in the process of building own data centre under the revival plan. ITIL is already providing IT solutions, like E-Banking. Aadhar based authentication etc. on basis from the data centre. ITI is aiming at expanding its data center operations by building a data center with 1000 rack space at Bangalore and 200 racks space data center at naini acting as DR site. ITI is planning to offer end to end data center hosting services including co-location, Bandwidth and managed services.

- Managed leased line network (MLLN) equipments: ITI has been a leader in supplying MLLN equipment for BSNL and MTNL since 2002-03. The existing MLLN networks of these telecom service providers have been set up and maintained by ITI

till date. Company has bagged one more big order for MLLN turnkey project recently from BSNL. ITI hopes and gearing up to address the future MLLN requirements on IP based technology.

- Solar project: ITI naini plant is having requisite expertise and experience for addressing opportunities related to solar power solutions. ITI has executed solar projects for BSNL as well as UP police. BSNL and other service providers are planning to upgrade their outdoor GSM telecom BTS sites with solar power especially in rural areas where power supply position is not good. ITI naini is planning to augment the solar panel manufacturing infrastructure with capacity up to 18 MW. ITI recently got a contract deployment of 15 MW solar power project under Capex and Opex model.

- Smart energy meters: Company has emerged as a lowest bidder in mega tender for supply of 50 lakh smart energy meters for energy efficiency services limited (EESL), a joint venture of NTPC limited, power fiancé corporation, rural electrification corporation and power grid. Under the project company will be supplying about 25 lakhs smart energy meters in phased manufacturing programme.

- Manufacture of smart cards: as on extension of national population register project, which is under execution by ITI as a consortium partner with BEL and ECIL, ITI is looking at the huge opportunity of manufacturing smart card based identity cards for the citizens in the country. In addition, there are opportunities regarding supply of smart cards for unorganized workers, driving licenses, motor vehicle registration etc. ITI is already having smart card manufacturing facility at its palakkad plant. This is being further augmented to take manufacturing of various types of identity cards.

Huge demand is expected from banking sector for contract as well as contract less cards in view of recent thrust by the government for cashless transactions.

- Component screening project: component screening is a project suggested by VSSC (ISRO) for ITI palakkad to take up for meeting their requirement of approximately 5 lakh screened components per year. Screened components are required regularly for VSSC for their space missions. Basic component screening facility has already been established in the plant. Further the infrastructure up gradation is in final stages to cater for new components and also for meeting needs for component screening for defence. ITI is already working with ISRO as one of the accredited sources for supply of avionic modules required/used for launching various satellite launch vehicles. ITI has contributed to the manufacture of electronic assembly for ISRO's Geosynchronous satellite launch vehicle (GSLV) mark III, one of the prestigious missions of ISRO which gave a grant leap for India in space. The electronic packages fabricated at ITI were successfully launched on jun 5, 2017.

- Wi-Fi products: Wi-Fi products are expected to be part of the digital India programme to connect every citizen to broadband network and also in setting up of smart cities. ITI is planning to address this business opportunity in association with the technology partner.

- Manufacturing of Li-Ion batteries for telecom applications: Long life, low maintenance & High energy density back up power solutions using Li-lon technology have been proved in all fields of consumer electronics like PCs, mobile phones, tablet PCs etc. they also make inroads into other applications of telecom industry like powering GSM equipments/towers. ITI has taken TOT (transfer of technology) for manufacturing and supply of Li-lon batteries with focus on meeting needs of telecom

applications like GSM BTS sites. ITI is planning to take up assembling of Li-lon batteries in one of its plants, specifically for supplying to the BTS sites.

- Low power BTS systems for remote villages: low power BTS systems have been planned as a means to extend mobile connectivity to cover all the unconnected villages in the country. USOF has planned to fund such programmes so that every village in the country is connected through mobile communication networks. ITI expects to get orders for supply of equipments required for such networks.

- Set top box: The country's progress towards digitization of television services has thrown open huge opportunities for supplying of digital set top boxes. This is further multiplied on account of introduction of HD and Ultra HD transmission. Company is planning to manufacture set top boxes to address this business.

- Sensor/modules/chipsets for IOT/smart city projects: ITI has made foray in to internet of things commonly called "IOT" which is making big headway in common man's day to day life across the world. The purpose of the smart cities mission is to drive economic growth and improve the quality of life of people. ITI has entered into teaming agreements with many start ups who have developed "smart" solutions which are integral part of lot sector. ITI is planning to offer solutions for smart education, smart heath, smart environment, smart transport etc. as of now, 90 cities find a place in the centre's programme. ITI is planning to actively participate in smart city tenders to secure business in the days to come.

- Manufacture of electronic voting machines (EVMs)/ VVPAT: ITI is planning to develop and manufacture electronic voting machines along with VVPAT, considering huge requirement of these machines from the election commission of India.

- Business with PSUs/contract manufacturing: Contract manufacturing for PSUs is an existing activity in ITI. ITI is already executing job works for PSUs like, BHEL, BEL, VSSC, NPOL etc. with upgradation of infrastructure in ITI, there is more scope for getting new business in the area of contract manufacturing.

- Next generation networks (NGN): next generation network (NGN) is a soft switch based telecommunication network capable of providing services, viz., voice, data & video by encapsulating them into packets. Manufacturing of IP TAX equipment-automatic and local exchange based on soft switch architecture is planned. BSNL and MTNL plans to migrate their TDM switches to NGN in order to provide new services to customers. This will boost NGN market.

- GSM: ITI has implemented GSM project in BSNL west zone and MTNL-Mumbai in technology alliance with M/s Alcatel-Lucent & in south zone in technology alliance with M/s Huawel.

Capital structure: the authorized capital of the company as on September 30, 2017 was Rs. 1200 cr. The paid-up share capital as on that date was Rs 960 cr. (Rs. 660 cr. Equity shares of Rs. 10/- each and Rs 300 cr. As preference shares of Rs. 100/-each). The percentage share of canter government in equity as on September 30, 2017 is 95.59%.

6.3 Financial performance indicators of ITI:

Financial Indicator ITI Table 4				
Particulars	**Performance during the year**		**(Rs. In crores)**	
	2017-18 (for 2nd Qtr. Jul 17-sep 17)	2017-18 (for 1st Qtr. Apr 17 jun 17)	FY 2016-17	FY 2015-16
1. Turnover &	335	280.84	2152	1851

other income				
2. Expenditure	335	280.47	1847	1600
3. Net profit/loss	289	0.37	305	251

The turnover for the year 2017-18 mainly constitutes from MLLN, GSM projects, GPON, defence business, data centre, AN RAX cards, NFS, AMC for OCB etc. as part of diversification, all the units have taken various initiatives to enhance production.

Product/project of ITI Table 5

S No	Product/project 2015-16	2016-17	2017-18			Anticipated Jan-mar 18
1	NFS cable laying 535.28	700.16	9.33	4.14	26.46	390.07
2	ROs/CCO/IT 145.03	190	26.22	26.48	32.89	214.49
3	Defence/ASCON 117.93	181.35	29.00	32.89	24.75	116.70
4	MLLN AMC/SSTP 42.64	154.85	16.41	59.85	32.98	67.46
5	GSM-WZ project/AMC 88.43	81.11	5.01	4.52	8.18	17.29
6	GSM-SZ/AMC 65.11	76.25	21.31	21.73	19.09	17.87
7	NPR/SECC Projects 104.63	70.59	0.00	0.00	0.00	0.00
8	NGN/C5/ph2 63.22	35.86	0.86	0.56	0.71	0.00
9	OCB AMC business 31.46	32.86	7.12	7.38	7.05	6.71
10	G-PON 6.66	22.51	58.17	65.58	71.34	110.91
11	Misc services 29.5	19.77	1.90	2.10	2.16	6.56

12	Data centre 13.96	19.13	4.25	1.32	3.05	11.38
13	Banking/div.prod./ cont/ mfg. 0	11.23	0.50	1.55	2.75	2.91
14	SMPS & repair 6.77	5.73	0.00	0.98	0.13	5.89
15	SATCOM & PCM MUX, CDOT AN RAX 0.48	5.24	0.00	4.47	5.00	2.87
16	GSM-MTNL 2.16	2.44	0.00	0.00	0.00	0.00
17	NPR smart card 0	0	0.00	0.00	0.00	0.00
18	WLL-CDMA infra 0.08	0				0.00
19	HDPE 0	0	0.48	0.00	0.00	0.00
20	Solar panel mfg. 0	0				2.00
21	New project		0.00	0.08	0.79	379.13
22	SIM/USIM/Smart cards 0	1.61	0	0	0	0
	TOTAL 1253.34	1610.69	180.56	233.63	237.26	1352.24

6.4 Major Private manufacture in telecom: sterile, ZTE, Huwaei ericssion

- **Sterlite Technologies -**

Sterlite in the last few years, have evolved business from a manufacturing-led model for passive connectivity products to an integrated portfolio of products, services and software to enable smarter networks for their customers. With these new capabilities, they are now uniquely positioned to engage with thier customers at the network design stage and become their trusted partners for end-to-end rollout and post execution management to deliver best-in-class network performance. Today, they design, build and manage smarter networks.

Sterlite Tech, technology and innovation reside at the core of our offerings and remain our key differentiator. Company state-of-the-art Centre of Excellence in Aurangabad is one of its kinds globally and focuses on advanced fibre-optic research, which has resulted in a strong patent portfolio of 146 across geographies. At our recently opened Centre for Smarter Networks in Gurgaon, we are building advanced technologies, fibre-enabled solutions for 5G networks, pre-connected fibre-kit solutions to bring cutting-edge solutions for next-generation networks.

Their focus on technology innovation and continuous process improvements to drive efficiency position us to build an extremely strong supply base. Sterlite manufacturing facilities in India, China and Brazil are world-class centres.

Given the backdrop of the strong fibre growth that we are witnessing globally, and their increasing market reach, they have decided on a next phase of capacity expansion toward 50 mn f km, to be executed in phases. This capacity will come in a Greenfield set up at an estimated capex of ` 1,000-1,200 crore.

Getting more from existing networks and reducing operational cost is top priority for CSPs (Communication service providers. Commercial considerations, rather than regulatory mandates, have become a key drive pressing CSPs to share their network infrastructure with either competition or launch multiple sub-brands (MVNOs) to optimise the investments made in network infrastructure, resulting in reduced capex.

India's Department of Telecommunications (DoT) now allows for active and passive infrastructure sharing, a move expected to help operators reduce capex costs. A leading operator has already started to reap the benefits of the modified rule, as it has entered into an exclusive spectrum sharing agreement.

The above trends demonstrate that the global telecom industry is changing at a rapid pace. Sterlite Tech are investing in technologies, such as 5G, IoT, Cloud, SDN and NFV to offer future-ready products to our customers. They believe in world-class network design, build, manage and monetise capabilities, supplemented by innovative products that build smarter networks for the global user and customers.

Fibre Demand

Fibre is ranked as the most important backhaul and transport technology for 5G due to its capability of delivering for high-capacity backhaul for intended data rates, according to a TIA and Interdigital joint study, 2017. Globally, it has been seen that the capex intensity increases significantly when the share of data increases in the total revenue pie.

Supporting these trends, *global fibre consumption in 2016 was 425 million fkm(Fiber KM*), which represents an 11% increase from 415 million fkm in 2015, as per a CRU report. China's 4G network coverage is on its way to reaching a high level.

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Digital Transformation in sterlite

Digital transformation is now a strategic imperative for CSPs globally, with two key dimensions – Network and IT. On the network side, virtualisation will increase network efficiency, scalability and agility with All Internet Protocol (IP); this will also mean that CSPs need to manage services and resources independently. On the IT side, changes in customer behaviour and expectations are driving the need for omni-channel capabilities and digital experiences facilitating digital customer engagements and interactions across multiple touch points. Traditionally, technology functions were segregated between Network and IT. However, the aforementioned technology trends are blurring the lines between these two functions. The convergence of Network and IT can offer CSPs numerous benefits, such as reduction in capital expenditure (capex) and operating expenditure (opex), faster cycle times and improved customer experience through streamlined operations.

Financials

Sterlite Tech ended FY17 with a strong financial performance. The Company has an order book of ` 3,018 crores, and saw an annual revenue growth of 14%, PAT growth of 31% and exports growth of 75%. Company has presence in 50 countries[15] .

Other OEM in Telecom Manufacturing

Huawei has grabbed 29 percent share of the global telecom equipment market, increasing its market share by 8 percentage points since 2013.The top seven telecom equipment manufacturers are Huawei, Nokia, Ericsson, Cisco, ZTE, Ciena, and Samsung in 2018, according to Dell'Oro Group.

[15] Sterlite Annual Report 17-18

Huawei's revenue share improved in 2018 — gaining about two percentage points of share annually in each of the past five years. Huawei improve revenue share despite challenges in the US and some of the European telecom markets due to security issues. During this period, Ericsson's and Nokia's market share declined about one percentage point annually on average until 2018 when both vendor held their market share flat. The latest GSMA report indicates that mobile operator Capex reached $161 billion in 2018 and forecast to touch $161 in 2019 and $160 billion in 2020. The focus of mobile operators will be in making investment in 3G, 4G and 5G roll outs and network optimization. Huawei said in December that it expects total revenue to increase 21 percent to $109 billion in 2018.

Nokia Networks business revenue was 20.121 billion euro (–2 percent) or $22.82 billion last year. Ericsson's revenue was SEK 210.8 billion (+3 percent) or $22.58 billion in 2018[16].

[16] Telecomlead.com/Networks

Chapter 7. Survey analysis

7.1 Survey Methodology

A on line survey was conducted by sending a questionnaire and opinion was taken online on different issues of telecom equipment manufacturing scenario in the country. The online survey was taken due to paucity of time for physical survey.

The questionnaire was sent to different stake holder in public & private sector as well as to manufacture associations. Some of them are as below

1. BSNL, MTNL ,. ITI , STERLITE , ZTE & Huwaei officials
2. Department of Telecom officials
3. Other OEM association members
4. TEMA (Telecom equipment Manufacture Association)

The opinions were received in the form response to questionnaire. The Questionnaire is placed at Annexure –I. The data so collected was analyzed and interpreted using graphs.

Simple random sampling selected : This type of sampling is also known as chance sampling or probability sampling where each and every item in the population has an equal chance of inclusion in the sample and each one of the possible samples, in case of finite universe, has the same probability of being selected. Regarding sample size , one can say that the sample size must be of an optimum size i.e., it should neither be excessively large nor too small. Technically, the sample size should be large enough to give a confidence interval of desired width and as such the size of the sample must be chosen by some logical process before sample is taken from the universe.

7.2 Interpretation of Responses of Questionnaire

The responses of Question on domestic manufacturing subjects are received on line from of public & private sector. From the responses it is evident that majority want appropriate Tax incentive, R&D promotion and FDI in telecom sector that will boost domestic manufacturing in telecom sector. The following is individual question responses interpretation

I1: From the Response of Q1the 50% respondent strongly believed that Domestic manufacturing activities can be increased by providing appropriate Tax incentive, R&D promotion and FDI in telecom sector.

I2 : The 50% respondent strongly believed that Domestic manufacturing of equipment will ensure safely of telecom network so India shall extensively promote Domestic manufacturing.

I3: The 45% respondent has responded that lack of proper policy & monitoring Cost is major reason for not production of telecomm equipment.

I4 : The 57.1% respondent strongly believed that India can increase export to word due to proactive policies of Govt.

I5: The 43.2% respondent strongly believed that MNC shall setup telecom equipment manufacturing base in India with or without joint venture due to security & economic reason.

I6: The 42.5% respondent strongly believed that setting up of separate Telecom research & development Fund (TRDF) will catalyze the manufacturing base in India.

I7 : 55% respondent strongly agrees that setup of special SEZ/CEZ will boost the domestic production & export in telecom sector.

I8: The 35.7% respondent agrees that make in India mission of Govt is providing suitable infra & TAX incentive for MNC & domestic companies in telecom sector.

I9: The 47.5% respondent strongly believed that the major Reason of Telecom equipment Import from outside the country is Better feature with low cost &High Reliability.

I10: The 45% respondent strongly believed that the major Reason of telecom equipment not manufactured in India in large Scale is Lack of appropriate policy by Govt.

I11: The 37.5% respondent strongly believed that the policy measures are required to be instituted to boost Innovation and productivity of local Telecom manufacturing in our country

I12: 47.5% respondent strongly agrees that uncertainties on return on investment. In spite of 100% Foreign Direct Investment (FDI) allowed in telecom sector by Government, there is not enough investment.

I13: The 38.1% respondent strongly agrees that Telecom research& development fund(TRDF) shall be created to promote indigenous R&D efforts and telecom equipment manufacturing.

I14: The 48.5% respondent strongly agrees that Telecom service provider shall be given some % rebate in annual licence fee base.

I15: The 40% respondent strongly believed that there is need to set up Telecom Finance Corporation (TFC) in order to provide easy Finance to ICT companies.

Chapter 8. Conclusion and Recommendations

8.1 Conclusion

A robust telecom network needs a strong telecom manufacturing base which will in turn contribute handsomely to the GDP and employment in the country. There is, therefore, need for a comprehensive Telecom Equipment Manufacturing Policy that would give the country a definite direction and facilitate in becoming a strong telecom manufacturing hub.

The government, in consultation with semiconductor industry, has increased focus on the ESDM sector in last few years. Some of the initiatives outlined in the National Electronics policy2012 and the National Telecom policy2012 & 2018 are already in the process of implementation, such as Preferential Market Access (PMA), Electronics Manufacturing Clusters (EMC) and Modified Special Incentive Package Scheme (M-SIPS). Further ,with the implementation of fabrication capabilities in India, the country could achieve a degree of self-sufficiency in domestic manufacturing in telecom sector.

The task of creating and nurturing an Indian Product industry, where design development and IPR generation takes place within India. Even with right policies, coordination between different government departments and telecom operators will be required.

R&D facilities, access to low cost funds, testing and certification, joint venture and skill development are areas which need to be strengthened to make the manufacturing environment more conducive. Several measures need to be taken to increase domestic production and enhance the value addition to the products being manufactured in the country.

Further, the following are few initiatives which need to be taken:

- Leverage large domestic market to provide preferential market access to Indian Products.
- A potent policy support to stimulate domestic product manufacturing without adverse financial impact to the government.
- 100% Preference for Indian products in government procurement and projects funded by government / USO.
- Obligation for Telecom operators to buy Indian Products (IP) and Indian manufactured Products (IMP)
- Increase Indian content in network over next ten years.
- Incentives for telecom operators to buy Indian Products and progressively increase indigenous content in network.
- Any future decrease in license fee for operators would come in the form of incentives for procuring Indian products and Indian Manufactured Products.
- Penalties not preferable option, but operators need to commit to support Indian Products by
- Commitment to purchase Indian products when they are comparable in price and performance to imported products.
- Commitment to participate in trials of newly created Indian products, nurture them and place pilot orders.
- Funding R&D and support Indian IPR creation and driving in standards.

Indian Products suffers from disadvantage due to poorer infrastructure, poor and higher cost power supply, higher interest rates, longer custom clearance times. The recommendations to catalyze domestic manufacturing are as under:

a) Deemed export status to sales of Indian Products in India (since import duty of the corresponding product is anyway zero).

b) To make Indian Product companies competitive, they should be given a subsidy of 10% of their sales (domestic and export) for the next 5 years.

c) Creation National Investment and Manufacturing Zones (NIMZs) as proposed by DIPP and also incentivise manufacturers in line with Modified Special Incentive Program scheme (MSIPs) & Electronic Design and manufacturing Cluster (EDMC) of Department of IT.

- Incentivise to set up system assembly, components, piece-parts and entire manufacturing ecosystem within the cluster.
- Develop strong Supply chain within the country and increase contribution in Global value chain (GVC) for subsystem & IC

d) Support companies with good track record to become strong global players by creating a Telecom Promotion Fund of Rs 10,000 Crores for soft loans (at interest rates of 3-5%) to manufacturers of Indian products for domestic as well as exports and for operators who deploy these products.

e) Income tax exemption for Indian Product companies for a period of 5 years (on the lines for software exports).

8.2 Recommendations

India has tremendous entrepreneurial energy which must be harnessed for the telecomm equipment manufacturing in India. There is a need to encourage our bright young entrepreneurs and give them needed funding (pre-venture and venture capital), management and mentoring support. Entrepreneurship Model is particularly suitable to

set up new Telecom Product companies. Also creating a market pull would encourage venture capital to invest in such start-ups. The further recommendation for telecom Indian manufacturing is as under:

- Strengthening of C-DOT centre by infusion of fund through govt, Partnership with global MNC for Technology Transfer ,Semiconductor design & development through SCL(semiconductor Complex limited) or privates companies & strong supply chain for domestic & international manufacturer .
- Creation of Telecom Entrepreneurship Development Board and Telecom Finance Corporation (TFC) at national Level
- Creation of separate Telecom Products & development cell headed by Sr DDG in DOT
- Combination of venture funding and low-interest loans through NBFC or Telecom Finance corporation
- Active support and funding to promote Indian Telecom Product brands in international trade shows and target markets. Contribution enhancement in Global value chain (GVC) in order to increase export.
- To give market access in telecom licensee (public as well as private) will result in assured market to Indian equipment manufacturers for achieving economies of scales and also units set up by multinational companies in India.
- With more and more innovative services and network technologies appearing on the horizon, It is recommended that C-DOT be strengthened by DoT to pursue major technology schemes for domestic manufacturing.

India must significantly scale up its influence on telecom technology growth urgently. Most large countries/markets that seek to influence the trajectory of telecommunications evolution, and play a role commensurate with their size and capability, have a Telecommunication's Standards Development Organization (TSDO), an autonomous body, recognized by the government, under the leadership of industry and with strong participation of the academia and the government. India too needs a TSDO to be set up at the earliest. The TSDO of India would be a national body with a responsibility towards facilitating active participation in and contributions to International standards. It should consolidate various efforts in the country and work towards influencing International standards to incorporate Indian requirements/IPR into telecom standards.. The TSDO should be a Public-Private Partnership (PPP), drawing on both public and private expertise.

Further, it is recommended that an National Telecom Manufacturing cell may be created in DoT to work in a mission mode with members of academia and industry as its members. The cell would be the body to define, manage, fund and oversee the progress of the entire sector so as to meet the mission objective.

The cell should see that current products, developed in India and comparable with those outside India in terms of the price and performance, be deployed widely. The cell should see that translational R&D towards state of art telecom products is supported amongst academia and in industry, with strong collaborations, and IPR generated and introduced in next generation international standards. It should ensure that the incentives are provided to the manufacturing companies as well as to the buyers. It should ensure that timely finance is available for Indian Product companies, both for R&D as well as working capital. It should help companies reach economies of scale and export the products. All this needs to be done as a mission .

A robust telecom network needs a strong telecom manufacturing base which will in turn contribute handsomely to the GDP and employment in the country. There is need for a comprehensive Telecom Equipment Manufacturing Policy that would give the country a definite direction and facilitate it becoming a strong telecom manufacturing hub in coming years.

Annex 1- Survey Questionnaire

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