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Telecom Equipment Manufacturing Policy

Developing an Actionable Roadmap

Executive Summary (1/2)

- Industry is aligned to the overall vision of the government in making India a centre for telecom equipment manufacturing
- Critical to separate goals of manufacturing, innovation, and security to design an actionable policy that is tamper proof, least market distorting and consistent with international commitments.

Manufacturing

- India will account for ~ 3% of the global market by 2020 (~USD 17 bn). Self-reliance is not a viable tool to drive globally competitive economies of scale; further, no country is wholly self-sufficient in such a technologically complex industry. Further, Indian manufacturing would require to grown by ~ 100% CAGR over the next 5 years to meet TRAI mandates
- Kick starting local manufacturing – aimed at global markets- calls for developing specialized telecom clusters while addressing infrastructural, fiscal and legal issues, including labor laws.
- Fiscal initiatives are key for accelerated development. Currently, the lack of a local cluster imposes an effective ~ 3% higher end cost on account of freight etc; government may wish to consider a time bound (5 years) incentive to overcome this and kick start the coalescence of a cluster in India
- Without local IC fabrication facilities, not more than ~15-20% value addition is possible in India even over the next 3-4 years. To go beyond that figure requires for India to promote the entire electronics cluster
- PMA mandate should be consistent with WTO guidelines. To the extent applicable, government may consider revising its PMA guidelines for ‘value addition’ to incorporate substantial transformation to recognize transformation activities and make policy more implementable.

Executive Summary (2/2)

Innovation:

- Encouraging foreign investment is key to transferring know-how and developing capabilities to enable end-to-end product development. Need to strengthen IP protection and infrastructure to facilitate this.
- Initiatives providing seed funds and infrastructure for early stage ventures need to incorporate global best practices.
- Lack of comparable commercial financing options costs local small players significantly in the market. This gap needs to be plugged from both supply and demand perspective
  - A fund which allows local players to offer competitive contract financing options to buyers should be established
  - Operators may be incentivized via license fee rebates
- To build the ecosystem, we need three or four independent mission mode taskforces to foster partnership between Government, industry & academia and focus on developing commercializable technologies

Security:

- Local manufacturing does not necessarily have any correlation with security. Government needs to develop a comprehensive CIIP framework across all networks under threat – financial, utilities, government etc. classifying action by critical services sought to be protected
- Basic manufacturing threats and operational attacks can be mitigated by a comprehensive certification and testing program (e.g., Common Criteria) which by design needs to run across all networks of all makes

Setting the Objectives

Promoting Manufacturing

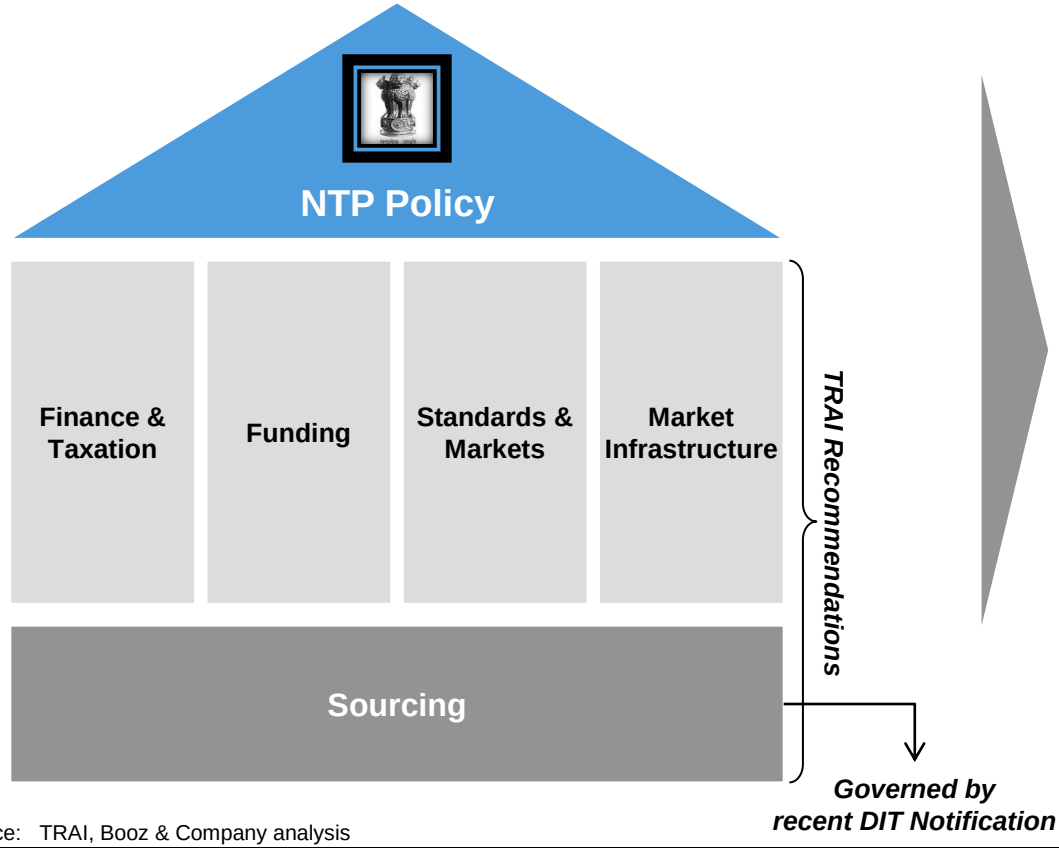
Fostering Innovation

Ensuring Network Security

Draft NTP reiterates the government's intention to make India a telecom equipment hub; industry is aligned to the vision

Overall Vision & Key Policy Pillars

"Make India a global hub for telecom equipment manufacturing and provisioning of converged communication services." – Draft NTP 2011

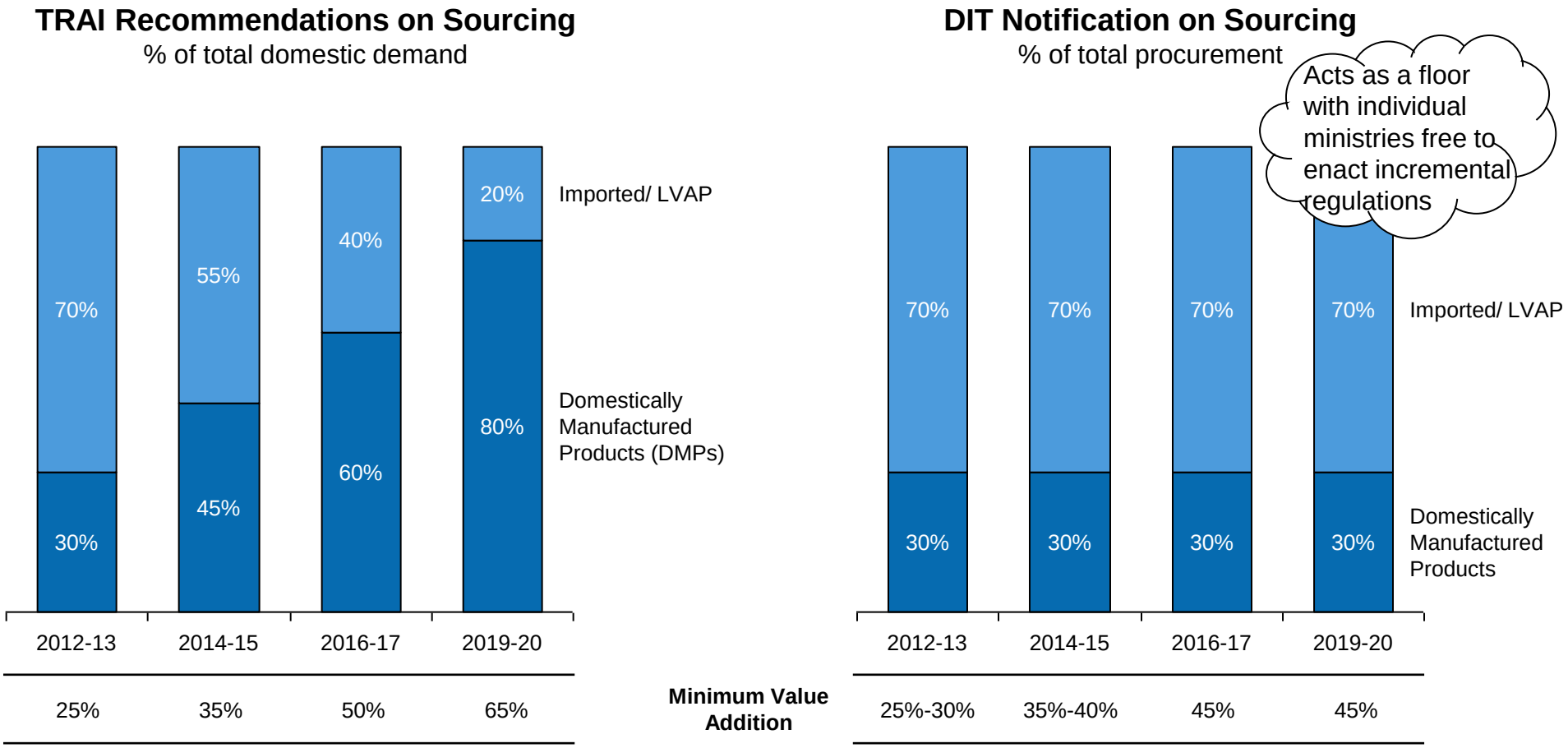


Area of Support

- 2011 National Policy on Electronics sets vision to promote India as ESDM manufacturing hub
- In January 2011, TRAI released policy recommendations for promoting domestic manufacturers in telecom equipment manufacturing
- DIT recently released notification highlighting preferential sourcing for Government procurement and security critical areas
- Telecom industry agrees with the Government of India, TRAI and DIT on the vision to promote hi-tech manufacturing in India
- However, recognize need to make key policy initiatives actionable to collectively enhance the competitiveness of telecom manufacturing industry

Source: TRAI, Booz & Company analysis

TRAI recommends 80% local sourcing with 65% value addition by 2020 ; DIT has set a floor of 30% sourcing with 45% value addition



Note: LVAP refers to Low value Added Products, where the value added is below the stipulated percentage; Value addition refers to the value of the inputs or bill of material sourced within the country and the value of IPR (TRAI) and value of domestic BOM per DIT
Source: TRAI, Booz & Company analysis

Draft TRAI recommendations also include finance, taxation, funding and infrastructure

NOT EXHAUSTIVE

Summary of Key Recommendations

Finance and Taxation

- Preferential access to DMPs with turnover < INR 1,000 crores for debt finance
  - 6% for IMPs
  - 3% for IPs
- Tax rationalization/ incentives compared to imports for telecom equipment, handsets and electronic components[1]

Funding

- Establish a Telecom Research and Development Council (TRDC) with dual mandate
  - Manage the Telecom Research & Development Fund with an initial corpus of INR 10,000 crores
  - Establish an R&D Park
- Create a Telecom Manufacturing Fund (TMF) with an initial corpus of INR 3,000 crores, to provide venture capital to indigenous manufacturing in the form of equity and soft loans

Key Recommendations

Standards and Markets

- Autonomous Telecom Standards Organization (TSO) to be established for carrying all works related to telecoms standards
- TCIL to be strengthened as a System Integrator for installing and operating networks in other countries using telecom equipment sourced from India
- Leverage software presence for promoting bilateral trade agreements to encourage export of telecom equipment

Market Infrastructure

- Establishment of Telecom Research and Development Park
- Establishment of ten manufacturing clusters with adequate infrastructure
- Establishment of two wafer fab facilities:
  - Cutting edge facility with government funding and support (upto 75% funding)
  - Second fab for general purpose chip fabrication, with upto 50% financing support

1) Includes total incidence of excise and VAT to be limited to 12%; No CST on domestic manufacture/ 2% CVD on imports; Income tax holiday and no MAT for 10 years; deferment of Excise/ Sales tax/ VAT/ GST for 5 years at nominal interest rates; for DMPs with < INR 1,000 crores turnover; Exemption from CVD/ excise for capital equipment

Source: TRAI, Booz & Company analysis

Current TRAI recommendations conflate innovation, manufacturing and security, which are best dealt separately

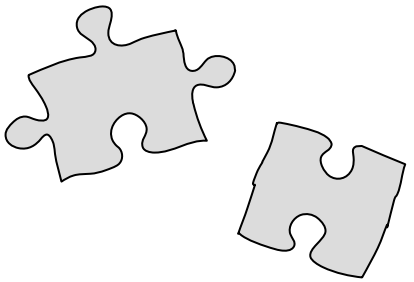
Ecosystem Requirements

Innovation vs. Manufacturing

	Innovation		Manufacturing	
Human Capital	▪ Highly qualified research teams ▪ Education system geared to support innovation	◕	▪ Large low-medium skilled labour force ▪ Vocational training institutes	◔
Infrastructure	▪ Strong environment for sharing of ideas- globally competitive university network	●	▪ Physical – power, water, land etc. ▪ Supplier network	◑
Funding	▪ Sustained funding in high risk venture ▪ Elicit private participation	◕	▪ High initial capital investment ▪ Easier to involve private firms	◑
Regulations	▪ Strengthen IP laws ▪ Get recognized as having strong IP protection – evidenced by action	●	▪ Friendly policies & easy approval process ▪ Establish perception of being favourable for manufacturing	◕

Time to Market ● Long ○ Near-term

Current policy conflates innovation and manufacturing; sets concurrent targets



Need to be separate - difference in inherent nature; longer lead time for innovation compared to manufacturing

Security needs to be addressed separately and comprehensively – local innovation & manufacturing do not ensure security

Source: TRAI, Booz & Company analysis

Our work on policy analysis has drawn on extensive interviews with government, industry and academia

Conducted interviews to engage 90% of all stakeholder types across manufacturing ecosystem

Interview Sources For Perspective Mapping on Policy

Primary Interviews

Government	Industry	Academia
Planning Commission, Government of India Government of India, Ministry Of Communications & Information Technology, Department of Telecommunications Department of Information Technology, Ministry of Communications & IT, Government of India National Manufacturing Competitiveness Council, Govt. of India	Domestic Equipment Manufacturers Global Equipment Manufacturers Operators Industry Associations	Indian Institute of Technology Madras Booz SME Network ▪ Experts in global manufacturing clusters ▪ Experts in innovation networks ▪ Labor law experts ▪ Telecom technology experts

Other Sources of Inputs

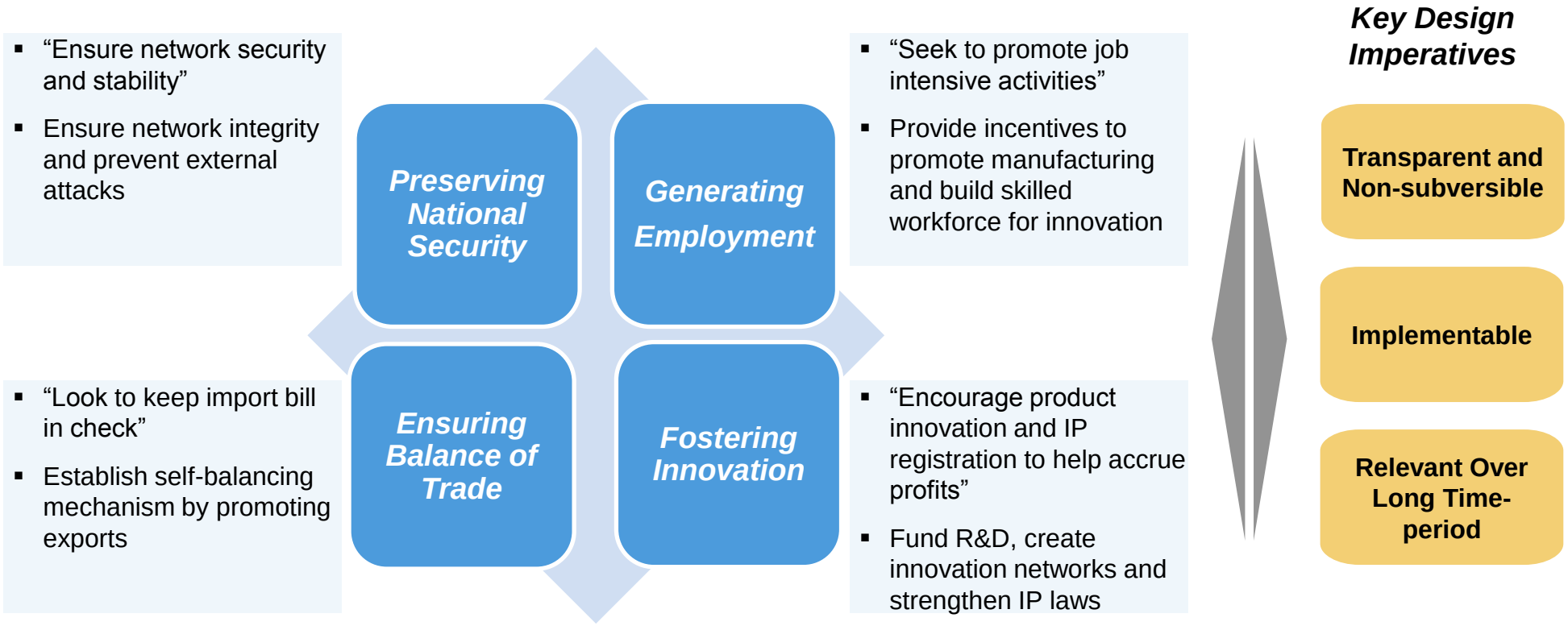
Booz IC	Booz Proprietary Models	Secondary Data
		

Source: Booz & Company analysis

While Government can aspire to achieve its multivariate objectives, resulting policy should ensure key design imperatives

Multivariate Objective led Policy

From our interactions with the Government, four objectives and select deign considerations have come to the fore



Source: Interviews, Booz & Company analysis

Setting the Objectives

Promoting Manufacturing

Fostering Innovation

Ensuring Network Security

Market Overview and Key Challenges

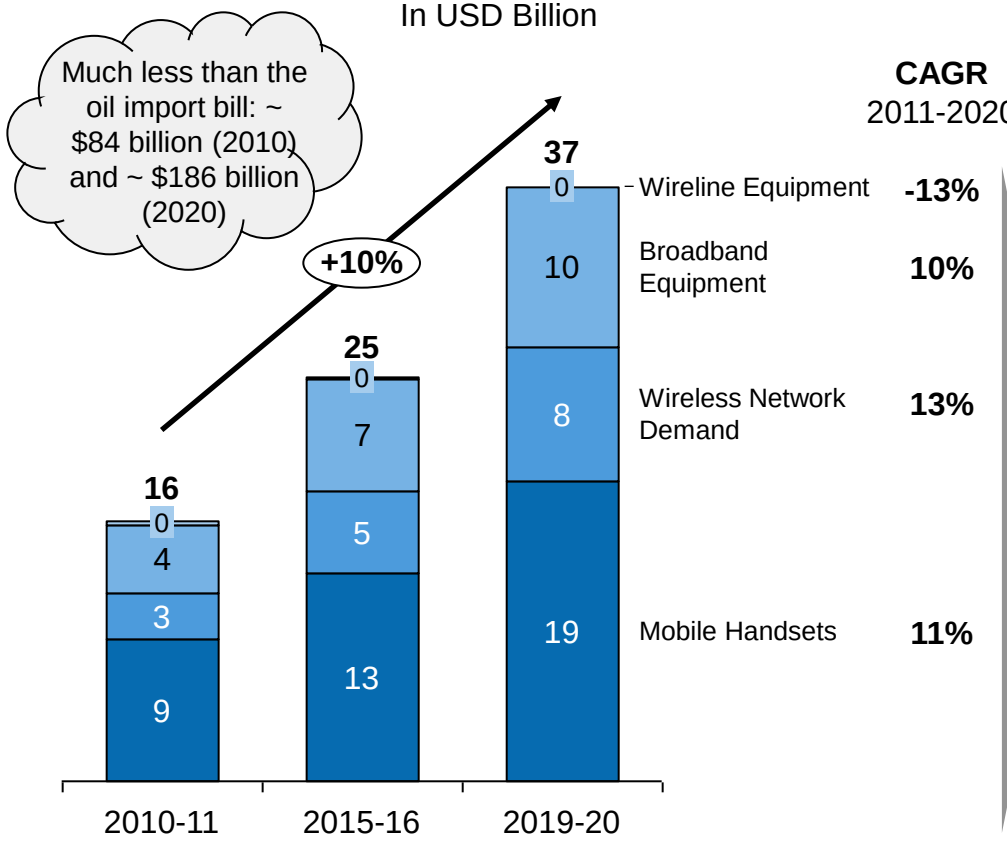
Manufacturing Ecosystem Imperatives

Stakeholder Considerations

The Indian telecom equipment market is expected to grow at ~10% between 2011-20 to reach ~USD 37 billion by 2020

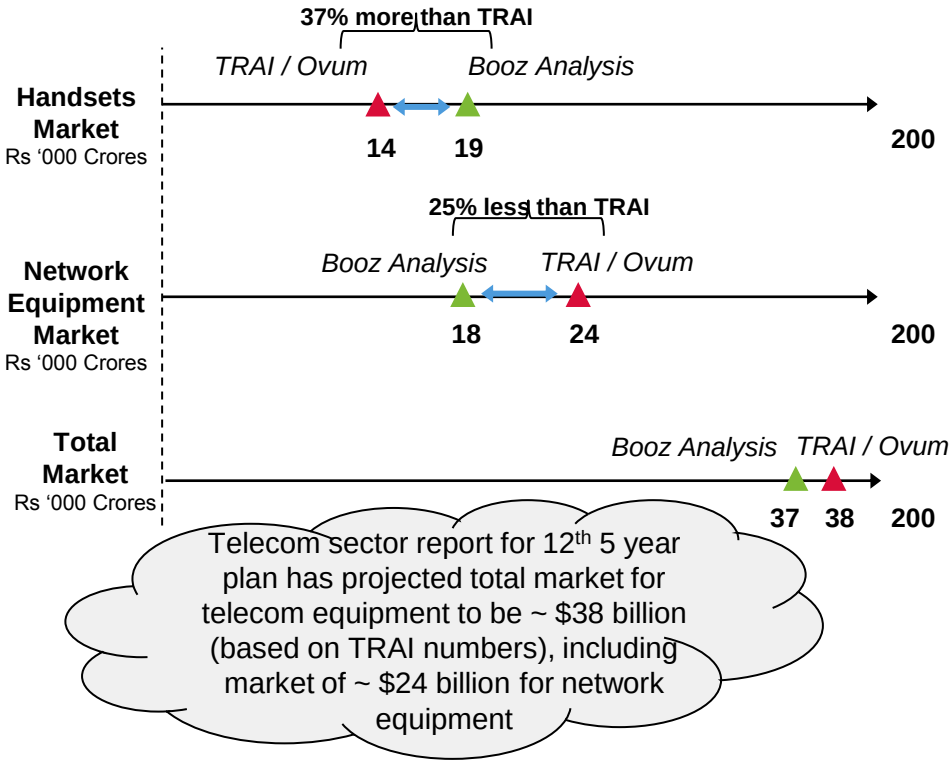
India Telecom Equipment Market [1]

In USD Billion



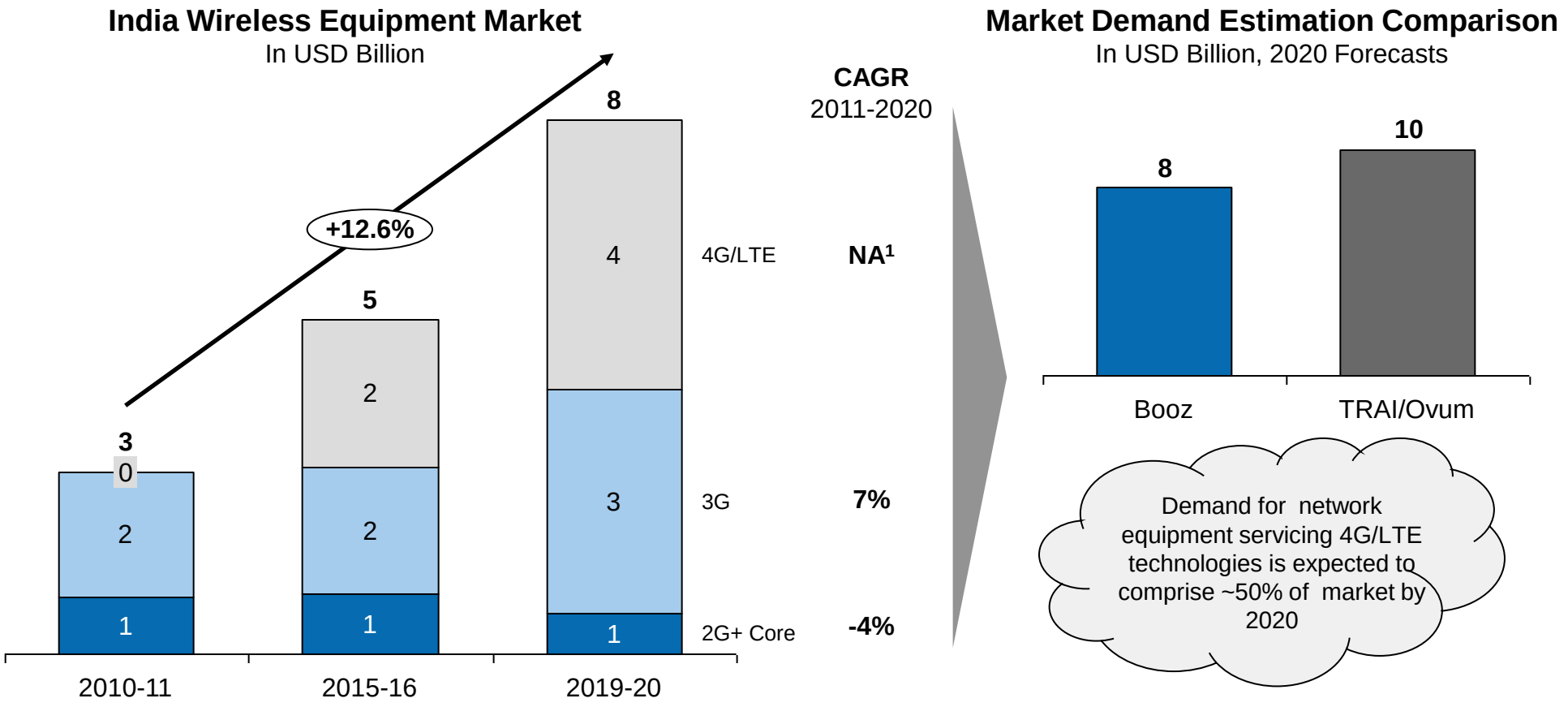
Market Demand Estimation Comparison

In USD Billion, 2020 Forecasts



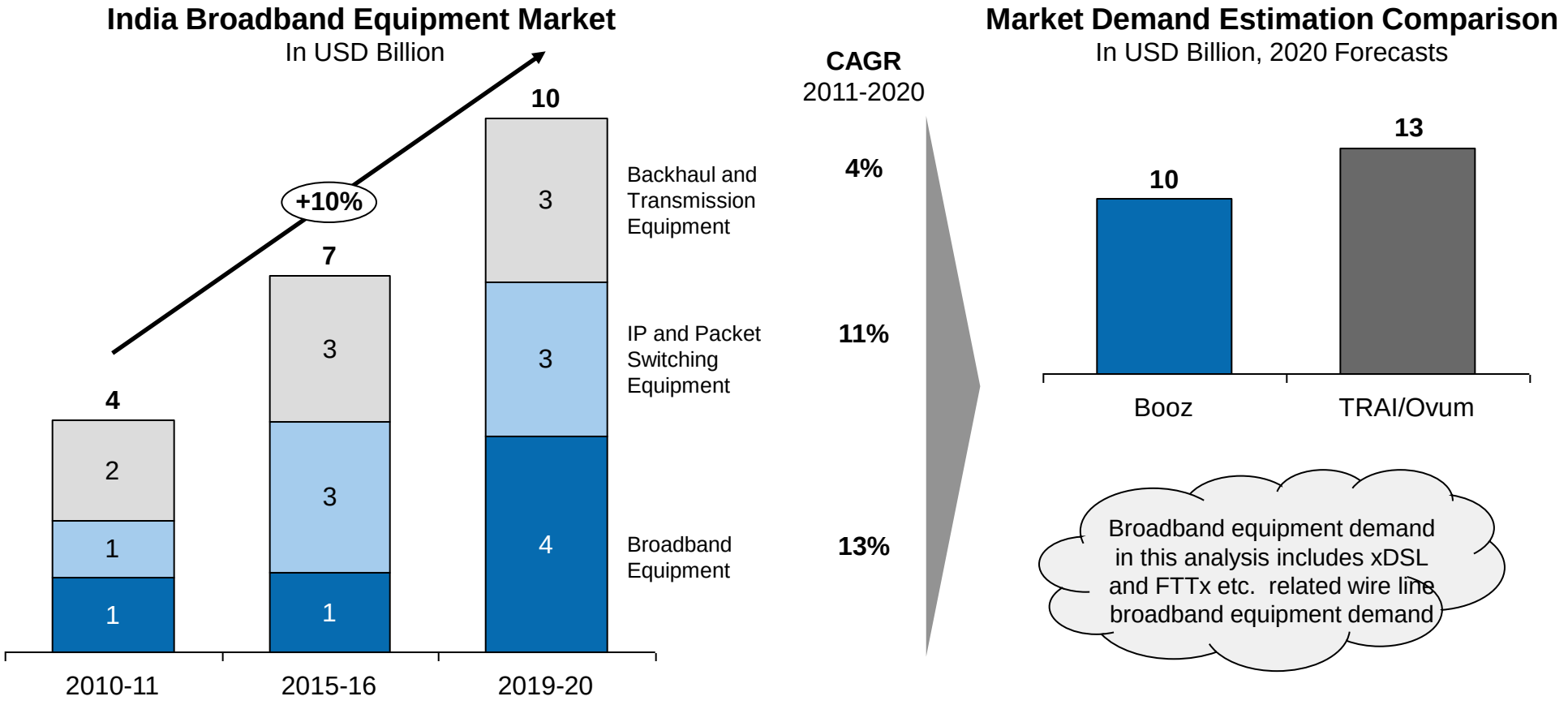
1) Does not include end user equipment; Broadband equipment includes xDSL and FTTx etc. related wire line broadband equipment demand; Wireless network includes mobile operator demands
Note: Telecom equipment demand forecasts are based on Booz and company proprietary models
Source: World Energy Outlook, TRAI, Ovum, Booz & Company analysis

The wireless equipment demand is expected to grow at 12.6%, primarily driven by newer technology equipment



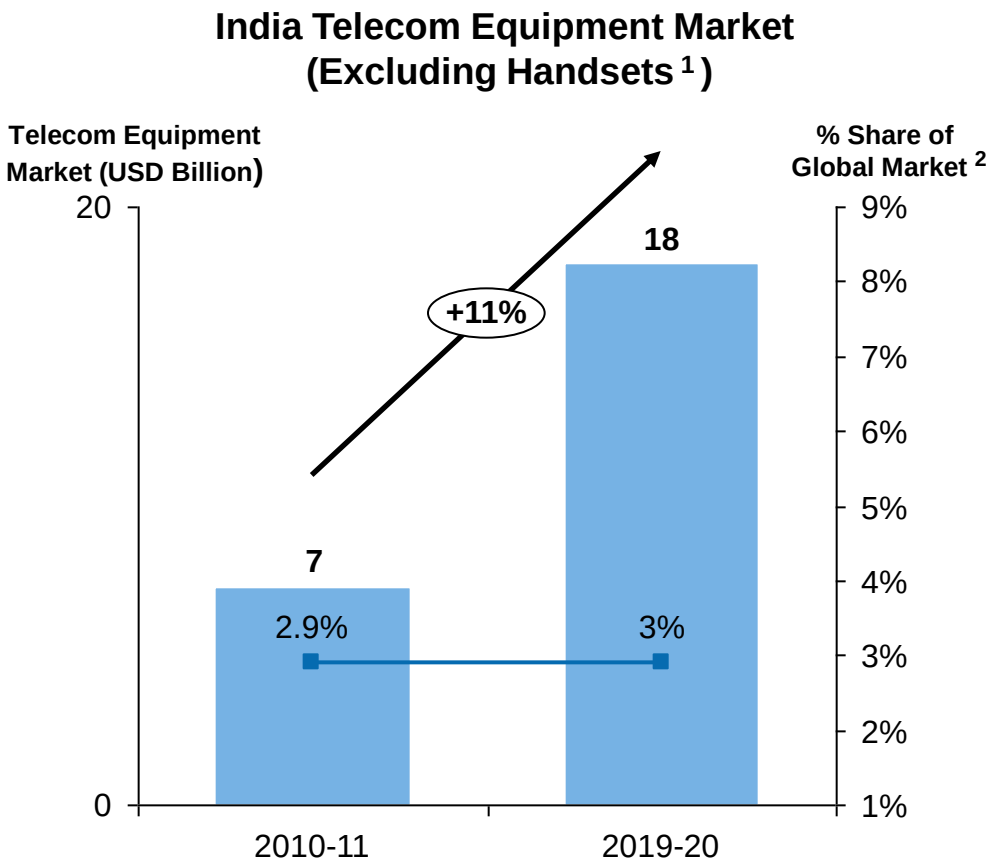
1) 4G/LTE network rollouts are expected to begin 2015-16 and so equipment demand for 2010-11 was negligible
Note: Telecom equipment demand includes telecom active equipment and excludes handsets
Source: TRAI, Ovum, Booz & Company analysis

Broadband equipment market demand is expected to grow by ~10% to reach ~USD 10 billion by 2020



Source: TRAI, Ovum, Booz & Company analysis

Despite strong forecasted growth, Indian market will be a small fraction of global demand



Indian telecom equipment market will not offer scale needed by local manufacturers to be globally competitive

Demand for Telecom Equipment-2011			
Country	**Market**	**Share of Global**	**% of GDP**
USA	**$47 Bn**	**18%**	**0.32%**
China	**$30 Bn**	**11%**	**0.51%**
Brazil	**$12 Bn**	**5%**	**0.43%**
France	**$8 Bn**	**3.3%**	**0.34%**
India	**$7 Bn**	**3%**	**0.57%**

Note: Task force report on IT&ITEs hardware estimates telecom products and equipment's to be USD 154 billion by 2020
1) The global handsets market was valued at $263 billion in 2010 with 1.4 billion units sold which would give India a share of 3% by value and 12.5% by volume
2) Global equipment market is as reported by TRAI at $260 billion in 2010 which gives India a 2.9% share in 2010 and $510 billion by 2020 which would keep India's share at 3% in 2020.
Source: Bloomberg, Datamonitor, TRAI, Ovum, Booz & Company analysis

Recent Gazette notification stipulates Preferential Market Access for government procurement and on security concerns

Analysis of Gazette DIT Notification: 15 February 2012

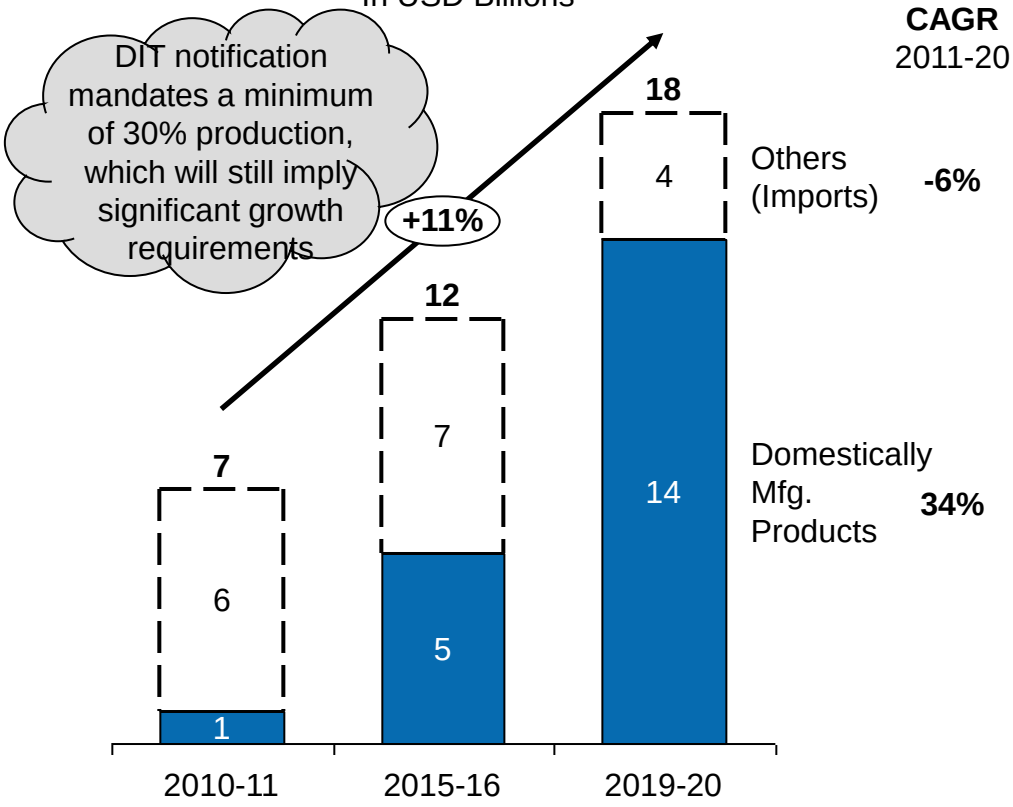
	Relevant Clause(s)	Provisions	Concerns
Scope	**"…Electronic products having security implications and agencies deploying them …-"** *Cl 2.2.1* ***"….also applicable for procurement of electronic hardware as a service from managed Service Providers"*** *…Cl 2.2.4*	▪ Procurement on security implications for country clause being notified by concerned ministry/ ies	▪ Different ministries may come with differing requirements
Coverage	**,,,percentage of procurement to be made from domestically manufactured electronic product or products but it shall not be less than 30% of the total procurement value of that electronic product or product**s- *Para 2.2.3.*	▪ Mandates floor of 30% for procurement of domestically manufactured electronic products ▪ Extends to electronic hardware procurement by MSPs	▪ Does not specify if 30% mandate applies to each operator for each individual transaction ▪ For managed services, unclear how 30%coverage would be calculated
Administration: Value Addition	**These electronic products shall meet the following graded domestic value-addition in terms of Bill of Material (BOM) from domestic manufacturer**s-*Para 2.3*	▪ Percentage of value add in terms of BOM from domestic manufacturers starting 25% in year 1 and goes up to 45% in year 5	▪ Does not define role of domestic manufacturer that supplies components – could lead to a label change regime
Administration: Compliance	**Individual Departments/ Ministries may provide for suitable incentives/disincentives for compliance under the policy**- *Para 5.3*	▪ Through suitable self certification system for domestic value addition by vendor ▪ Checks to be provided by STQC	▪ Consistency of interpretation ▪ Does not describe recourse if no Domestically Manufactured products are available

Ex 3 of notification specifically mentions Telecom licensees

PMA mandate to source 80% locally may be challenging; requires unprecedented expansion of domestic production capacity…

India Telecom Equipment Market Demand

In USD Billions



Key Points: 2011-15 Scenario

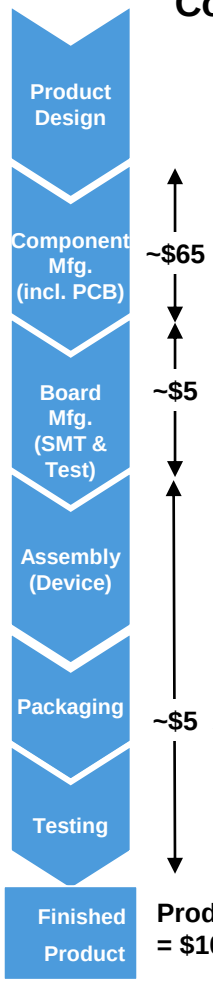
- Domestically Manufactured Products (DMP) would have to grow by ~40% in the next five years to meet PMA provisions
- Indian Products (IP) are estimated to be currently ~Rs 0.9 K crores by value. As per policy provisions this must be increased to ~14K crores by 2015 requiring a CAGR of 102%
- Meeting these targets would require substantial existing infrastructure on the ground to support manufacturing and innovation

Note: TRAI estimates the percentage of domestic demand being met through exports as being 12.3% in 2010. Indian Products were estimated by TRAI to be 2-3% of total demand.
Source: TRAI, Ovum, Booz & Company analysis

... especially given that currently a manufacturer imports ~90% of the product cost

EXAMPLE

Components are a large fraction of product cost….



~$65

~$5

~$5 ← + ~$25 material cost

Product Cost = $100

+ margin (product design cost)
= Selling Price

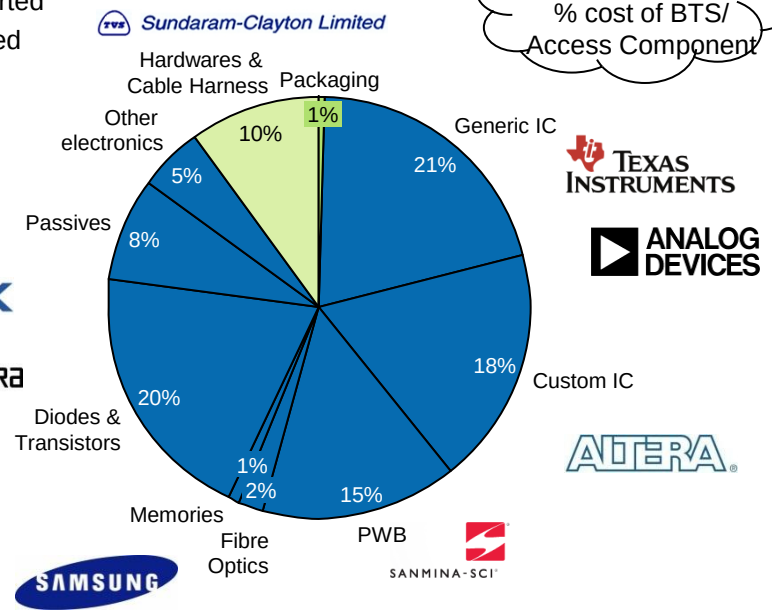
PCB and basic components + packaging material account for ~90% of product cost.

Overheads and processing "value add" account for remaining ~10%

… but very few are made in India today

Currently Imported
Locally Procured In India

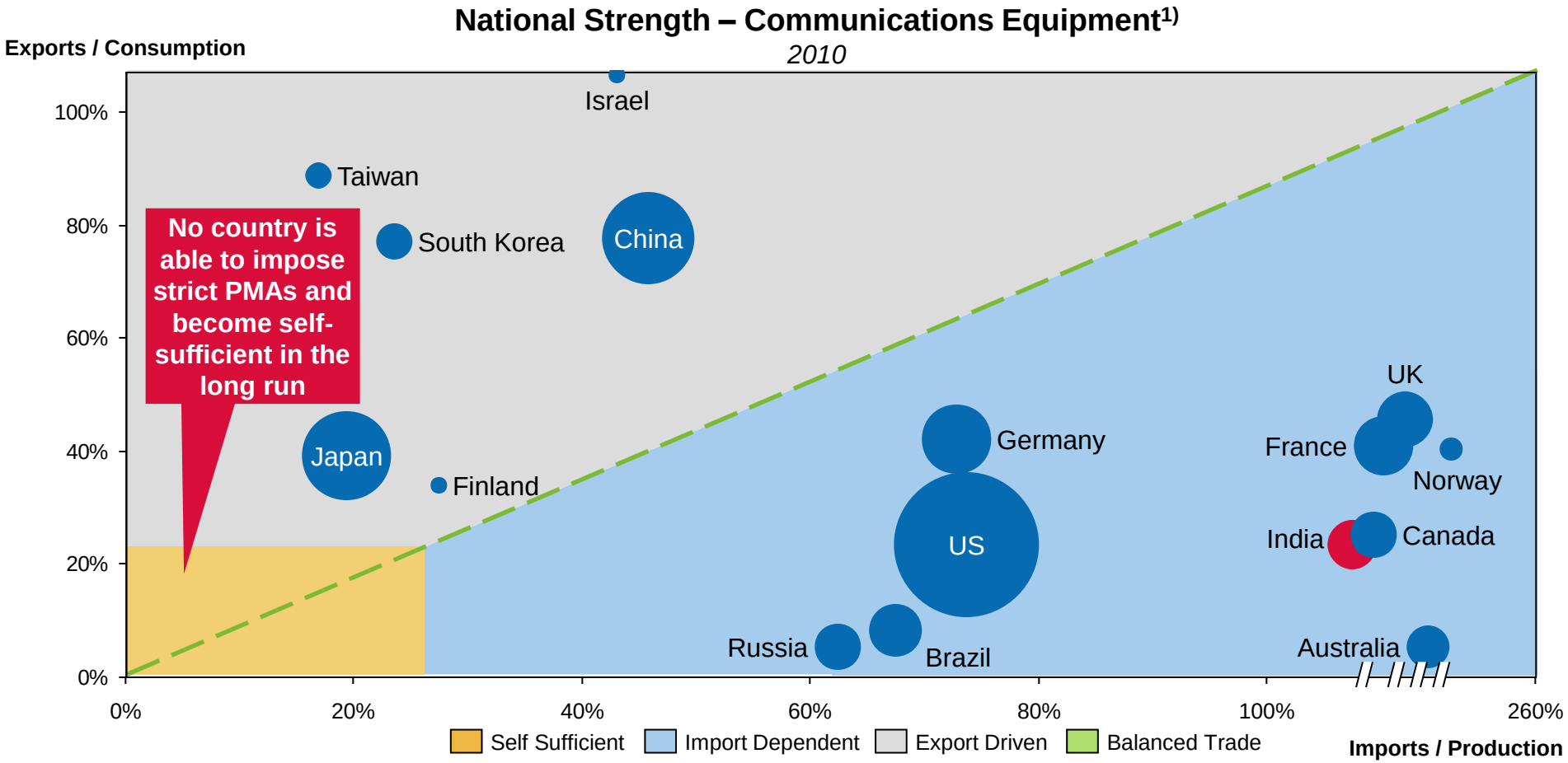
Distribution of Component Cost
% cost of BTS/ Access Component



In order to go beyond ~20% value addition, India needs clusters encompassing multi-layered PCB boards, ATMP for custom IC, special purpose active and passive electronic components

Source: Interviews, Booz & Company analysis

No country is wholly self-sufficient, necessitating India to unavoidably plug into the global supply chain



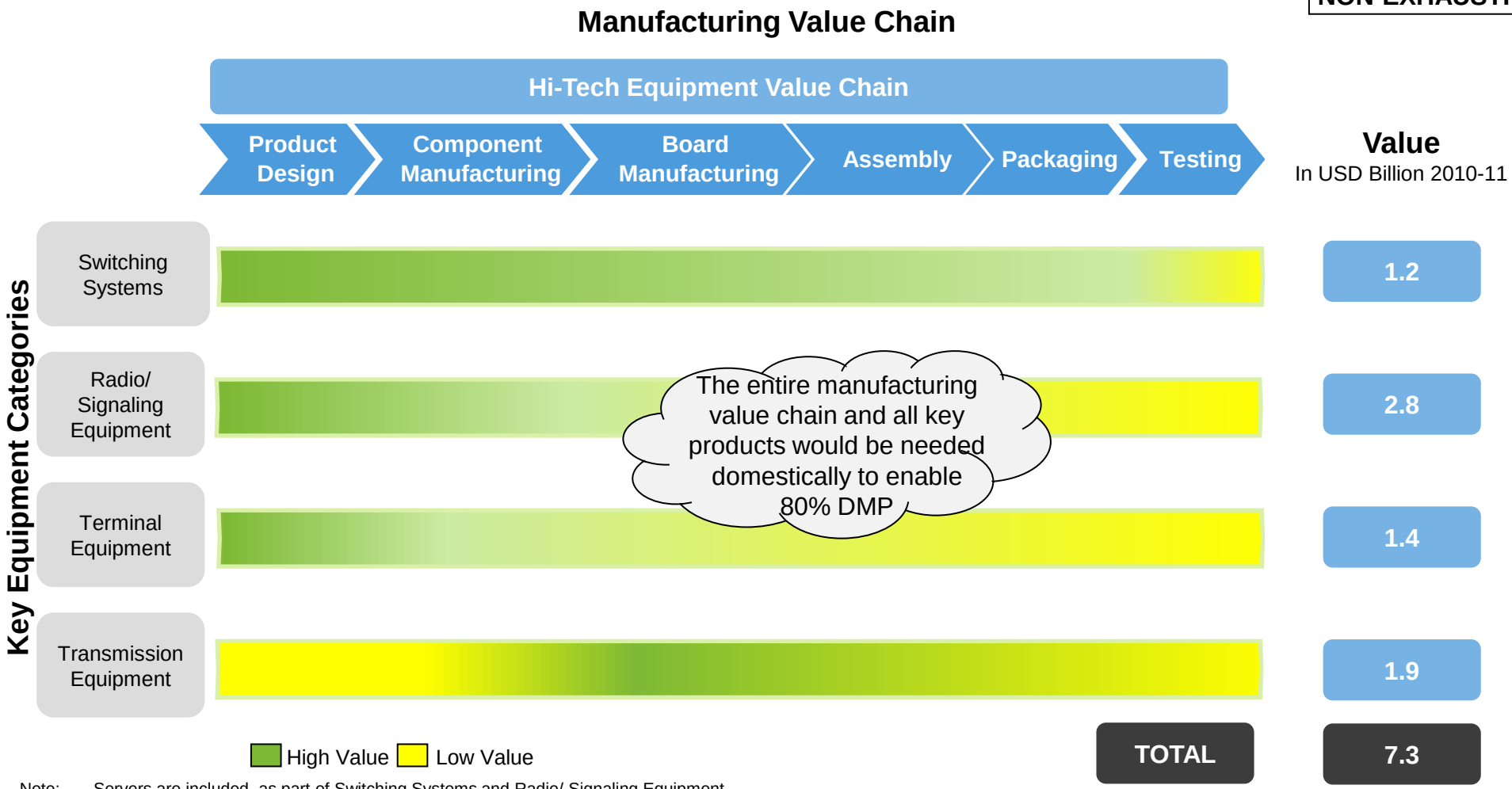
1) ISIC Rev 3, Communication Equipment (D32): Manufacture of radio, television and communication equipment and apparatus. Includes electronic valves and tubes and other electronic components; television and radio transmitters and apparatus for line telephony and line telegraphy; and television and radio receivers, sound or video recording or reproducing apparatus, and associated goods

Note: Bubble Size represents GDP

Source: Global Insight and Booz & Company analysis

Furthermore, it will mandate an impractical objective of building an end-to-end play across the value chain

NON-EXHAUSTIVE

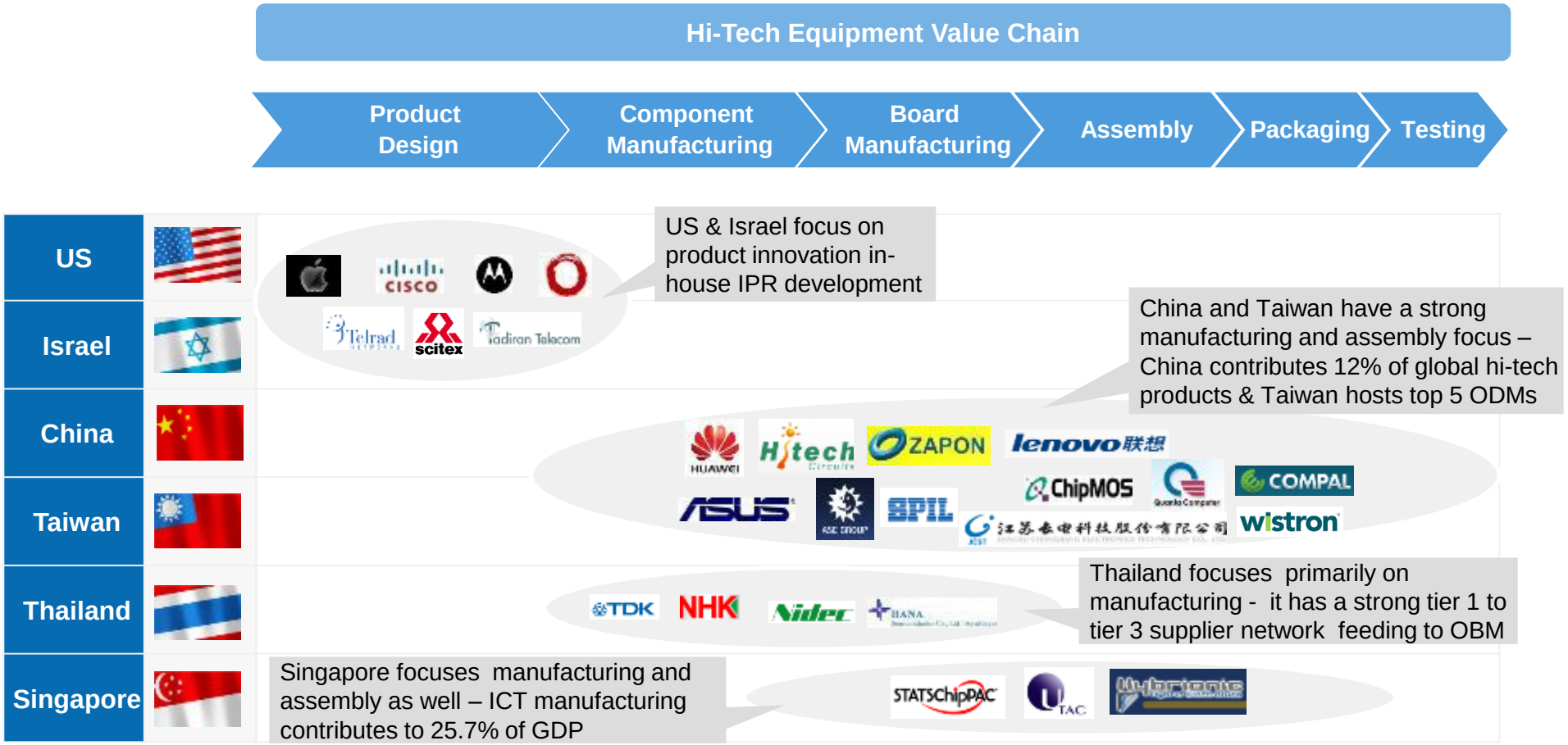


Note: Servers are included as part of Switching Systems and Radio/ Signaling Equipment
Source: Booz & Company analysis

End-to-end value chain play is infeasible - successful countries have developed expertise in select areas …

DOMESTIC PLAYERS

Global Leaders Across Value Chain

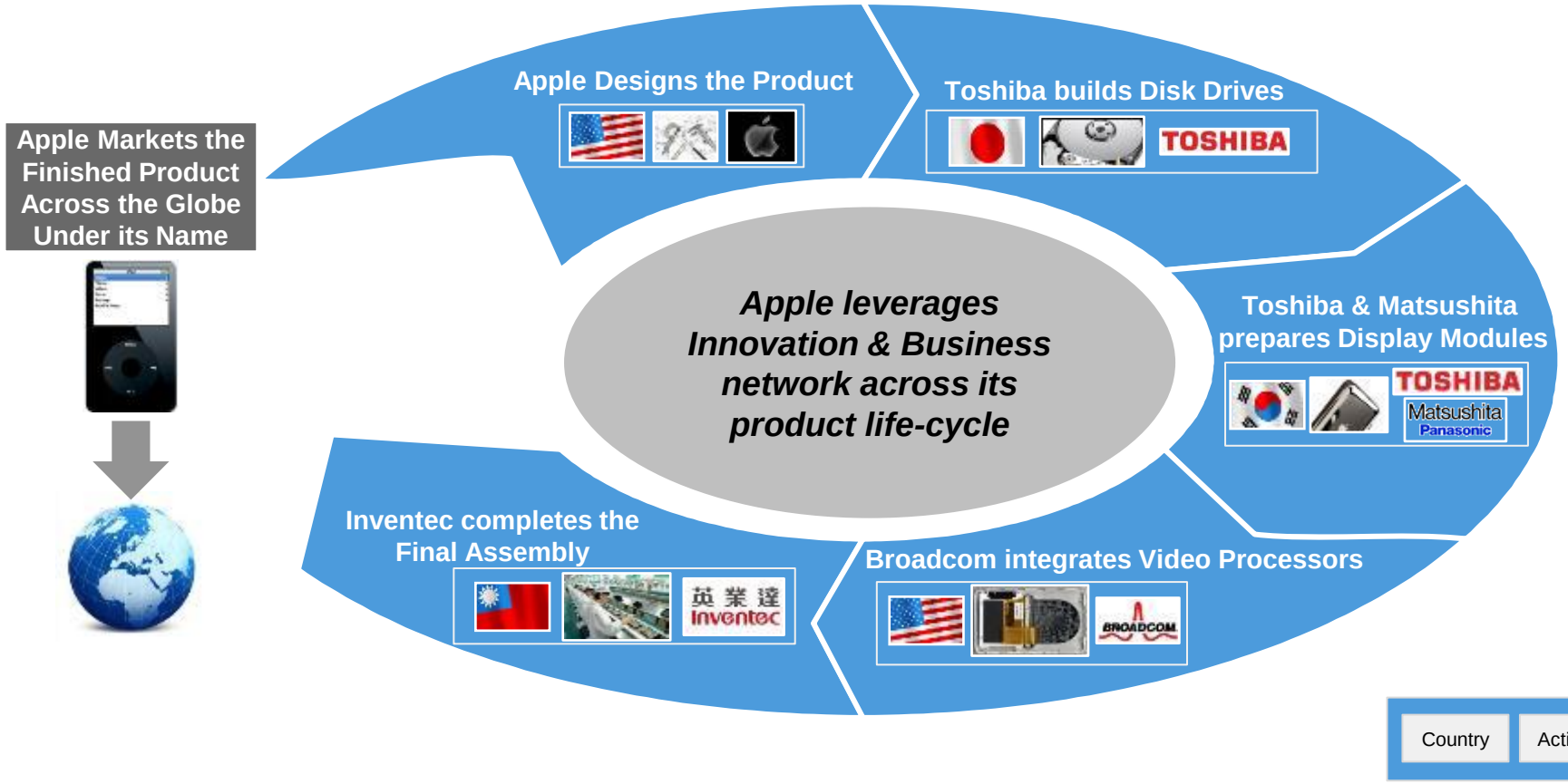


Source: Booz & Company analysis

… and then plugged into the global supply chain to seamlessly support the global hi-tech industry

ILLUSTRATIVE

30 GB iPod Value Chain
Innovation & Business Networking



Source: Booz & Company analysis

In summary, current manufacturing target present significant challenges – Government needs to set up water tight initiatives

Focus on building a robust manufacturing eco-system

- Government needs to identify the optimal strategic imperatives to build a robust manufacturing eco-system
- Government needs to identify the key issues in manufacturing and design robust incentives accordingly

Design transparent / implementable policies for stakeholder qualifications

- Government needs to assess potential issues faced by all stakeholder types (manufacturers, operators, etc.)
- Government needs to define 'value addition' in a robust and implementable manner in order to make the policy relevant and effective

Source: Booz & Company analysis

Setting the Objectives

Promoting Manufacturing

Fostering Innovation

Ensuring Network Security

Market Overview and Key Challenges

Manufacturing Ecosystem Imperatives

Stakeholder Considerations

Kick starting domestic manufacturing calls for developing specialized telecom clusters with anchor and synergistic tenants

Cluster Participants

Element	Rationale
Anchor Tenants	▪ Large tenants are established to provide critical mass for other tenants as either one of their primary buyers (i.e. OEMs for Auto Cluster) or suppliers (i.e. smelters for Metals Cluster) ▪ Product can be for both inside or outside the cluster

Synergistic Tenants	▪ Synergistic tenants are ones whose proximity to the anchor are critical for cluster's success
	  ▪ e.g. Auto, synergy results from optimizing of logistics flows and reduction in inventory
	  ▪ e.. Petrochem, synergy yielded from thermal integration and optimization of side streams
	▪ On-site presence not as critical if a robust logis-tics system in place allows for "virtual" proximity

Optional Tenants	▪ Optional tenants may be synergistic but their presence is not critical for the cluster's success

*"A cluster is a **geographically proximate group** of **inter-connected companies** and **associated institutions** in a particular field, **linked by commonalities and complementarities**"*

Proposed by TRAI in Sec.2.93

Specialized Cluster in Taiwan

IC Cluster

Logic Design		▪ Design Houses (~260 in total)
Mask		▪ IC masks manufacturers (~4 in total)
Fabs		▪ Fabrication, Wafer Probing & Dicing (~13 in total) ← Wafer (8) ← Chemicals (18)
Packaging		▪ Packaging (34) ← PCB Boards (14) ← Lead Frame (4)
Final Testing		▪ Testing (~34 in total)

- ***Highly integrated value chain with synergy of cluster***
- ***Well developed supporting services***
- ***Agile and fast-responding supply network***

Source: Booz & Company analysis

Government needs to adopt a comprehensive strategy for cluster development, including infrastructural, fiscal and legal initiatives

PRELIMINARY

Cluster Development Conditions		Government Role		
		1 Infrastructure	2 Fiscal	3 Legal
Factor Conditions	▪ Availability of inputs for competitive manufacturing	Provide access to ▪ Power (energy) ▪ Transportation ▪ Skilled labor for hi-tech manufacturing	▪ Offer time bound incentive to overcome logistics/ freight costs	▪ Build regime with favorable labor laws amenable to employer and employee
Demand Conditions	▪ Easy access to local and global markets		▪ Promote export via zones aligned for this purpose	
Context for Firm Strategy and Rivalry	▪ Promotion of healthy competition via ownership and business policies			▪ Ensure certainty in policies ▪ Streamline approval process (especially environmental clearances)
Related & Supporting Industries	▪ Prevalence of ancillary industries required for manufacturing	▪ Access to sufficient technology infrastructure (testing facilities etc.) ▪ Proliferation of component supply base		

Source: Booz & Company analysis

Current infrastructure is a significant roadblock for manufacturing activities - strong initiatives are key to develop clusters

Infrastructural	Key Issues	Recommendations
Energy	▪ High tech manufacturing needs uninterrupted and assured power supply ▪ Power supply is in-consistent and in short supply. ▪ Current cost of power to industry does not provide any distinct manufacturing advantages	▪ In Section 2.93/94, TRAI recognizes need for developing infrastructure ▪ However, regarding power generation for telecom manufacturing, DoT can work with Ministry of Power to set-up dedicated generation facility for clusters
Transportation	▪ Need improved ports, road network and warehousing capabilities to build capacity for future China plugs in 9% of GDP into public works compared to 4% in India	▪ Prioritize road and transport network development in areas marked for clusters catering to telecom manufacturing ▪ Invite logistics firms as synergistic and optional tenants to set-up base in ear-marked clusters
Hi-Tech Manufacturing Skills	▪ Requires adequately trained manpower to meet basic manufacturing and plant management needs ▪ Currently low cost yet skilled labor for hi-tech manufacturing is in short supply; can be augmented	▪ In Section 2.78, TRAI recognizes need for skilled manpower and recommends training institutes for on-demand training ▪ Suggest that these institutes can be co-located in/near clusters with telecom specific training (similar to NMP plan to set up ITIs in NMIZs) ▪ Can establish with foreign investment and partnerships
Technology Infrastructure	▪ Requires good primary and secondary component supplier base ▪ Need centralized testing and certification agencies ▪ Good to have additional support services like prototyping, shared infrastructure etc.	▪ TRAI (Section 2.93) recommends setting up of clusters for component development – industry supports this. ▪ In Section 2.5, TRAI recommends setting up a standard Test and Certification Agency.. However, need to establish certification centers in each cluster ▪ Can provide capital support for development of ancillary industries like prototyping etc.

Source: Interviews, TRAI, Booz & Company analysis

Infrastructural disabilities lead to cost disadvantages; Government can incentivize manufacturing via lower duties and special credits

Impact of Disabilities on Cost Structure
%

Cost Account	India	China	Comments
Raw Material Cost	85	85	▪ Assume CST waiver
Raw Material Freight Costs	3	1.2	▪ Difference arises from absence of component supply base
Labor	2	2	▪ Similar labor costs due to lower wages in India offset by lower productivity
Power and Overheads	10	7	▪ Higher power costs and uncertain supply in India
Total Cost	100	95.2	▪ ~5% cost differential

Key Issues: Duties

- Application of CST/ State VAT renders domestic manufacturing uncompetitive as State VAT (2-12%) is often greater than Special Additional Duty
- Underdevelopment of domestic supplier base and infrastructural handicap translate to higher cost structures for domestic manufacturers

Recommendations

- Institute scheme to offset infrastructural and freight disabilities, as also state VAT rates:
  - Devise scheme similar to Focus Products Scheme to include all telecom equipment and components manufacturing locally in line with DIT requirements
  - Offer Duty Credit Scrip as fixed % of exports and DTA sales for fixed period (5 years)
  - Allow for Credit Scrips to used against excise payments

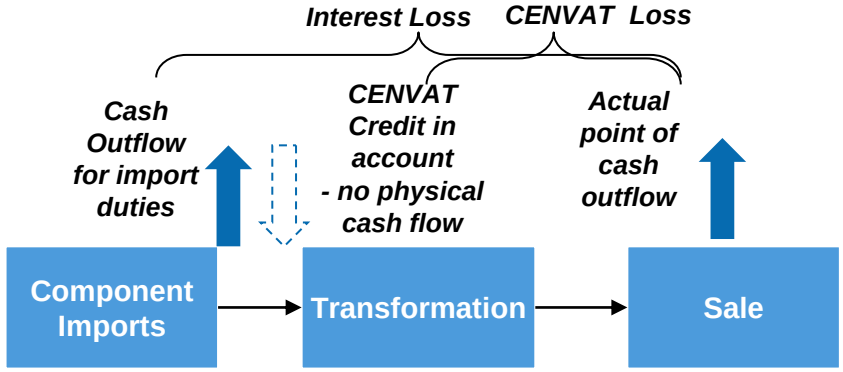
Note: Assume power costs contribute to 5% of overall costs. Assume other overhead costs are same between India and China
Source: Interviews, DIT Task Force, Study , Booz & Company analysis

The Government needs to harmonize fiscal regulations across manufacturers and modify the current refund system

PRELIMINARY

Un-harmonized Regulations

Induced Cash-flow Issues



Key Issues

- Current regulations do not recognize intra-SEZ sale as foreign exchange earning transaction
- Precludes development of component eco-system as they grapple meeting Net Foreign Exchange requirements at SEZ

- Interest loss due to difference in time between cash outflow for import duties and taxes and point of reconciliation and refunds after product sale
- Unpredictability in refund amount
- Non-accrual of balance CENVAT credit

Government Imperatives

Export benefits need to propagate to component manufacturers within manufacturing zone

Streamline process for obtaining refunds and CENVAT credit accrual

Source: TRAI, Booz & Company analysis

Current recommendations do not impact labor laws – critical to modify restrictions clauses in order to develop effective clusters

Concerns	Problem Areas	Relevant Laws and Chapters
Flexibility to Scale Production Based on Demand Fluctuations	▪ Telecom equipment industry considered to highly seasonal with fluctuations in demand which can vary significantly based on available projects at any given time ▪ Existing manufacturers restricted by lack of flexibility on labor force employment that would enable them to optimize workforce to meet demand ▪ Contract labor gaining precedence in the market in a bid to bring in this flexibility	i Section 25M of Industrial Disputes Act of 1947 that covers the provisions regarding prohibition of lay-offs for factory workers ii Section 25G lays down the procedure for retrenchment and imposes the "last-come-first-go" principle which restricts the employers intention to keep the best workers
Provisions and Conditions Regarding Employment of Labor	▪ Provisions relating to number of permissible hours of work for during a day or week ▪ Restrictions on overtime and payments deemed necessary to compensate for overtime We do not envisage any required dilution on OSHA and right to association	iii Section 51 of the Factories Act 1948, covering the maximum number of permissible hours for factory workers in week iv Section 54 of the Factories Act 1948, covering the maximum number of permissible hours for factory workers in day v Section 64 of the Factories Act 1948, covering the maximum number of working hours (including overtime) permissible under state amendments

Source: Booz & Company analysis

Section 25M of IDA 1947 restricts manufacturers from optimizing workforce hiring to meet demand fluctuations

Section 25M of IDA 1947: Clauses and Amendments

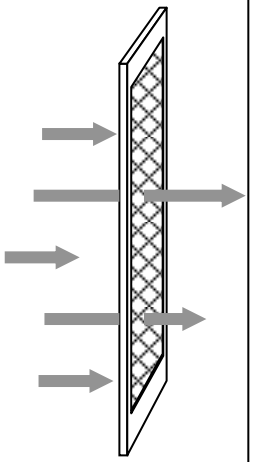
Currently IDA contains 27 different forms pertaining to disputes that may arise from the Act

Industrial Disputes Act: Section 25M

- Covers restrictions on lay offs of factory workers

No workman (other than a badli workman or a casual workman) whose name is borne on the muster rolls of an industrial establishment to which this Chapter applies shall be laid- off by his employer except 1[with the prior permission of the appropriate Government or such authority as may be specified by that Government by notification in the Official Gazette (hereinafter in this section referred to as the specified authority), obtained on an application made in this behalf, unless such lay- off is due to shortage of power or to natural calamity, and in the case of a mine, such lay- off is due also to fire, flood, excess of inflammable gas or explosion]. ***- Section 25M , Sub-Section 1***

Where the workman (other than badli workmen or casual workmen) of an industrial establishment, being a mine, have been laid- off under sub-section (1) for reasons of fire, flood or excess of inflammable gas or explosion, the employer, in relation to such establishment, shall, within a period of thirty days from the date of commencement of such lay- off, apply, in the prescribed manner, to the appropriate Government or the specified authority for permission to continue the lay- off***- Section 25M , Sub-Section3***



Amendments Proposed

- Sub-Section 1 needs to be modified to allow:
  - No quantitative restrictions on hire and layoff – across any category of employment- subject to appropriate contributions to the social security and other contributions
- Sub-section 3 creates a bureaucratic process and delays even in case of lay-off being due to reasons prescribed in sub-section 1

Source: Booz & Company analysis

Section 25G of IDA 1947 allows for legal action against layoffs; dispute may be filed for any reason other than time of hire

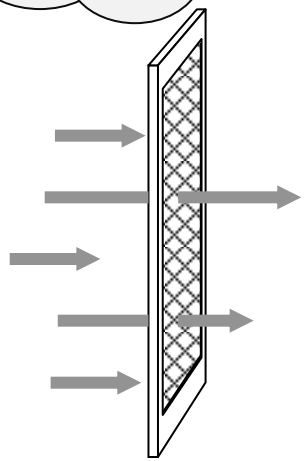
Section 25G of IDA 1947: Clauses and Amendments

Industrial Disputes Act: Section 25G

- Covers procedures in case of retrenchment of workers of factory workers in the

Where any workman in an industrial establishment, who is a citizen of India, is to be retrenched and he belongs to a particular category of workmen in that establishment, in the absence of any agreement between the employer and the workman in this behalf, the employer shall ordinarily retrench the workman who was the last person to be employed in that category, unless for reasons to be recorded the employer retrenches any other workman
. ***- Section 25G***

Any departure from the principle of the clause requires prior agreements between employer and worker



Amendments Proposed

- This clause of the IDA allows for legal disputes since employer is bound to show reasons for retrenchment of any workman unless this was based on “last come first go” principle
- This clause under the IDA may be amended to allow the manufacturer to retrench without provision for dispute based on accepted criteria for determining lack of performance of a worker

Source: Booz & Company analysis

Specific provisions of the Factories Act of 1948 governing overtime and permissible working hours also needs to be re-evaluated

Factories Act 1948: Clauses and Amendments

Factories Act 1948

- Covers provisions governing overtime and hours of employment

Weekly Hours

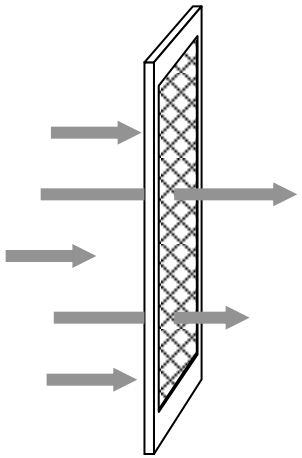
No adult worker shall be required or allowed to work in a factory for more than forty-eight hours in any week. ***- Section 51***

Daily Hours

Subject to the provisions of section 51, no adult worker shall be required or allowed to work in a factory for more than nine hours in any day. ***- Section 54***

Overtime (State Legislative Provisions)

the total number of hours of work in a week including overtime, shall not exceed sixty;
The total number of hours of overtime shall not exceed fifty for any one quarter
- Section 64



Amendments Proposed

- Overtime is an opportunity for able workers to earn extra income and so limits may be amended as current provisions of fifty hours a quarter implies less than one permissible overtime hour in a day
- Weekly, daily and quarterly working hour restrictions may need to be aligned with international labour best practices e.g., 12 hours, subject to overall existing weekly caps

Mandating shorter working hours adds significantly to transport costs, especially given the poor state of the public transport infrastructure. Malaysia currently allows 12 hours a day as permissible working limit while China has more flexible overtime limits

Source: Booz & Company analysis

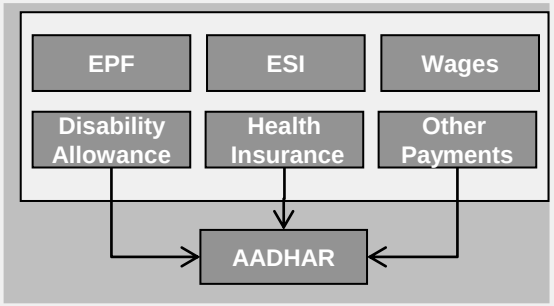
There is a need for a comprehensive framework of labor laws that balances the needs and concerns of both employer and employee

Key Elements of Recommendations on Labor Law Framework

PRELIMINARY

Wages and Benefit's Provisions

- **Recommendations**: Benefits distribution has to include:
  - **Single account linkage:** Any employer, irrespective of nature of contract, must deposit contributions under all labour schemes (EPF, ESI etc.) under different sub-accounts or a single account but which are linked to single AADHAR number or account
  - **Self Declaration**: Employer and employee have to self-declare the accounts that they are paying into or receiving benefits into respectively



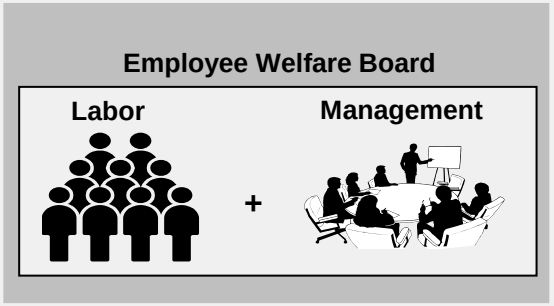
Layoff Provisions

- **Recommendations**: Layoff provisions need to be flexible without compromising welfare
  - **Quantitative restrictions on layoffs:** No quantitative restrictions on layoffs to allow seasonality based adjustments on hiring. This is to be uniform across industries with no differentiation based on nature of contract
  - **Wages**: Wages on termination to be uniformly addressed as being equal to 15 days of wages for every year of employment with the employer, prorated over the duration of total employment

We do not recommend any dilution of the occupational safety and employee health related provisions contained within existing labor laws

Unionization Provisions

- **Recommendations**: Rights to association should remain; however
  - **Employee Welfare Board (EWB):** Every employer should have a labour welfare board on which representatives of management and labour are present . Representations of proposed changes should be made to EWB
  - **Work Stoppage Provisions**: No work stoppage unless 70% of employees vote for this using secret ballot
  - **Wage Disputes:** Wage disputes will be effective from date referendum is passed



Source: Booz & Company analysis

Regulatory processes need to be streamlined in line with NMP; mechanics need to be detailed with additional considerations

Key Issues

- **Complex Certification & Monitoring Process**:
  - Involvement of multiple agencies seen as a source of corruption and harassment
  - Single window clearance does not work well. Often opens to multiple windows
- **Lack of Transparency**: No clear understanding of rules and processes that need to be fulfilled
- **Long Clearance Time**: Lengthy approval process delays commencement of manufacturing

Relevant NMP Recommendations

- **Simplified Clearances & Monitoring:**
  - Streamlined clearance procedure with official of State Pollution Control Board to be posted in zone
  - Involvement of third-party agencies to supplement Government agencies for compliance monitoring
  - Institute web-enabled process
- **Well-defined Clearance Time:** Defined timeline with respect to all clearances beyond which application shall be deemed approved
- Plan NMIZs properly to reduce number of clearances required

Additional Considerations

- **Clear Definition of Roles**:
  - Need to ensure proper division of roles and responsibilities with introduction of third party agencies and online processes
  - Can afford greater autonomy to third-party agencies
  - Can institute special process for NMIZs
- **Ensure Transparency with Online Process**: Web-enabled process should target to provide greater transparency regarding approvals required, criteria to secure approval and reasons for rejection
- **Competitive Clearance Window**: Define clearance time in line with international best practices

Source: Interviews, National Manufacturing Policy 2011, Booz & Company analysis

Guaranteed time bound incentives that are stable over the duration of the concessions are needed to attract investment

Government Prior Incentive Rollbacks: Examples

"The Union finance ministry is mooting withdrawal of the tax incentives to manufacturing units in Himachal Pradesh and Uttarakhand The will affect the bottom-line of fast moving consumer goods (FMCG) companies like Dabur, Nestle, Hindustan Unilever. If the government does away with these subsidies, industry experts say the cost of companies in these regions could increase by anywhere between 20 and 30 per cent" – **March, 2010**

"Finance minister P Chidambaram had in his Budget for 2008-09 proposed an end to the seven-year income tax holiday for refineries commissioning after April 2009. The proposal would affect all proposed new refineries except that of Reliance Petroleum Ltd"~ **2009**

Implications and Current Plan

Implications

- Investor confidence needs to be built up with guarantees on length of tax incentives
- Incentive structure should allow continuation in the face of changing governments and respective policies

Central government needs detailing on current incentives to encourage companies across the value chain

Current Package

Initiatives	Description	Budget
Tax Deferment	▪ 5 year tax holiday to new companies	Rs 3,154 Crores
Tax Benefits	▪ Limiting Excise and VAT to 12%	Rs 37,450 Crores
Interest Subsidies	▪ 6% interest subsidy for IP and 3% for IMP	Rs 22,782 Crores
TOTAL		Rs 63,386 Cr

Source: Interviews, Booz & Company analysis

Setting the Objectives

Promoting Manufacturing

Fostering Innovation

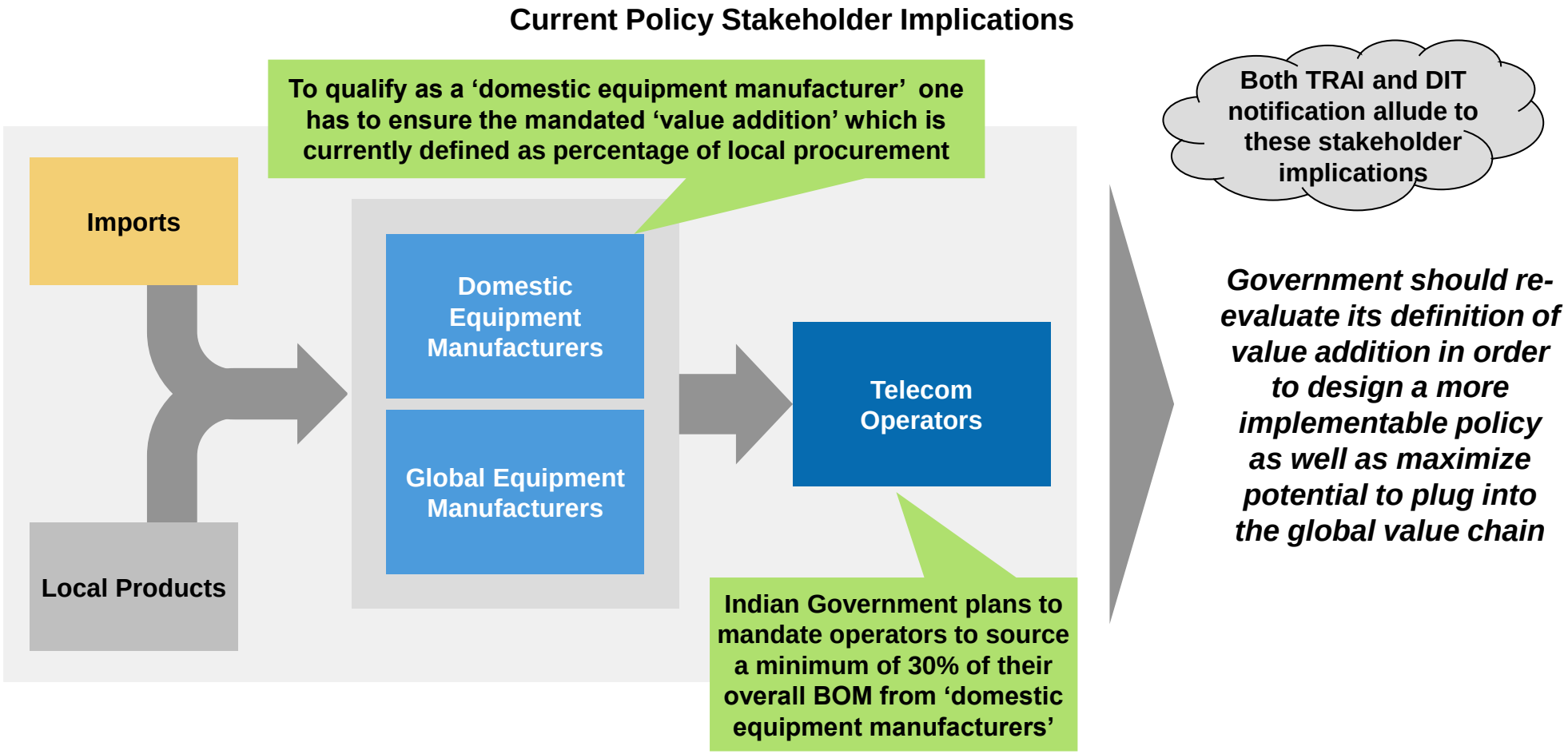
Ensuring Network Security

Market Overview and Key Challenges

Manufacturing Ecosystem Imperatives

Stakeholder Considerations

Proposed policy puts the onus on operators to drive PMA – non-optimal definition of value addition makes the policy impractical



Source: Booz & Company analysis

Applying PMA to other than non-commercial Government and for security critical procurements will need WTO verification

Proposed PMA Quantification

TRAI Proposal & DIT Notification

Mandate that certain percentage (quantitative requirement) of operator / Licensee procurement arises from products meeting threshold % of local value addition with value addition defined as below

$$\text{Value Add}^{1} = \frac{\text{Local BOM}}{\text{Total BOM}} \times 100$$

Conflict in areas of non-security critical commercial procurement

WTO Compliance for Commercial Procurement

Relevant Clauses from GATT

Paragraph 1: The [Members] recognize that internal taxes and other internal charges, and laws, regulations and requirements affecting the internal sale, offering for sale, purchase, transportation, distribution or use of products, and internal quantitative regulations requiring the mixture, processing or use of products in specified amounts or proportions, should not be applied to imported or domestic products so as to afford protection to domestic production.

Paragraph 5: No contracting party shall establish or maintain any internal quantitative regulation relating to the mixture, processing or use of products in specified amounts or proportions which requires, directly or indirectly, that any specified amount or proportion of any product which is the subject of the regulation must be supplied from domestic sources. Moreover, no contracting party shall otherwise apply internal quantitative regulations in a manner contrary to the principles set forth in paragraph 1.*

Paragraph 7: No internal quantitative regulation relating to the mixture, processing or use of products in specified amounts or proportions shall be applied in such a manner as to allocate any such amount or proportion among external sources of supply.

1) Definition of Value Add based on DIT Notification
Source: Booz & Company analysis

If applicable, PMA guidelines for 'value addition' should be amended to incorporate substantial transformation…

Substantial Transformation

- **Definition:** Substantial transformation is said to have occurred when the article or commodity has a new name, new character or new use compared to the inputs used to produce the article or commodity

- **Tests of Substantial Transformation:** Countries measure the degree of substantial transformation using 3 tests:
  - ***Change in name*** requires change in commercial designation or commercial identity of the product, which may be shown by trade literature, catalogues or brochures
  - ***Change in character*** requires change in physical aspects of the product such as change in physical dimensions, chemical composition or physical qualities
  - ***Change in use*** requires a product to be transformed into a product with a different use or a change of a product with many uses into a product with a single use

- **Advantages for India:** A substantial transformation measure will be:
  - Compliant with WTO regulations
  - Accompanied usually by significant value addition which can be used to offset the import bill

Making India a hub for substantial transformation will meet the objectives targeted by the government

Key Proposed PMA Amendments

- **Balance Imports Through Substantial Transformation**: Equipment manufacturers can perform substantial transformation to offset import bill for components

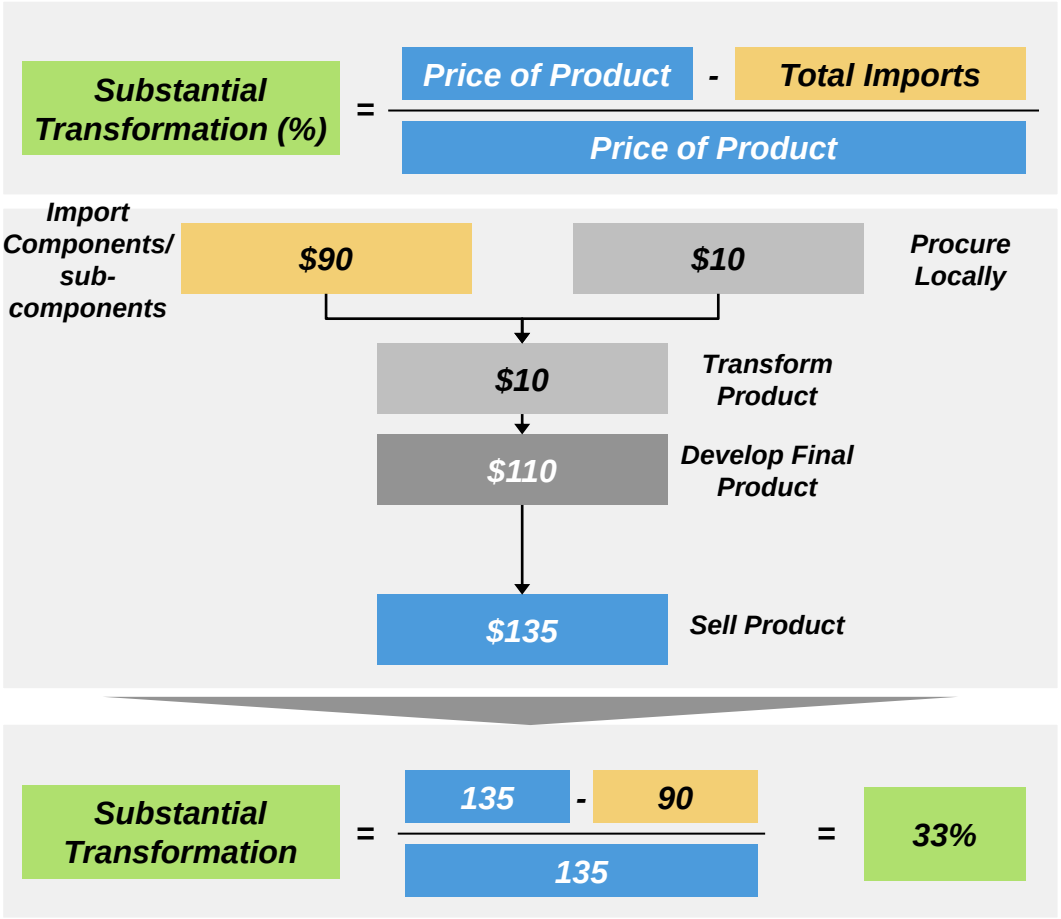
- **Objective of Amendment**: As manufacturers offset imports via substantial transformation they will bring strong manufacturing skills as well as boost demand for local products

- **Accountability**: Operators be made responsible for ensuring import balance through substantial transformation criteria is met by all its vendors

Source: Booz & Company analysis

…to help Government design an implementable and robust policy to fuel local manufacturing and create jobs

Substantial Transformation - Overview



Potential Approaches to Meet Criteria

- ***Foster in-house substantial transformation***
  - Build and foster key design and manufacturing activities in order to increase the value add on procured imported and local products
  - Drive transfer to technology know-how and skills as well as create significant jobs thereby meeting key Government objectives
- ***Reduce value of imported components***
  - Telecom equipment manufacturers can increase adoption of local components in order to ease the requirements on in-house substantial transformation
  - Increasing demand will drive growth for local manufacturing thereby meeting key Government objectives

Source: Booz & Company analysis

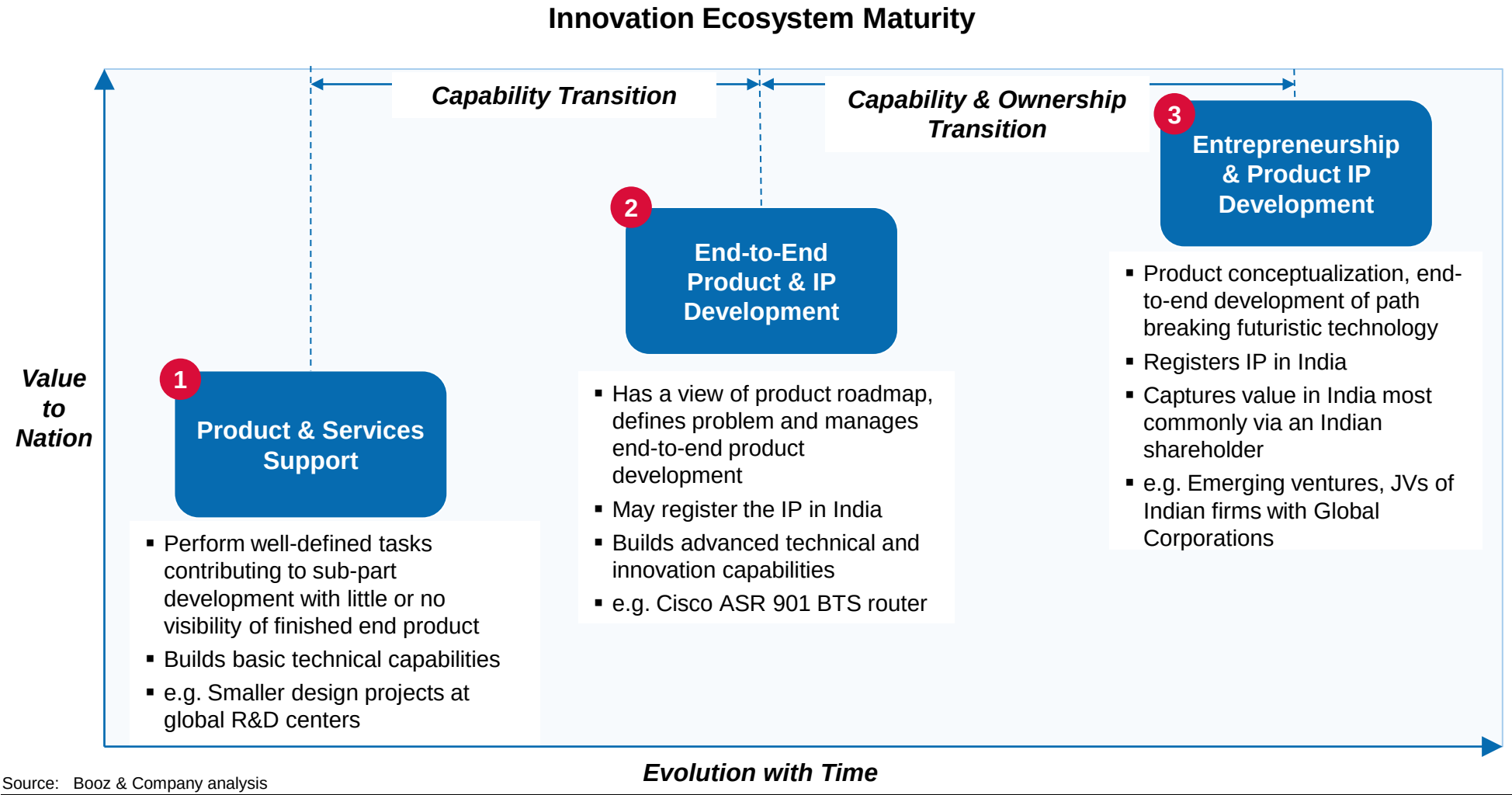
Setting the Objectives

Promoting Manufacturing

Fostering Innovation

Ensuring Network Security

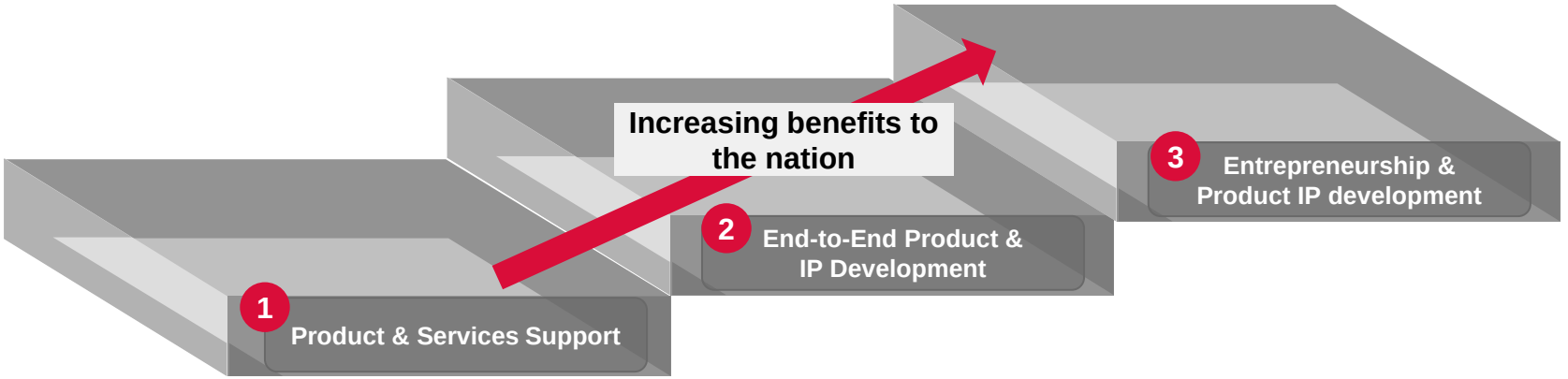
The innovation ecosystem typically evolves in three stages with a build up of local capability and participation levels



Source: Booz & Company analysis

Evolution provides incremental benefits to the nation; initial phase provides jobs, latter stages help drive innovation and forex

Jobs	▪ High volume of relatively lower skill jobs	▪ Emphasis on low volume high skill jobs	▪ Emphasis on high skill jobs but may support manufacturing jobs
Innovation Capability	▪ Builds basic technical capabilities	▪ Requires advanced technical knowledge with end-to-end product development skills	▪ Requires path-breaking innovation ability in emerging technologies
Fiscal/ Forex	▪ Forex inflow from exporting engineering services	▪ Forex inflow from exports	▪ Forex inflow from exports ▪ Fiscal impetus from profit accruals



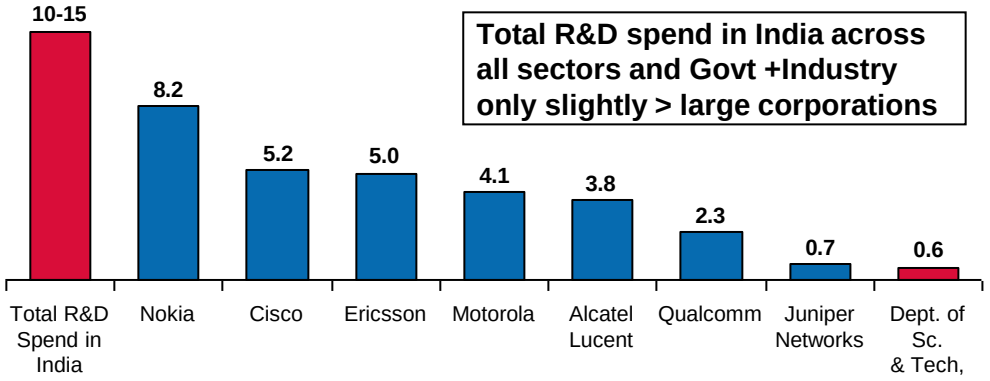
Source: Booz & Company analysis

Global players are critical to drive the first two stages of evolution; they bring in large spend and transfer know-how

NON-EXHAUSTIVE

Telecom R&D Spend

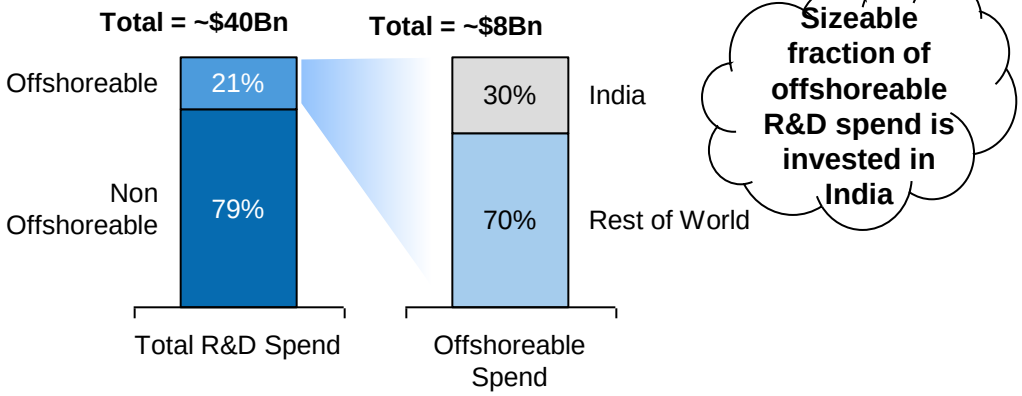
2008-09, USD Bn



Total R&D spend in India across all sectors and Govt +Industry only slightly > large corporations

Investments in India

2009



Sizeable fraction of offshoreable R&D spend is invested in India

Source: Interviews, UNESCO, Booz & Company analysis

Activities at India Research Centers

Alcatel·Lucent

- Joint research center with C-DoT (~250-500 employees)
- Provides hardware, software design and testing services
- Develops complete terminals, small cells and base stations

CISCO

- Largest development center outside US
- Employs ~5000 people with ~370+ patents granted
- Perform end-to-end product development e.g. ASR 901 router for BTS; also had manufacturing support

intel

- Large center in Bangalore with ~2500+ engineers
- Provide hardware and support for global processor development+ small group focusing on end-to-end products for India

Large scale employment and infusion of technical knowledge helps build basic and advanced capabilities in the ecosystem

However, currently investments are limited by weak technology, IP and education infrastructure

Current Industry Concerns

Technology Infrastructure

- Need support for testing, certification and prototyping
- Helps broaden innovation activities to include complete product development

> ***To build another Silicon Valley, India needs to create an ecosystem with adequate contract manufacturers for prototyping, product qualification and compliance labs***
> *- Senior Executive, Global Technology Company*

IP Infrastructure & Protection

- Weak IP infrastructure with four offices across India
- Sluggish process – takes ~4 years for patent grant whereas entire process takes ~2.5 years in US
- Not recognized as a destination with strong enforcement of IP protection

> ***While the IPR regime in India consists of robust IP laws, it lacks effective enforcement, for which "least priority given to adjudication of IP matters" is often quoted as a reason***
> *- FCCI, World IP Day, 2010*

Educational Infrastructure

- Engineers grapple with ramping upto speed and conceptualizing new products
- Engineering curriculum places minimal importance on practical experience - takes ~10months to bring Indian engineer to full productivity vs. 2-3months in mature geographies
- Lack of engineers with advanced degrees- Doctorate: Bachelors is 0.4% in India vs. 11.3% in US

> ***There is also a lack of talent for product conceptualization and product management for the emerging markets. Systems management for captives still continues to be driven by headquarters, so talents for this area need to be nurtured.***
> *- Indian Semiconductor Association*

Source: Interviews, USPTO, Booz & Company analysis

To usher international investments , the Government needs to be more proactive in building an ecosystem with sound infrastructure

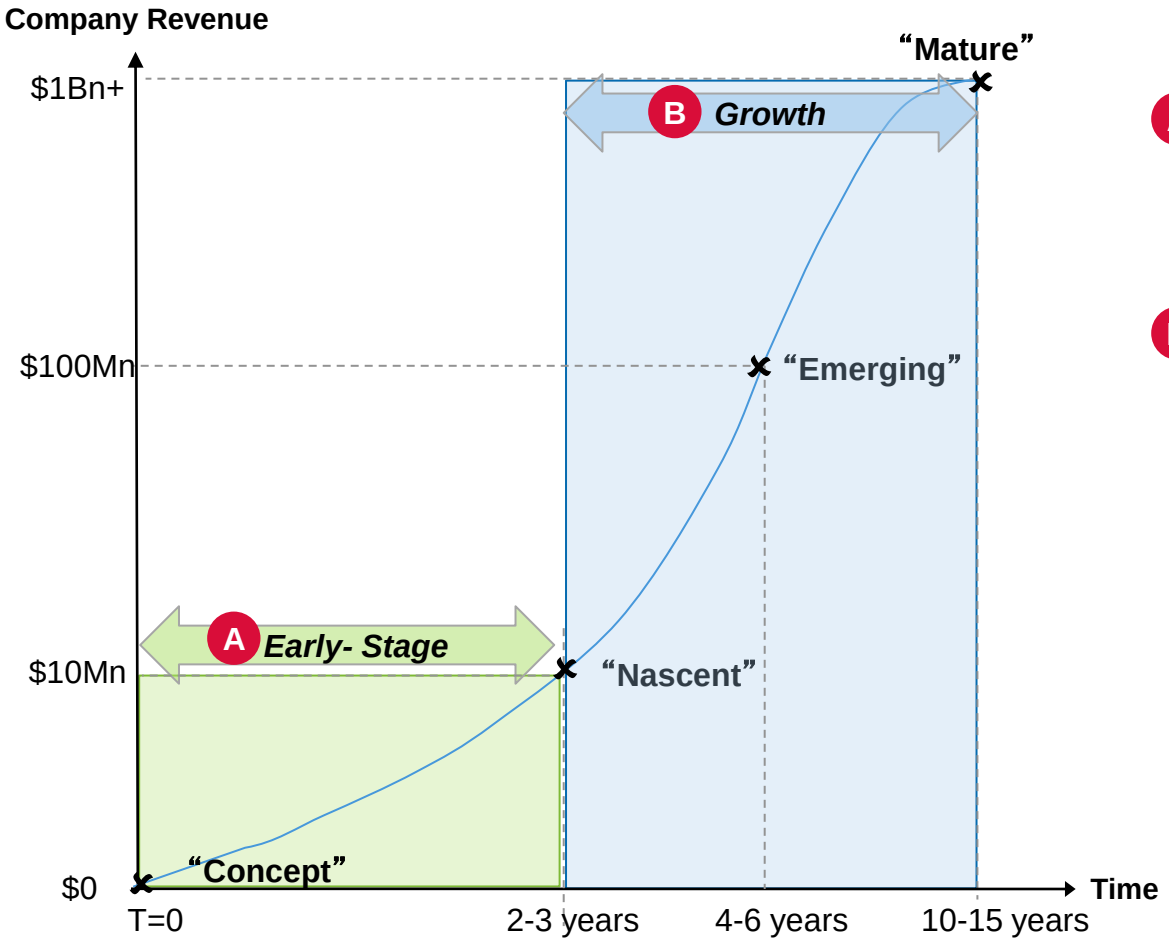
Imperatives for Government

Technology Infrastructure	▪ Policy recommendation proposes converting Telecom Engineering Centre into an autonomous testing and certifying agency (TRAI- §2.50)	▪ However, ecosystem needs to extend beyond testing to include shared labs, prototyping etc. ▪ Provide funding and extend subsidies (e.g. SEZ benefits) to promote development of SME engineering services organizations.
IP Infrastructure & Protection	▪ While the Authority delves briefly on the topic in TRAI- §3.44, there are no clear steps highlighted	▪ Ease the IP application process using global best practices. e.g. US ▪ Strengthen IP protection by taking action against violators ▪ Reinforce India's brand image as IP destination
Educational Infrastructure	▪ Training institutes at the polytechnic level to promote manufacturing have been considered (TRAI- §2.78) ▪ Engineering education has not been addressed	▪ Upgrade engineering curriculum to include latest telecom technologies and practical know-how ▪ Encourage collaboration between academia, Government labs and industry; can facilitate PhD programs on specific topics at IITs and IISc with industry support

Source: Interviews, USPTO, Booz & Company analysis

In parallel, we need to start developing an ecosystem to foster entrepreneurship - typically requires much longer gestation period

Key Steps in Evolution of New Ventures



Source: Booz & Company analysis

Stages of Evolution

A Early-Stage:

- Evolution of product from concept to prototype with initial roll-out.
- **"Concept"** : Disruptive product concept based on cost and/or technology advantage

B Growth Stage:

- Evolution of companies from small-contract based sustenance to mature self-sustaining globally competitive levels
- **"Nascent" :**
  - Completely developed product with patent filed
  - Basic pilot runs in progress
- **"Emerging":**
  - Achieved break-even or profitable
  - Established scale in home market or region
  - Beginning to export
- **"Mature":**
  - Globally established player
  - Drives economies of scale at global level

Across the early stage development cycle, companies are faced with lack of VC funding and absence of adequate infrastructure

Early Stage Development

Early Stage companies include those incubated at TCOE India

	Key Activities	Challenges
Product Conceptualization	▪ Ideation and business plan development ▪ Typically involves small technical team + business lead	**Lack of seed funding to develop on concept and prototype**
Product Development	▪ Refining concept ▪ Prototyping ▪ Build team to include sales, marketing, support functions	
Field Testing & IP Filing	▪ Obtain field trial contracts from operators ▪ File for IP	**Insufficient physical and support infrastructure**

Source: Booz & Company analysis

TRAI has proposed the TRDF to provide seed funding; detailed design is yet to be fleshed out

Need for Funds

- Sufficient early stage VC funding is not available to cover large development costs
  - *"While VCs are willing to invest a few crores in ventures, product development from basic research to commercialization requires several tens of crores" – Entrepreneur*
  - With relatively low volume of funding early stage VC funding:
    - spreads too wide across sectors and..
    - lacks risk appetite to provide sustained support for product development
- As TRAI highlights, may also apply to projects within larger organizations that have long lead time and may not receive funding

TRAI's Proposed Incentives

- Establishing Telecom Research & Development Fund to finance R&D projects
- Fund setup with a corpus of Rs.10,000 crore and interest accruals of ~Rs.800 crore used to fund projects (§3.43)
- Plan to fund ~Rs.20 crore per project over 2 years with 40 active projects at any time (§3.41)
- Research center to bear 50% of the cost. Funding for educational institutions could be 100%
- Fund managed by government, industry and academia jointly

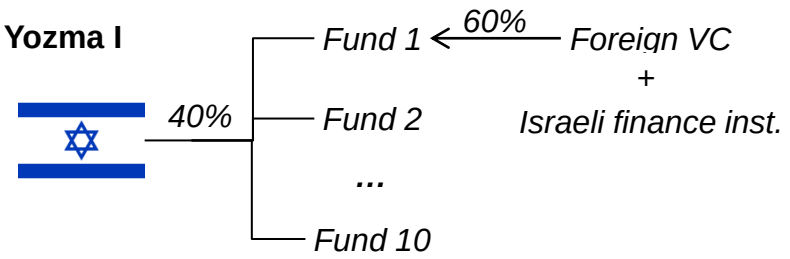
May need to rework fund size as projects may require >20crores or may need investments for >2years

Program structure and administration mechanism is yet to be detailed

Source: Interviews, IVCA, Booz & Company analysis

Global best practices can be incorporated in program design for the seed fund

Case Study: THE YOZMA GROUP managing venture capital funds since 1993



- Govt. invested $8Mn each in 10 funds+ $20Mn
- Fund had to engage one foreign VC institution and well-established Israeli financial institution
- Government would invest about 40% of funds raised. $100Mn of Govt funds, called for $150Mn private funds
- Each fund had call option on Government shares at cost plus interest for 5 years
- Provided funding and risk sharing to start-ups but also upside from acquisition of Government shares

Recommendations for Program Mechanics

- **Structure:**
  - Based on venture capital model
  - Can be modeled along lines of DST's Technology Development Board providing loan assistance, equity subscription and grants
  - Need to cater to start-up proprietary ventures similar to TePP
- **Design:**
  - Appropriately leverage foreign and best domestic expertise
  - Adopt strategies to raise sufficient capital without bleeding Government exchequer
  - Offer additional incentives to entrepreneurs including mentoring, additional upside from stake sale etc.
  - Utilize similar selection parameters as DST's grants – need to measure merits comprehensively including merit, team, plans etc.

Source: Booz & Company analysis

The provisions for infrastructural support need to be more comprehensive than currently proposed to cater to early stage firms

Comprehensive Infrastructure Support

- Proposed R&D Park to co-locate innovation firms (TRAI- §3.39)

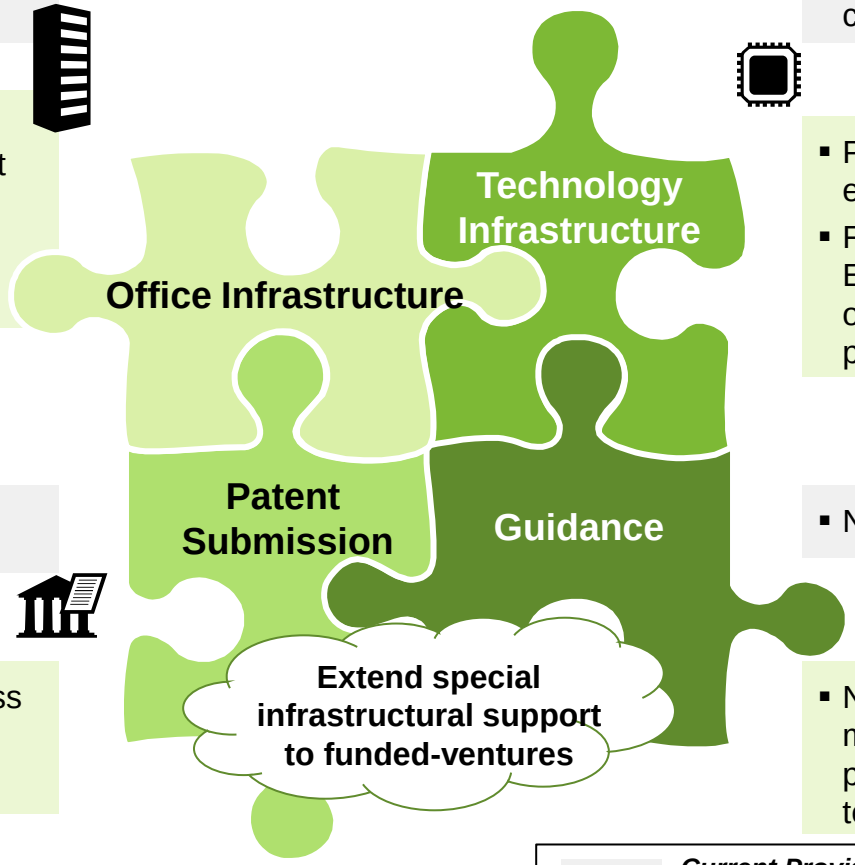
+

- Developing office infrastructure requires upfront capital investment
- Can mitigate the burden for select start-up firms with plug-and-play offices in proposed R&D park

- Centralized testing agency for all companies (TRAI- §2.50)

+

- Provide shareable resources for basic equipment assembly and testing.
- For instance, establish shared EMI/EMC test facilities in R&D park for ongoing testing during development phase



- Support for IPR filing fee (TRAI- §3.45)

+

- Recommend this extends to access to legal support beyond filing fee reimbursement.

- No specific provision

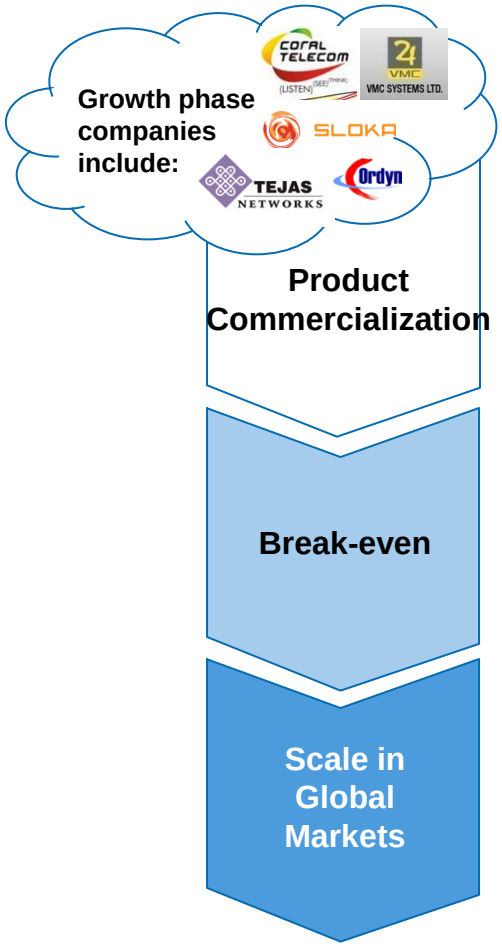
+

- Nurture selected firms by establishing mentoring network and facilitating periodic interactions with business and technology experts

Current Provisions in Recommended Policy | *Suggested Amendments*

Source: Booz & Company analysis

As they seek to attain scale, companies face challenges in offering competitive prices and attractive financing options



Growth Phase Development

Key Activities

- Establish supply chain, manufacturing and competitive vendor contracts
- Focus on marketing and sales
- Balance supply and demand to optimize inventory levels and cash-flow
- Achieve sufficient traction in domestic/primary market to meet production threshold
- Focus on growth and increasing market share via exports

Challenges

Stay competitive in pricing by balancing vendor contracts and demand

Offer attractive financing options in line with global players

Source: Booz & Company analysis

For instance, post liberalization a large telecom PSU failed, on the lack of a sustainable advantage

PSU – Wireless Communication Equipment (1975 – 1999)

Since 1975

Preferential Access

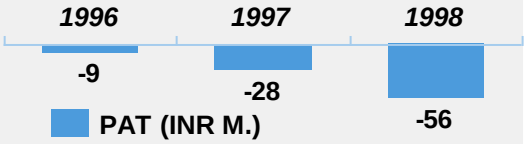
- Domestic manufacturers supplied telecom equipment to Defense sector
- Failed to achieve economies of scale and upgrading the technology

In 2006, PSU was disinvested

Post 1990 - 1999

Liberalization

- Accessed Japanese technology in 1992
- Followed broad banding
- NTP 1994 disturbed nascent liberalized telecom sector
  - **Revenue Sharing**: License fee annually @ 17% of "**Adjusted Gross Revenue**" for the Metro cities & Telecom Circles
  - Resale of business / assign ability/transferability of license
- **1998-99**
  - Recorded a negative growth of ~75%
  - Net Loss of ~ 139 Cr.



Reasons For Failure

Unfavourable Environment

- *NTP 1994 had clauses* like revenue sharing & assignability of license
- Additionally, political instability led to decreased investor confidence

Failed Equity Proposals

- Consequently, PSU had to undergo multiple failed equity proposals:
  - **1997**: Telia backed out pick up Rs. 125 Cr. of equity on adverse effects of NTP
  - **1997:** AIG refused Rs. 100 Cr support because of absence of Telia

Cash Crunch

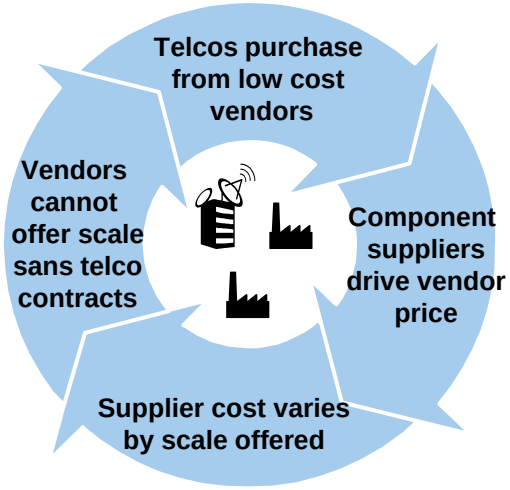
- Failed to execute the orders worth Rs. 140 Cr.
- Faced legal issues due to non-payment short term borrowings
- Faced legal cases for non-payment to creditors, suppliers, depositors, etc

Source: Booz & Company analysis

Facilitating competitive pricing calls for a broader strategy beyond current proposals of demand assurance and capital funding

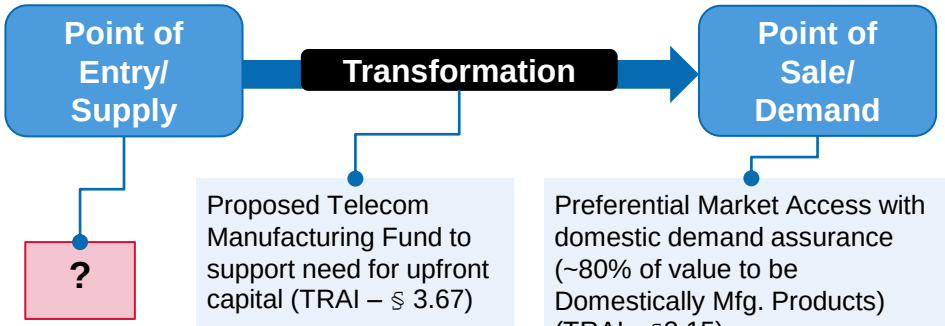
Pricing Dilemma

Start-up vendors face a chicken and egg situation….



Vendors need:
- Upfront capital for capex investment to build capacity
- Lower prices from suppliers

Government's Proposed Initiatives



Doesn't address issue of lack of mid-scale suppliers to provide competitive prices at lower volumes

Domestic demand assurance may not be sufficient to drive globally competitive economies of scale

Policy Recommendation

- Government may co-invest via JV or technology transfer to bring mid-size component manufacturers to cluster
- Provide tax incentives to start-ups to enable favorable pricing

- Can incentivize operators to procure Domestically Manufactured Products or Indian Products via license fee rebates

Source: Interviews, Booz & Company analysis

Attractive credit lines will enable growth stage ventures to offer financing options in-line with large global players

The Credit Issue

Global players benefit from attractive financing options provided

Global Banks + **International Vendors**

Offer multi-billion dollar credit lines to end-buyers for purchase of telecom equipment from select vendors

Buyers (e.g., Telcos)

Helps reduce capex and improves cashflow

国家开发银行 China Development Bank

HUAWEI

"Huawei's $30 Billion China Credit Opens Doors in Brazil, Mexico"

SEK

ERICSSON

"MTS seals €670m Ericsson vendor financing deal"

Government needs to help growth stage ventures in providing financing in-line with large global players – currently not addressed in policy

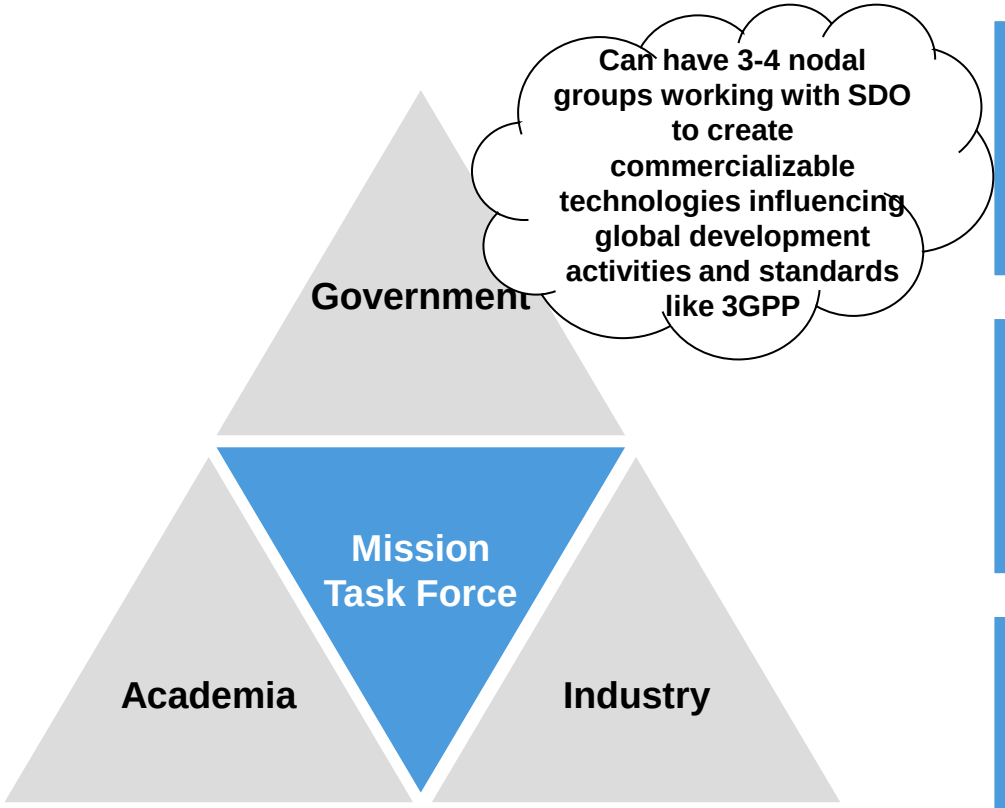
Proposed Recommendations

Objective	▪ To offer buyers comparable benefits in cash-flow management and expenses as globally prevalent credit lines
Structure	▪ Establish master fund to offer credit lines to buyers of telecom equipment from select Indian ventures ▪ Evaluation criteria: – Indian Ventures can be from among those funded by TRDF or similar Government initiatives – Need to evaluate credit worthiness of end player to manage risk profile of portfolio ▪ Credit lines to cover sale in domestic as well as international markets
Key Considerations	▪ Risk management for Government ▪ Value of fund provided ▪ Mechanism balancing operator cash flows

Source: Interviews, Secondary Research, Booz & Company analysis

Government needs to establish mission task forces for program management and to facilitate ecosystem evolution

Mission Task Force Structure and Key Objectives



Capability Development	▪ Provide strong mentorship to build key capabilities required to establish ventures across multiple growth stages ▪ Provide access to academia and technology infrastructure
Networking	▪ Facilitate strong networking opportunities to broaden the reach and success potential of the venture ▪ Introduce venture to relevant platforms to access necessary talent/knowledge
Program Management	▪ Provide program management assistance across different growth stages building on proposed TRDC ▪ Help control finances in development, integration and testing phases

Source: Booz & Company analysis

Setting the Objectives

Promoting Manufacturing

Fostering Innovation

Ensuring Network Security

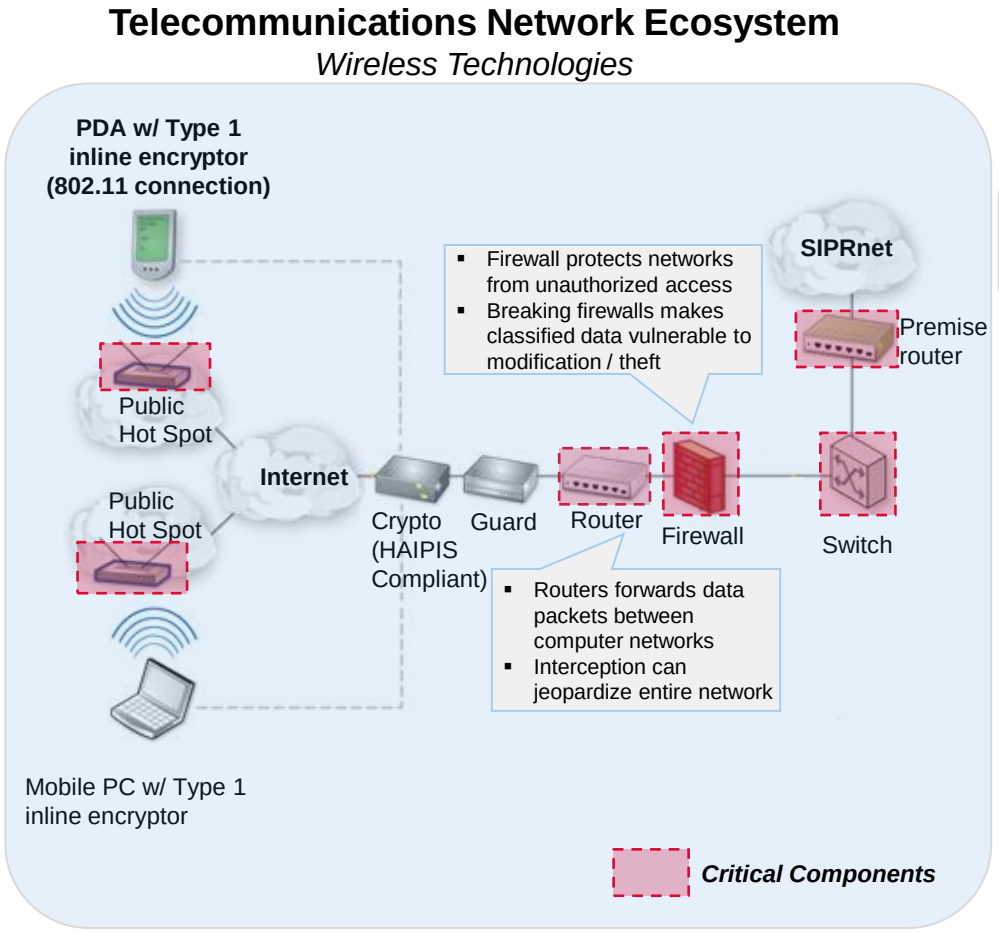
Security is on-going issue; countries have been struggling to come up with a comprehensive policy

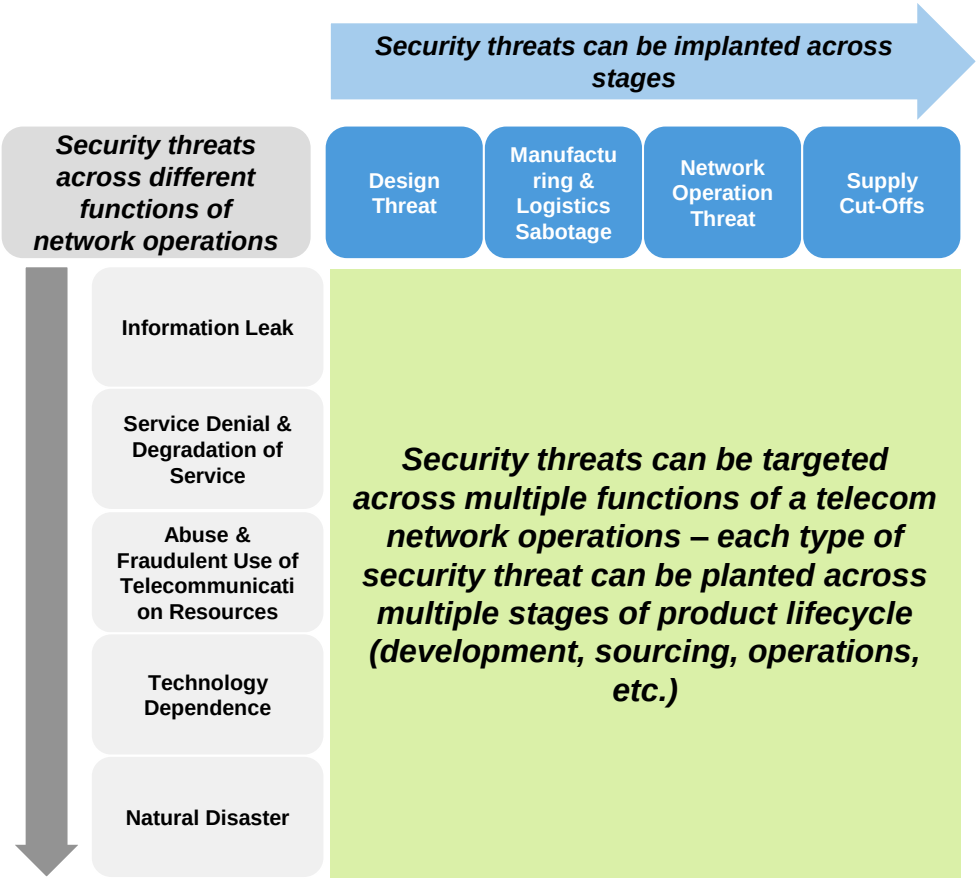
Key Issues in Telecommunications Equipment – National Security

Country	Key Issues	Few Initiatives
US 	▪ **Dependence on foreign innovation and manufacturing** for critical components (**ICs** embedded in routers, switches & hubs & **fiber networks**) ▪ **Growth of foreign MNCs** & related M&A deals with domestic players shifting the greater control to foreign nations (Merger of **Huawei & Symantec** – providing critical internet security)	Restrictive role played by CFIUS on Telecom mergers & other deals Established *common criteria* to set-up technical standards & configurations
Canada 	▪ **Complete access** to design standards for telecom equipment & software for **legal surveillance yet to be met** ▪ **Potential information interception** from signal intelligence (SIGINT) which carries certified national data	Dedicated Departments – DCA (Departmental COMSEC Authority) Member in establishing *common criteria* via CTCPEC

Source: Booz & Company analysis

Security threats can undermine several critical activities by acting on a network component; can be stimulated at multiple stages





Source: Telecom Security Policy, Booz IC and Booz & Company analysis

Security threats can classified into six distinct types - each one can be stimulated at multiple stages

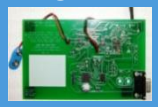
Type of Security Threats vis-à-vis its Form

Types of Security Threats	Description	Vulnerabilities	Stage of Stimulation
Information Leak	▪ Unauthorized access can lead to leak of critical information which could be personal, commercial or classified	▪ Existence of Spyware ▪ Remote Access ▪ Physical Access	▪ Design ▪ Manufacturing & Logistics ▪ Network Operations
Service Denial & Degradation of Service	▪ Intended to disrupt the service either by crashing the complete network or flooding it with unnecessary traffic	▪ DoS / DDoS ▪ PDoS, LDoS ▪ ICMP, SYN Floods	▪ Network Operations
Abuse & Fraudulent Use of Telecommunication Resources	▪ Illegal access to CPEs due to poor protection (both soft & hard)	▪ Theft ▪ Modification of data, information or network software	▪ Manufacturing & Logistics ▪ Network Operations ▪ Supply
Technology Dependence	▪ Complete dependence on imported equipment renders critical component vulnerable because of the complete developer's control	▪ Non-supply ▪ Remote Access ▪ Kill Switches	▪ Design ▪ Network Operations ▪ Supply
Natural Disaster	▪ Infrastructural damage	▪ NA	▪ Manufacturing & Logistics ▪ Logistics & Supply

Source: Booz & Company analysis

These security threats can be targeted across multiple stages – Network Operations are most vulnerable

Various Forms of Security Threats – Telecommunications Ecosystem

Security Threats Across Stages	Description	Ease of Interception
Design Threats 	▪ Alternate circuit schematics renders the equipment vulnerable ▪ Interception needs expert skill set and ill-intentions at the vendor's design labs ▪ Damages the entire network, difficult to diagnose & requires complete infra replacement	2
Manufacturing & Logistics Sabotage  	▪ Interception at the hardware level ▪ Tampering via direct access & could be executed subject to the security around the equipment ▪ Recovery through maintenance services / complete replacement	3
Network Operation Attacks 	▪ Interception by malicious spywares ▪ Attackers access the network remotely and NetOps attack is common as could be executed from anywhere ▪ Recovery through more efficient algorithms and procuring certified critical components	4
Supply Cut-Offs 	▪ Supply cut-offs of critical component disrupts services & makes the network vulnerable to further soft attacks ▪ Depends on suppliers, international relations, etc. ▪ Complete cut-off freezes entire network and causes substantial damage	1

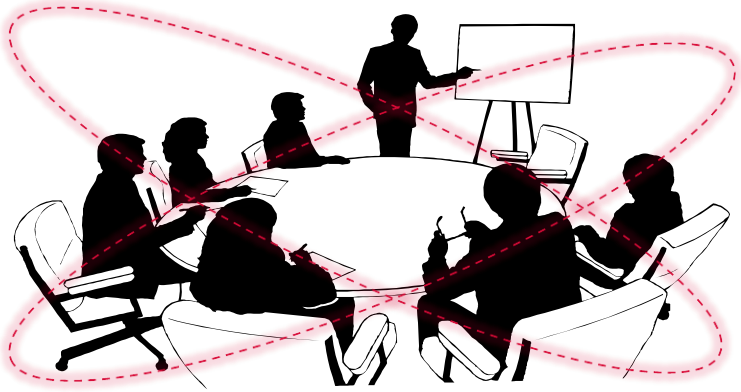
Source: Booz & Company analysis

A comprehensive CIIP framework can be designed and implemented to arrest security threats types across all stages

Map of Security Threats

Stages of Threat	Types of Threat
Design	Information Leak
Manufacturing & Logistics	Service Denial & Degradation of Service
Network Operation	Abuse & Fraudulent Use of Telecommunication Resources
Supply	Technology Dependence
	Natural Disaster

Comprehensive CIIP Framework



Critical Information Infrastructure Protection

- Robust methodology to tackle all the national security threats
- Mechanism to identifying security critical areas & designing well monitored roadmap for its execution
- Policy Levers for nation wise impact

GOI has proposed establishment of NTNSCB to formulate the telecom security policy and telecom equipment security framework

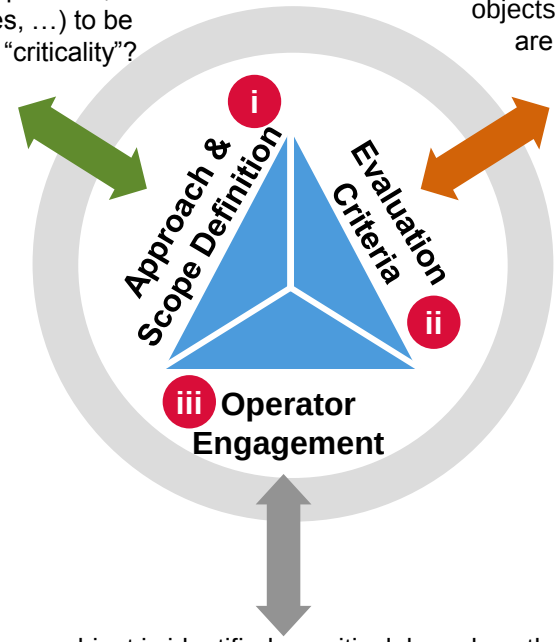
Source: Booz & Company analysis

CIIP program design involves three stages – approach definition, evaluation criteria selection and operator engagement assessment

Elements of National Approaches to CIIP

How does the national approach define the whole set of objects (services, operators, infrastructures, …) to be evaluated for "criticality"?

What criteria should be used to determine which subset of objects and services are "critical"?



Once an object is identified as critical, how does the national authority manage its relationship with owners/operators to ensure / improve the protection of critical infrastructures?

	Key Components of Various National CIIP Approaches
Approach & Scope Definition	▪ Processes generally begin with **identifying cross-sector "services"** (key functions, vital societal functions, critical sectors like financial services, government utilities etc.) supported by ICT services or operators
Evaluation Criteria	▪ **Objective:** – Population affected, financial loss, environmental impact, public order, restoral time, psychological (Services Dependent) – Redundancy, revenue, employment, coverage, number of subscribers (Operator Dependent) ▪ **Subjective:** Evaluation commonly made on experience, sensibility, and stakeholder consensus rather than quantitative matrix
Operator Engagement	▪ All approaches involve national operators at some point, but **not all label them "critical" operators** ▪ Risk Assessment **usually performed by operators** ▪ Private operators are **in the best position** to determine which physical infrastructures support key services

Source: Booz & Company analysis

While implementing this program in the EU, each country decided its own approach and scope; few chose the asset-oriented approach

Elements of National Approaches to CIIP

i Approach & Scope Deiniftion

- **A** Service-Oriented Approach
  - CI are identified starting from **vital services / functions** and then looking at supporting infrastructures
- **B** Asset-Oriented Approach
  - CI are identified by **categorizing the existing infrastructures** & evaluating their impact on supported services
- **C** Operator-Oriented Approach
  - Identify **critical operators** and then ask the operators to identify their own CI
- **D** Mixed Approach
  - Combination of the approaches listed above and / or other alternatives

ii Evaluation Criteria

- **E** Objective Criteria
  - **Quantitative analysis** of estimated impacts across various categories (population affected, financial loss,…)
- **F** Subjective Criteria
  - **Consensus-based opinion** that can be difficult to estimate accurately (interdependency, alternatives)

iii Operator Engagement

- Recommended Risk Management
  - **Cooperation-based** operator engagement model involving awareness raising and suggested approaches to risk management
- Mandated Risk Management
  - **Legislation-based** operator engagement model with specific mandated requirements, timelines, and reporting procedures

Approach & Scope Definition And Evaluation Criteria

	A	B	C	D	E	F
Austria			✓		✓	
Belgium	✓					✓
Czech Republic	✓		✓	✓		✓
Denmark	✓		✓	✓	✓	
Estonia	✓					✓
Finland	✓				✓	
France	✓				✓	
Germany	✓					✓
Hungary	✓					✓
Italy	✓					✓
Netherlands	✓	✓	✓	✓		✓
Norway		✓	✓	✓	✓	
Poland		✓				
Spain	✓				✓	
Sweden			✓			✓
UK	✓				✓	

Mixed Approach

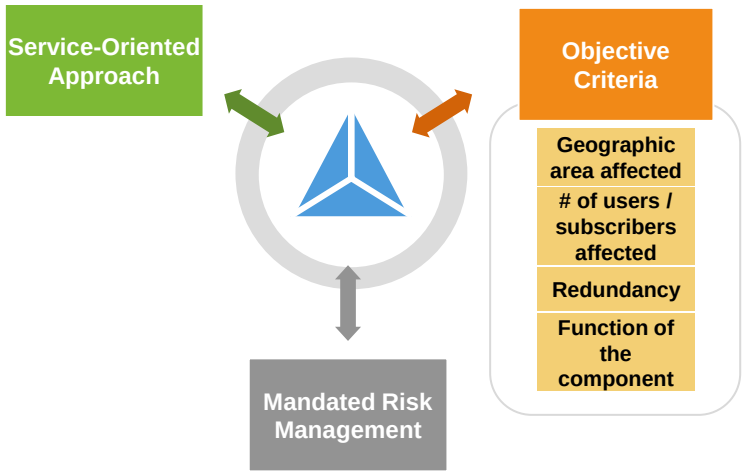
Source: Booz & Company analysis

Finland and UK, for instance, adopted a service oriented approach; security critical services served as infrastructure evaluation criteria

CIIP Running Programs

Country Examples

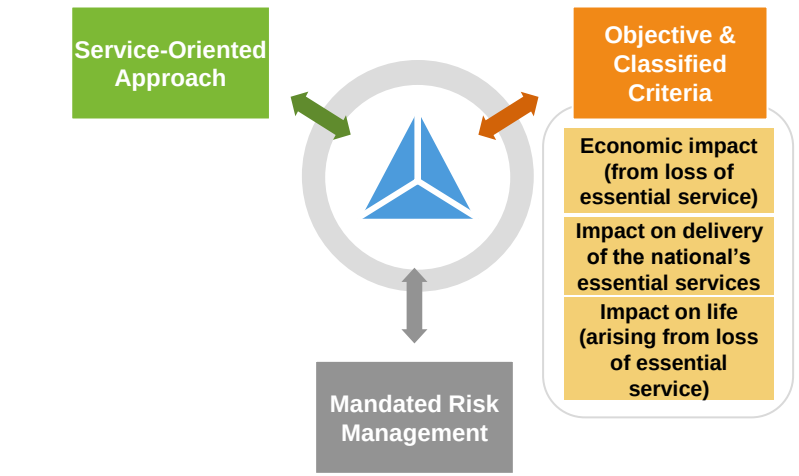
FINLAND



Regulatory Bodies

- FICORA has established priority ratings against which telecom operators must evaluate their components
- Self-evaluations are then communicated to FICORA, and each component is designated a position somewhere along the priority ratings scale, depending on the results of the evaluation
- The criteria are geographic area affected, number of users or subscribers affected, redundancy, and the function of the component

UK



Regulatory Bodies

- Centre for the Protection of National Infrastructure (CPNI) provides integrated security advice
- CSIRT was established for central government which further formed NISCS to include responsibility for Critical National Infrastructure (CNI)
- Issues technically phrased warnings to its communities
- Established "critical" list – "*20 critical controls for effective cyber defense*"

Source: Booz & Company analysis

Implementing CIIP program yields an exhaustive list of security critical infrastructure

CIIP – Identifying Security Critical Infrastructure

Data Collection

Organizational Structure

Identify the manner in which Critical Infrastructure Protection, and CIIP specifically, is organized nationally, if any

Policy

Identify existing policies on identification of critical infrastructure, if any and potential future development, areas covered, and their evolution

Methodology

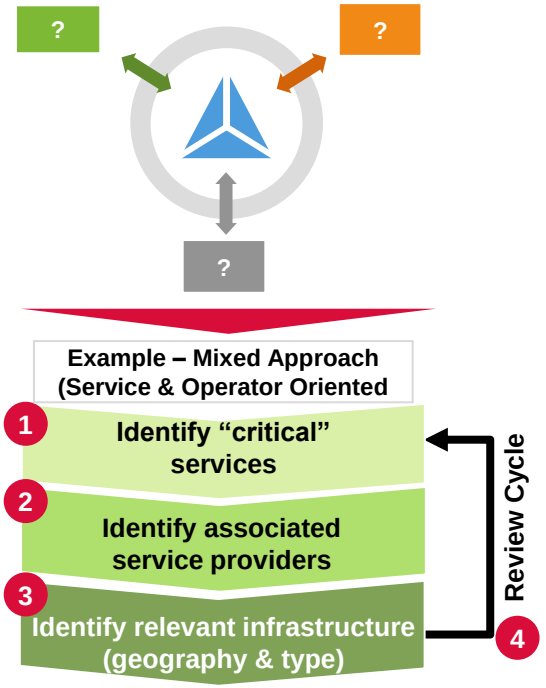
Identify existing methodologies, if any, for the identification of Critical Information Infrastructure

Cross-Border Aspects

Identify how cross border aspects are considered, if existent, that how cross-border failures would impact CII

CII Selection Procedure

Tailored CIIP Approach



Security critical functions of relevant network components and architecture by service-type and operator

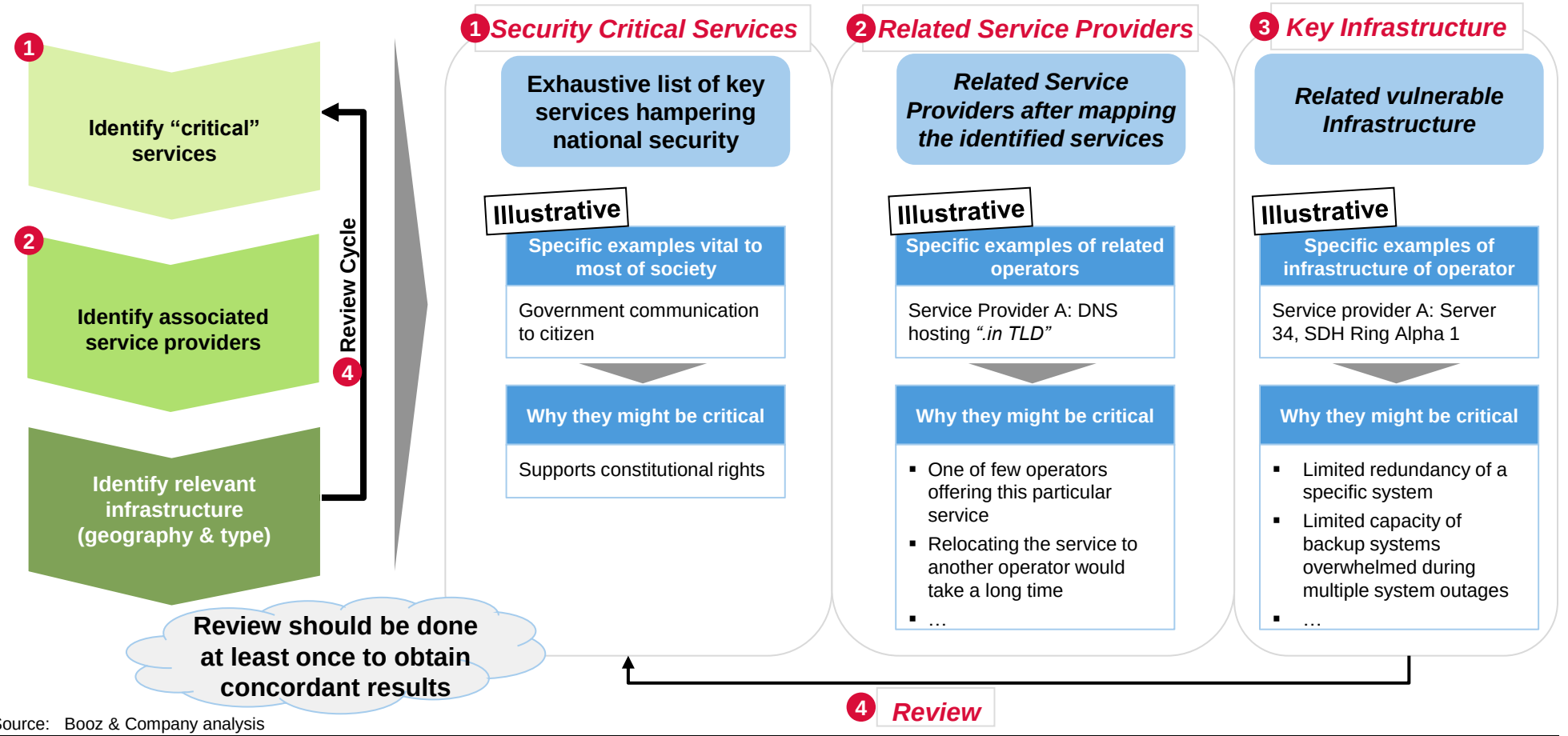
Government could act by key policy levers

Source: Booz & Company analysis

Indian Government can leverage CIIP program to identify security critical functions of relevant network components and architecture

ILLUSTRATIVE

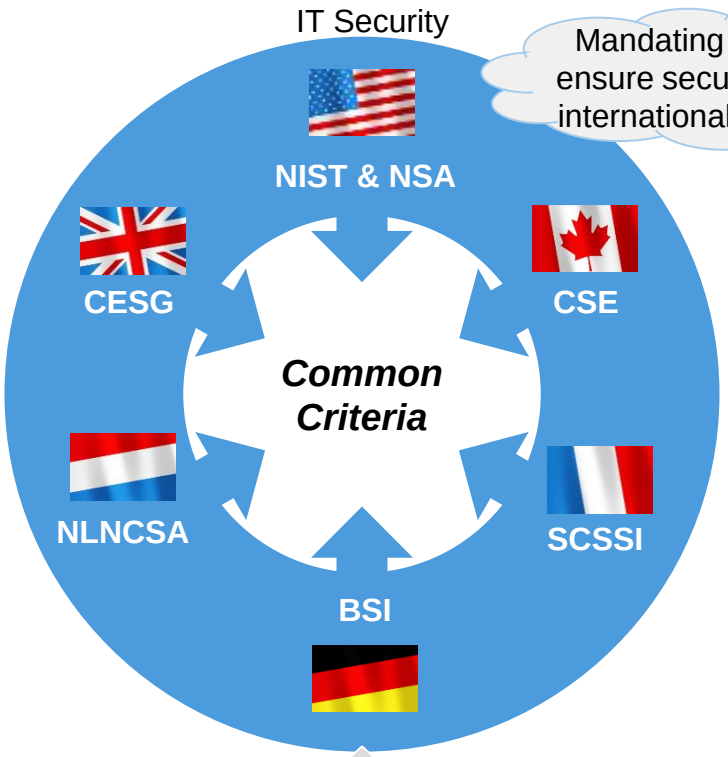
Prioritization of Focus Areas for Security Sensitive Components



Source: Booz & Company analysis

Upon identification, a comprehensive certification mechanism should be mandated based on the Common Criteria

Key Founding Countries and Organizations – *CC*



- Initiated by three key certification bodies
- TCSEC (USA), ITSEC (European Union), CTCPEC (Canada)

Discussion

- **Key Objectives Achieved**
  - Assurance that the products meet a minimum set of functional criteria
  - Demonstration of interoperability with existing network equipment
  - Demonstration of product performance under specific conditions in specific configurations
- **Specified Evaluation Assurance level (EAL)**
  - Government can incorporate security imperatives by customizing EAL criteria suitably
  - Recommend that the Government enter into mutual agreements with other countries to harmonize Protection Profiles and EAL criteria
  - EAL can be made stringent in a phased manner once domestic manufacturing picks up
- **Assigning Certification/Validation Bodies**
  - Government has selected few CABs/CBs with TEC, DoT as designating authority
  - Should expand CBs to include international labs and labs established domestically via PPP

Note: CAB- Conformity Assessment Body CB – Certification Body
Source: Booz & Company analysis

Common Criteria will help ensure security compliance of various level; India could adopt a phased approach for certification

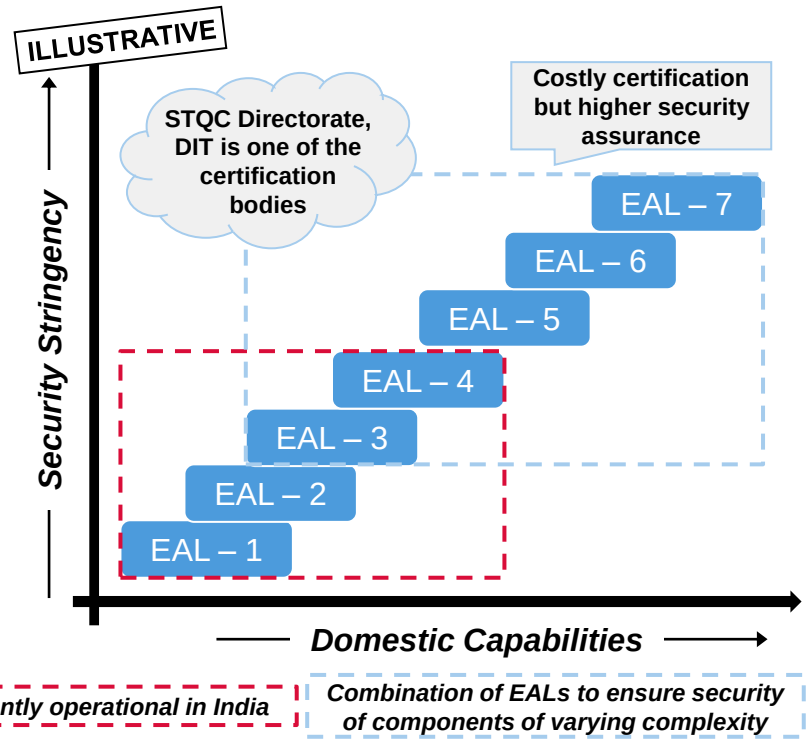
Evaluation Assurance Levels

Common Criteria

Increasing Security Stringent Conditions

EAL – 7 Formally Verified Design & Tested	▪ Comprehensive analysis using formal representations & formal correspondence and comprehensive testing
EAL – 6 Semi-formally Verified Design & Tested	▪ Structured representation of implementation, architectural structure, improved configuration management, etc.
EAL – 5 Semi-formally Designed & Tested	▪ Validation of covert channel analysis ▪ Assurance of no tampering during development
EAL – 4 Methodically Designed, Tested & Reviewed	▪ Independent vulnerability analysis demonstrating resistance to penetration attackers with a low attack potential
EAL – 3 Methodically Tested & Checked	▪ Assurance of the security functions at the design stage using functional & interface specification
EAL – 2 Structurally Tested	▪ Testing security functions, confirming test results and checking against vulnerabilities ▪ Developer assistance in handing over details
EAL – 1 Functionally Tested	▪ Ensure correct operation of TOE ▪ Conducted w/o assistance from the developer

- India, currently, provides certification up to EAL4
- India could ramp up the certification level (4+) mandates with the capability building of domestic players



Note: TOE: Target of Evaluation
Source: Booz & Company analysis

Appendix

Current duty structures and fiscal policies do not favor domestic manufacturing of finished goods and components

Comparative Tax Structure-Imports and Exports

	On Imports	On Domestic Products
Customs	0%	NA
CVD	10% (may vary)	NA
SAD	4% (adjustable)	
Excise (or CENVAT)		10%
State VAT		4-14%
CST		2%
Octroi (State)	As applicable	As applicable
Other Taxes (entry, local area development)	As applicable	As applicable
TOTAL[1]	14%	16% -26%

TRAI recognizes and illustrates the case for tax disadvantage of 2-12% faced by domestic manufacture of equipment in India

2-12% disadvantage

Key Issues

- **Inconsistent duty structures across imports and domestically manufactured products rendering domestically manufactured products uncompetitive**
- **Lack of incentive for component ecosystem development as incidence of tax and computation for suppliers is different**
- **Need to streamline process for obtaining refunds and CENVAT credit accrual**

1) Total excluding applicable Octroi and other taxes
Source: TRAI, Booz & Company analysis

While the Government currently provides some direct and indirect tax benefits, these need to percolate across the ecosystem

NON-EXHAUSTIVE

Scheme	Direct Taxes	Indirect Taxes	Other Clauses
Special Economic Zones	▪ Export profits 100% tax exempt for first 5 years, 50% for next 5 years and 50% of ploughed back export profit for next 5 years ▪ Sale from SEZ to DTA considered deemed exports and hence, tax exempt ▪ No Dividend Distribution Tax and MAT	▪ Duty free imports of components ▪ Companies usually have special agreements granting multi-year concession benefits on Central Sales Tax and Local VAT as applicable ▪ Typically instituted by State and may also include service tax benefit ▪ Can be in form of refund or soft loans	
Electronics Hardware Technology Park/ Export Oriented Unit	▪ Export profits 100% tax-exempt	▪ 100% excise exemption for purchases of capital goods and components from DTA ▪ Central Sales Tax is fully refundable ▪ Cenvat credit on service tax ▪ DTA sales of upto 50% of FOB of exports subject to concessional duties (50% BCD) ▪ In case of DTA sale of goods manufactured by EOU /EHTP / STP / BTP, where basic duty and CVD is nil, such goods may be considered as non-excisable for payment of duty	▪ Needs to be a positive Net Foreign Exchange earner ▪ ITA1 supplies to DTA will be counted for NFE calculations
Special Geographic Areas	▪ 100% income tax exemption for 5 years and 25-30% thereafter	▪ 100% excise duty exemption for 10 years from date of commercial production	▪ Concession for Uttaranchal, HP, J&K, Gujarat, etc.

1 ***Allow duty drawback to domestic manufacturing linked to value add for a limited period to overcome freight costs***

2 ***Provide export benefits to inter-se transactions within telecom clusters***

Source: Booz & Company analysis