Planning Commission
Government of India

TECHNOLOGY & DEPTH
Recommendations and Implementation Plan

XII Five Year Plan – Manufacturing

August 2012

Foreword

India needs to improve its manufacturing capabilities, without which it cannot achieve its goals of a faster growth in employment through more rapid growth of its manufacturing sector. Manufacturing capabilities are, in essence, the application of technologies for conversion of materials and production of complex products. The advance of industrial nations has been brought about by the continuing discovery of new technologies and greater effectiveness in their application. Competition between manufacturing nations is fundamentally a competition between them in their abilities to apply, and develop technologies more effectively than other nations. Efficient application of technologies in manufacturing also requires sophisticated organizational skills. Thus, at the heart of the development of competitive manufacturing capabilities lies the ability to learn and apply technologies faster than other nations. By many measures, India has been slipping in this race. The consequence is that, in an open competitive world, India is importing more manufactured goods and cannot increase its exports as fast as it wants to.

India must increase the technological depth of its manufacturing sector with more value addition in India. A combination of many inputs, including skilled manpower, better managers of factories, and more research and development of new production technologies and products is required to achieve this objective. Depth also requires many levels of production to take place in the country. Beyond assembly of products, capabilities to develop and produce new materials and components, and also the machines and tools for their production, are also necessary. Since competitive technologies are embedded in machines and production tools, competitive machine tool building capabilities are essential for increasing technological depth and sustainable competitiveness of the country's manufacturing sector. It is a matter of concern that India's machine building capabilities are inadequate for the country's manufacturing ambitions, with the country importing increasing volumes of machines and tools, even second hand machines from other countries, rather than producing more of its own.

Strong linkages amongst assemblers, component producers, and machine builders are necessary to increase value addition and technological strength of the country's manufacturing. Since there are conflicts of interest between them, the strengthening of manufacturing sectors requires institutions that can coax and coordinate actions amongst multiple independent organizations. This is not easy for governments when most or all of the actors in a sector are private organizations rather than government organizations, as they are in India. In such situations, coordination can be brought about only through processes of coordination, rather than imposition through state authority. Concerted action on priority areas for technological development, as well as the selection of these areas must happen through more systematic engagement of the producers and the various policy organs of government. The strength of these processes of coordination will determine the speed with which the country can develop technological depth and strength of its manufacturing.

A systematic process, with wide participation of business, government, and experts, in 26 Working Groups, was adopted to develop the strategy to grow India's manufacturing sector, which fed into the 12th Five Year Plan. This distilled several focus areas and actions. Thereafter the Planning Commission went deeper, with the assistance of The Boston Consulting Group, into the policy and institutional changes required in the country at this time to improve technology and depth. This Report describes the implementation disciplines and steps that are necessary. As they should be, many of these are delineation of the processes required, in which on-going participation of several stakeholders will be necessary. The Report thus points to a flotilla of boats to be launched and the people who must be on board them so that the people aboard can sail to together to bring about the strengthening of Indian manufacturing's technological base.

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1. Preface

Since independence in 1947, the Indian manufacturing sector has moved from the initial phase of building the industrial foundation in the 1950s and early 1960s, to the license–permit raj in the period 1965–1980, to the phase of liberalization in the 1990's, emerging into the current phase of global trade and competitiveness.

The Indian economy is expected to grow between 8-9 per cent in the medium to long term. The growth can be sustained over a long period only when the manufacturing sector also grows robustly and is competitive on a sustainable basis. Today the manufacturing sector accounts for ~15% of the GDP. It is targeted that the manufacturing sector should grow at ~2-3% higher than the overall GDP in order for it to have a significant economic contribution.

Further, for poverty reduction, it is essential that the type of growth pursued ensures substantial job creation. Manufacturing must provide a large portion of the additional employment opportunities required for India's increasing number of youth. Agriculture cannot be expected to provide more jobs when it is expected to release labor due to increases in productivity which would have to be absorbed in other sectors. While the services sector has been growing fast, it alone cannot absorb the 250 million additional income-seekers that are expected to join the workforce in the next 15 years. Hence if India is to provide employment to its surplus labor force, rapid growth of manufacturing sector, in particular, of the labor intensive sectors is essential.

The Planning Commission, Government of India releases the National Manufacturing Plan every 5 years with a defined objective. For the current plan, a widely consultative and inclusive approach was adopted to prepare the manufacturing industry roadmap under the XII Five Year Plan. Twenty six working groups were set up to analyze opportunities and constraints and develop recommendations both on sector-specific issues and cross-sectoral issues. A Steering Committee was constituted to provide overall guidance and strategic direction to the process of development of the plan and oversee the functioning of the working groups. In addition to articulating the strategy, the steering group concentrated on the overall process for implementation which has a dedicated focus in the XII Five Year Plan.

To deliver on the huge aspirations of the share of manufacturing in overall GDP, 11 strategic imperatives have been identified. These imperatives are strong enablers for the growth of manufacturing in the country and represent issues cutting across industries. These imperative include the following – Technology & Depth, Human Resources Development, Business Regulatory Framework, Environmental Sustainability, Land, Water, Role of PSEs, National Manufacturing and Investment Zones, MSMEs, Clustering and Aggregation, and Boosting India's Manufacturing exports.

One of the most strategic imperatives is Technology and Depth (T&D). A principal objective of the XII Five Year Plan is to increase 'depth' in manufacturing, which involves increasing participation across the value chain in manufacturing, improving domestic value addition and stimulating innovation. The Planning Commission had set-up a working group to define the roadmap for improving T&D in Manufacturing. This working group looked at all aspects of manufacturing depth including strategies for promoting technological development, trade and fiscal measures to encourage technology development and strategies for standardization, certification and accreditation.

Over the last six months, a team from the Boston Consulting Group (BCG) and the Planning Commission reviewed the reports submitted by the working groups to refine the final recommendations and develop implementation plans on increasing technology and depth in the manufacturing sector. The process followed to develop implementation plans started with a literature review and secondary research of reports addressing the current technological depth in the country. Over the course of the project, the team conducted numerous interviews with representatives across a breadth of organizations. Working group members were contacted to understand the rationale behind each recommendation and preliminary basis for their implementation. Subject matter experts were interviewed to take their views on the various recommendations and whether existing gaps can be addressed. Interviews were also conducted with some of the owners of the recommendation to understand their perspective on the issues. Further, relevant benchmarking was undertaken with global peers to derive learnings and determine levers which can be applied in the Indian context. The team identified 14 actionable levers and developed an implementation plan for each of them showing the end outcome as well as the key stakeholders for each plan. Finally, all the levers recommended were evaluated on the dimensions of feasibility and impact.

This report is the summation of the recommendations and implementation plan for improving T&D in the country. It is structured around 3 areas (Research & Development and Engineering, Production and Standards) as the core sections. Each section contains an in-depth analysis of current status and ecosystem in the country, relevant benchmarks with global peers and highlights the gaps and issues in the present setup. Next it talks about the different levers to address the gaps and the implementation plan and steps to realize these levers.

The stakeholders responsible for undertaking the plans are also suggested and have been divided under two categories: a) *Anchor:* Body responsible for funding and implementing the recommendation and b) *Facilitator:* Body responsible for creating a platform for joint discussion and achieving alignment from various stakeholders.

The report represents a comprehensive framework and a set of recommendations on increasing T&D in the country with a well defined action agenda. The plan if executed successfully with the support of the various stakeholders identified would ensure a sustainable and competitive manufacturing sector and reach the aspirations developed in the XII Five Year plan.

2. Introduction

2.1. Context – The Need to Focus on the Manufacturing Sector

India has become one of the fastest growing economies in the world over the last decade. During this period the manufacturing sector has exhibited a growth rate of ~7%, and has been a strong contributor to the overall GDP growth. However the GDP contribution of manufacturing is at ~15% compared to other developing countries is still low (Exhibit 2a), therefore promising a significant upside in the coming decades provided the fundamental enablers to create a vibrant manufacturing ecosystem are in place.

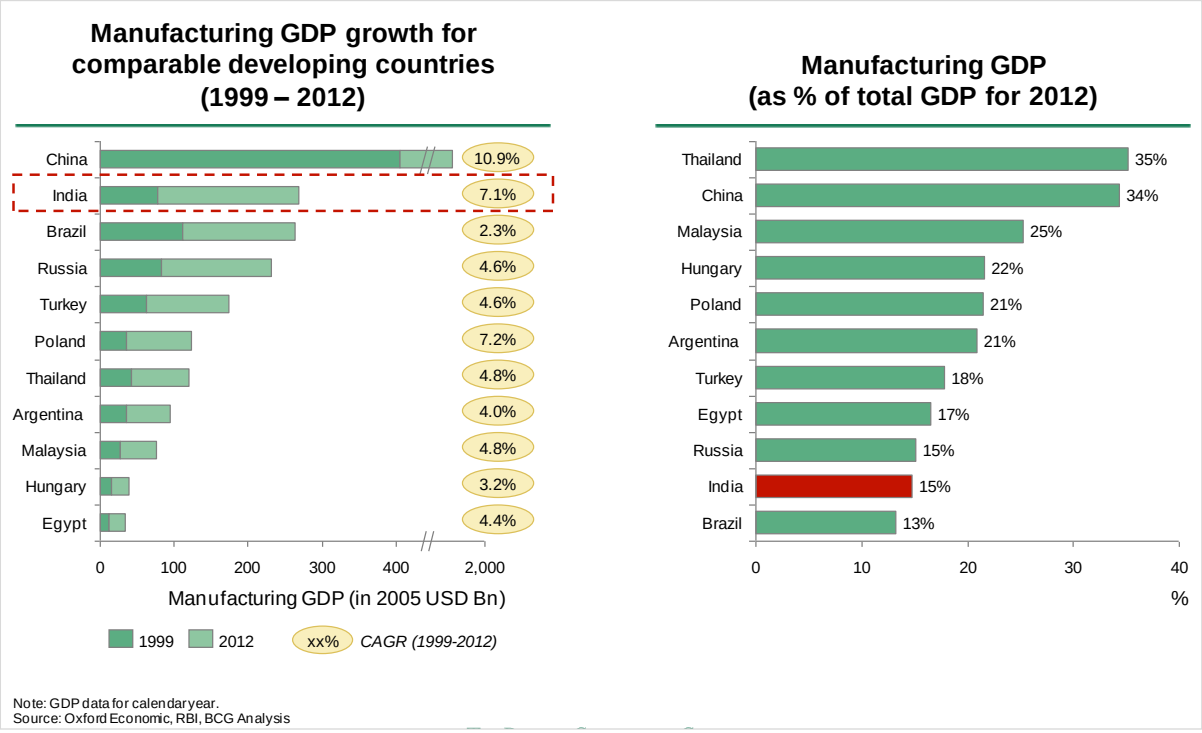
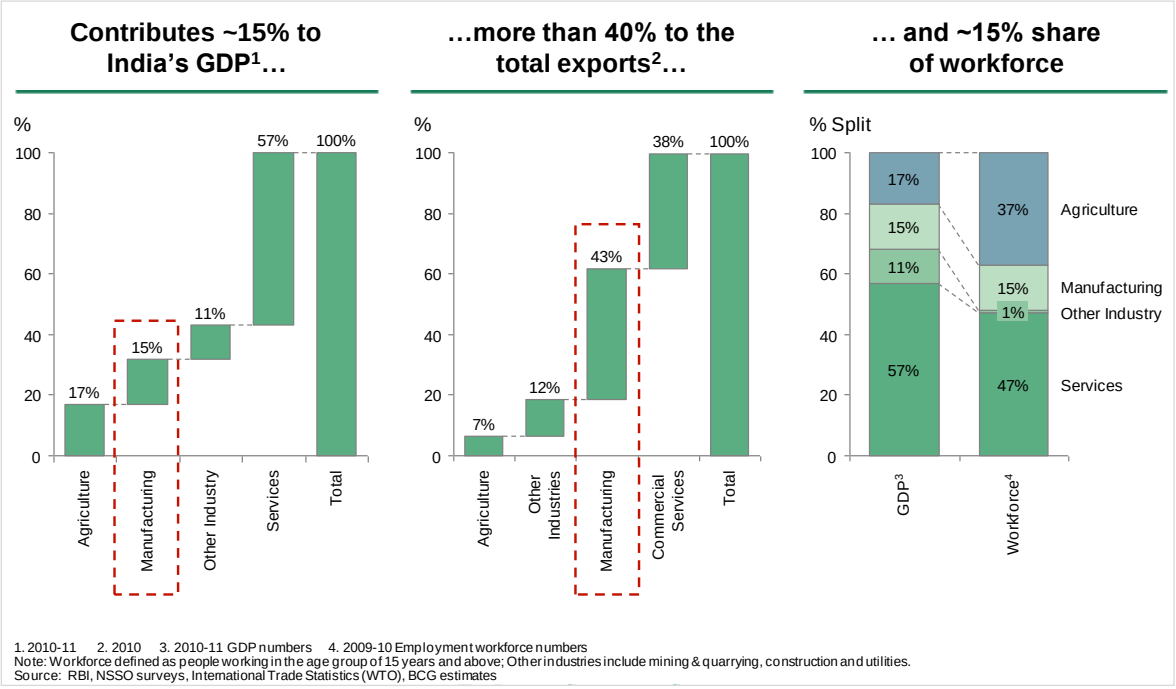


Exhibit 2a: Share of Indian manufacturing GDP as compared to global benchmarks

The importance of manufacturing for the Indian economy cannot be understated (Exhibit 2b). The sector contributes disproportionately large share of over 40% to the exports of the country. Besides, around 15% of the workforce today finds employment in this sector. Globally, manufacturing sector serves as the backbone of an economy, contributing heavily to the GDP and providing technical self-sufficiency to countries. Its multiplier effect on enabling industries also makes it a major contributor to employment generation.



1. 2010-11 2. 2010 3. 2010-11 GDP numbers 4. 2009-10 Employment workforce numbers
Note: Workforce defined as people working in the age group of 15 years and above; Other industries include mining & quarrying, construction and utilities.
Source: RBI, NSSO surveys, International Trade Statistics (WTO), BCG estimates

Exhibit 2b: Importance of manufacturing sector to the Indian economy

The XII Five Year Plan addresses the strategies required to achieve growth in industrial sectors selected on the basis of their strategic importance, employment potential, competitive advantage and growth potential. It has also been recognized that there are 11 cross cutting strategic imperatives that are not industry specific, which affect the growth of entire manufacturing industry and represent the core enablers. T&D in manufacturing represents one of these cross cutting strategic imperatives and is one of the critical elements to ensure that manufacturing in India remains globally competitive and the growth we are witnessing is not transient but sustainable (Exhibit 2c).

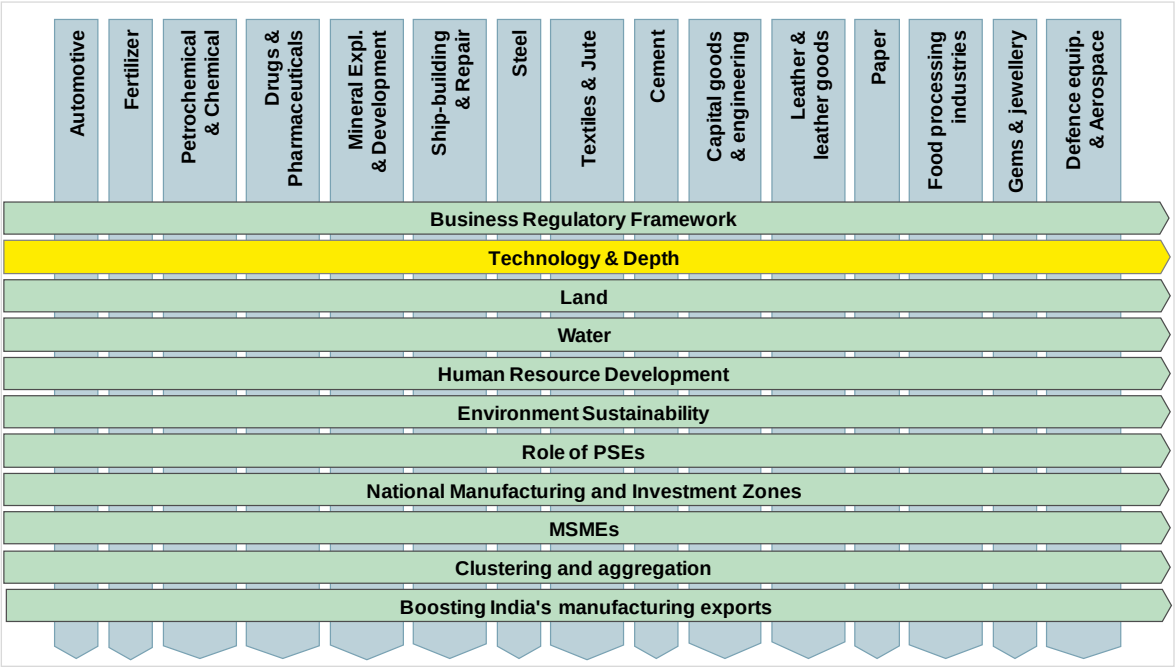


Exhibit 2c: Cross-Sectoral Themes

2.2. Importance of Technology and Depth

Depth in technology is defined as the capability across the product value chain, from assembly of the final product, moving upstream to design and manufacturing of components to fundamental product design and R&D.

Depth in technology is extremely important for a country as it allows for greater value capture and ensures more sustainable competitive advantage in a global economy. For instance, even when a part of value chain of an industry is threatened to move to a cheaper labor cost destination, it is the depth of the value add in an economy that can sustain local manufacturing. It not only maintains competitive advantage of current industries but is essential in attracting new industries which leverage similar areas of depth, ensures self-reliance on strategically important sectors and an equitable trade balance.

Technological capabilities can be best described in terms of three levels: *first,* the basic level that involves the ability to operate and maintain a production plant based on imported technology and components; *second,* the intermediate level that consists of the ability to develop local components and supply chain and involves absorption of process technologies; and *third,* an advanced level that involves absorption of product technologies and fundamental research on materials and components.

Manufacturing in India is at present at the basic or the intermediate level; further there is an absence of organized technology led initiatives that could deepen our footprint. Developing T&D has thus been identified as an important strategic imperative for Indian manufacturing in the XII Five Year Plan. The key requirements for improving T&D are to provide an enabling environment for domestic enterprises to invest in technology creation, technology absorption and achievement of higher value addition; ensure availability of demand for products developed and manufactured indigenously; and provide supporting infrastructure for foreign enterprises to invest in manufacturing and research activities in the country.

14 actionable levers have been identified to improve the T&D within the country and have been grouped under 3 areas – R&D and Engineering; Production; and Standards (Exhibit 2d).

The 14 identified levers influence directly or indirectly, the end objective of developing better technological capabilities and depth in the country. These levers are interconnected and impact each other as an ecosystem. There are various interconnections between the levers (Exhibit 2e).

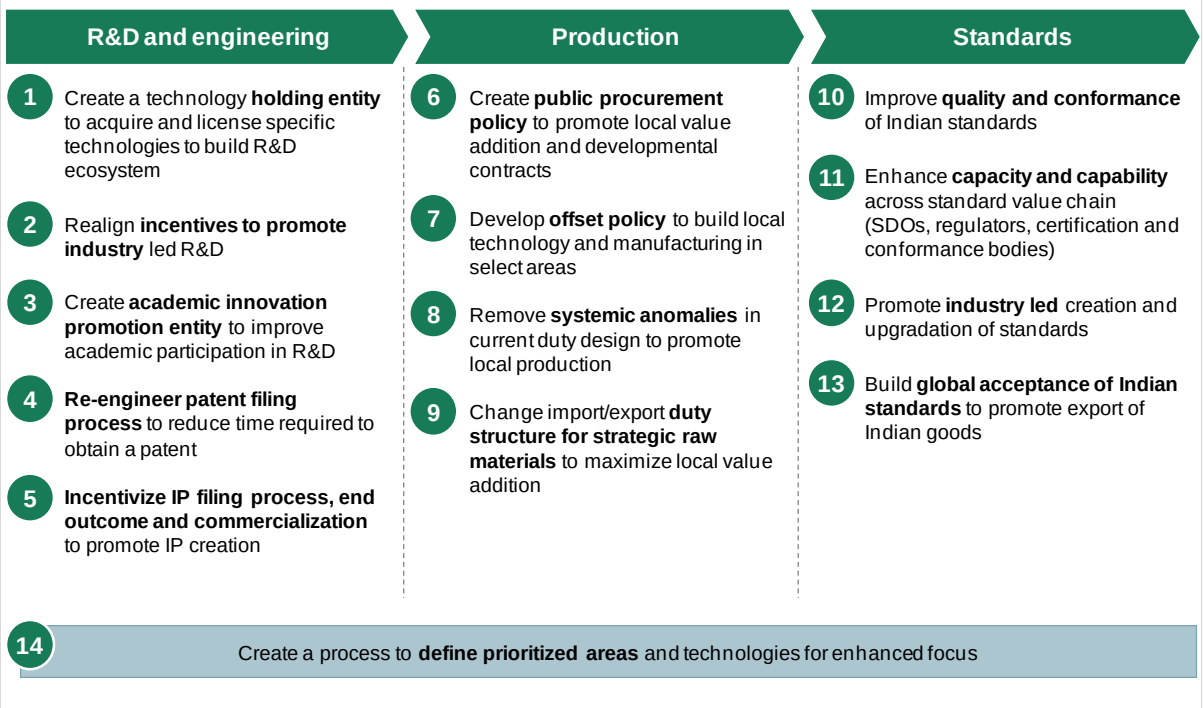


Exhibit 2d: 14 levers identified to enhance Technology & Depth in India

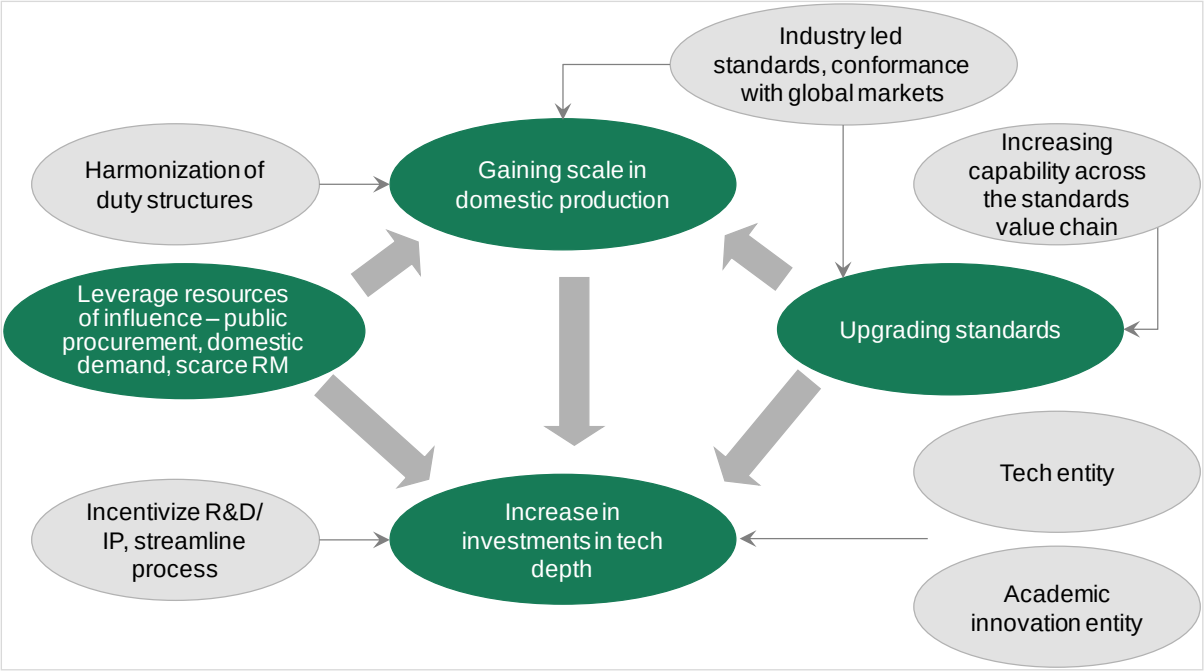


Exhibit 2e: Interconnection of Levers

To describe the above ecosystem let us use one example to define the interconnections and their consolidated impact.

We can leverage the spheres of public influence such as public procurement to ensure local value addition which would lead to scale in domestic production and ensure technology transfer in the local industry. Increasing scale allows companies to undertake investments to

increase technology and depth in manufacturing. In addition, increasing the quality and conformance in defining standards would provide the incentive for companies to invest in technology to meet those standards. In parallel incentivization of the IP process for commercial exploitation would further boost the focus and investments in research.

Overall all these levers are expected to work as a combined ecosystem to boost the Depth of Technology creation in the country.

3. R&D and Engineering

3.1. Current Status

India's current spending lags behind its global peers in R&D and Engineering. In FY11, India's R&D expenditure accounted for 0.9% of GDP, much lower than global peers (Japan ~3.5%, US ~ 2.8%, Singapore ~2.6%) (Exhibit 3a). Though Indian research infrastructure is expanding, it is still below global benchmarks. In India, both number of research professionals and R&D centers have doubled in the past 5 years. However, India still has a low R&D penetration within its workforce with 150 R&D professionals per million populations as compared to the much higher penetration for China, UK and Finland (Exhibit 3b).

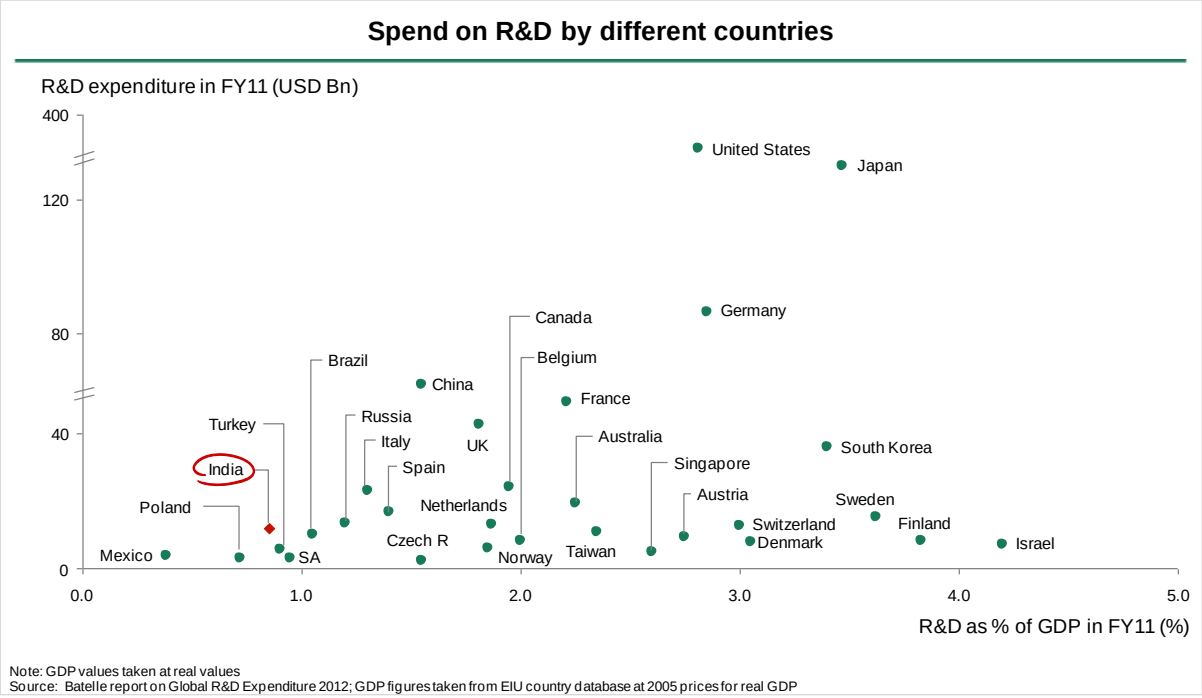
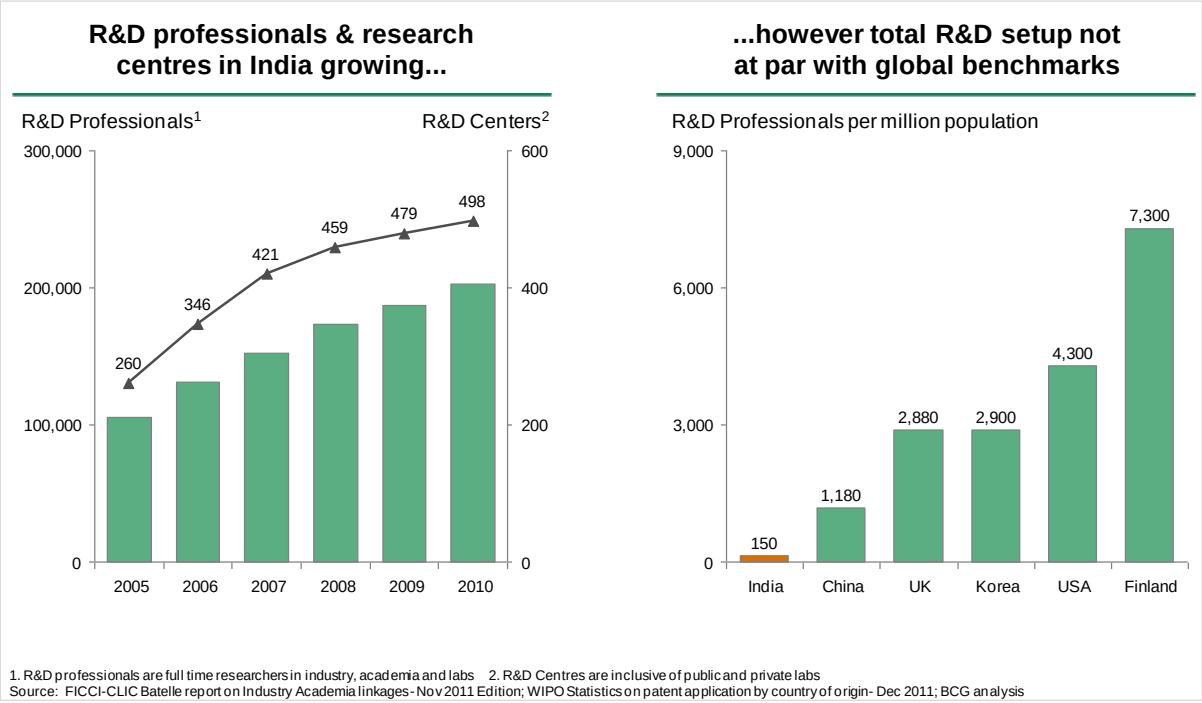


Exhibit 3a: Total R&D spend in India against global benchmarks

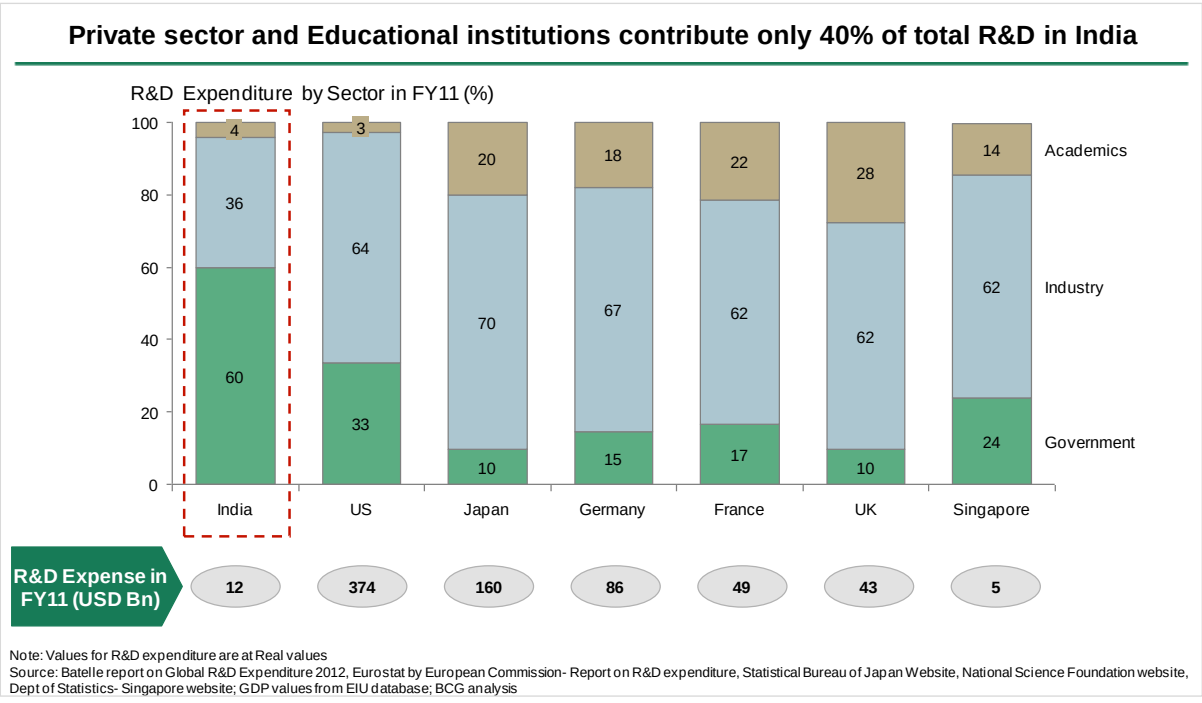
Further, the share of industry in R&D expenditure is much lower in India than global peers with Government contributing around 60% of total R&D expenditure in India; unlike global peers where industry led R&D spending is much higher (Exhibit 3c). Also most government R&D expenditure in India goes into non-industrial sectors like space, defense, agriculture, biotech, etc. with share of industry being very small (Exhibit 3d).

In addition, while there is infrastructure for research in academic institutes in India like the IITs etc., the patent filing rate is quite low as academics are more focused towards publishing papers rather than on conducting research on topics of commercial application for R&D.
This is driven by a combination of limited funds, absence of industry connect, lack of awareness on patenting and insufficient incentives around commercialization of research.



1. R&D professionals are full time researchers in industry, academia and labs 2. R&D Centres are inclusive of public and private labs
Source: FICCI-CLIC Batelle report on Industry Academia linkages - Nov 2011 Edition; WIPO Statistics on patent application by country of origin- Dec 2011; BCG analysis

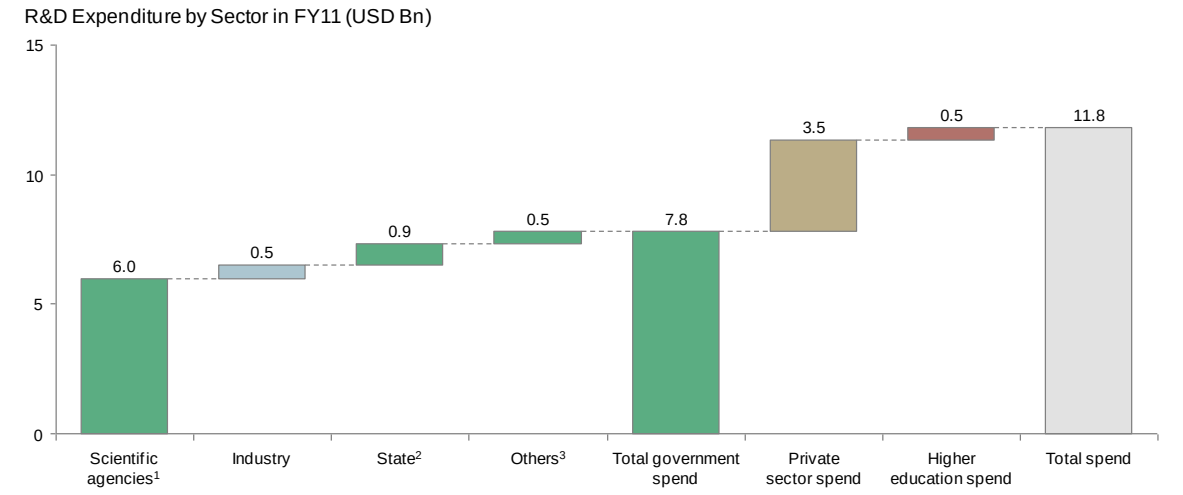
Exhibit 3b: Indian research infrastructure against global peers



Note: Values for R&D expenditure are at Real values
Source: Batelle report on Global R&D Expenditure 2012, Eurostat by European Commission- Report on R&D expenditure, Statistical Bureau of Japan Website, National Science Foundation website, Dept of Statistics- Singapore website; GDP values from EIU database; BCG analysis

Exhibit 3c: R&D spend of India across sectors and against global peers

Very little direct support to Industry and academia by the Centre

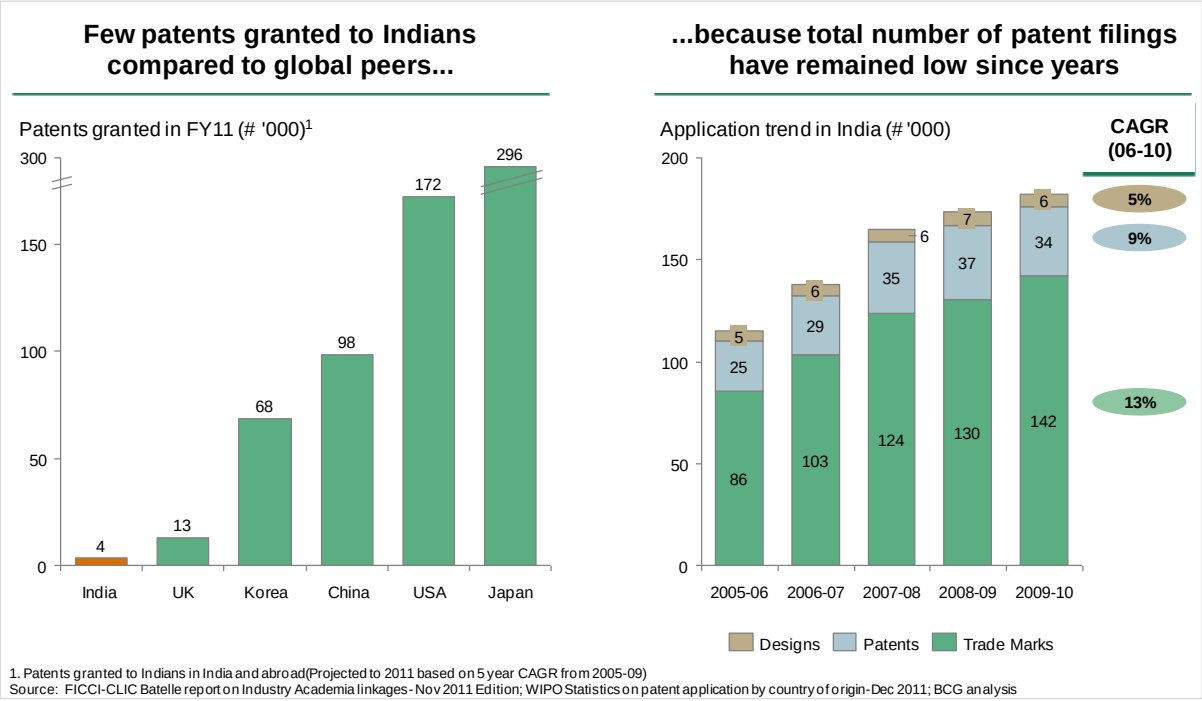


1. Split of Scientific agency spend by government- DRDO (USD 1.53Bn), Space department (USD 0.78Bn), DAE (USD 0.52Bn), ICAR (USD 0.49Bn), CSIR (USD 0.40Bn), DST (USD 0.35 Bn), ICMR (USD 0.12Bn), Biotech department (USD 0.09Bn), M of Communication and IT (USD 0.06Bn), Others (USD 0.1Bn) 2. State Sector includes R&D expenditure of State Agricultural Universities and other state departments/organizations 3. Others includes expenditure on scientific agencies and PSUs by government other than the major ones shown
Note: FY11 values are estimated with same ratio of departments and PSU as in 2005-06 with total R&D exp in FY11 at .9% of GDP and currency conversion at USD 1=Rs 50
Source: DST report on R&D Expenditure in 2005-06

Exhibit 3d: Break up of R&D expenditure across sectors in India

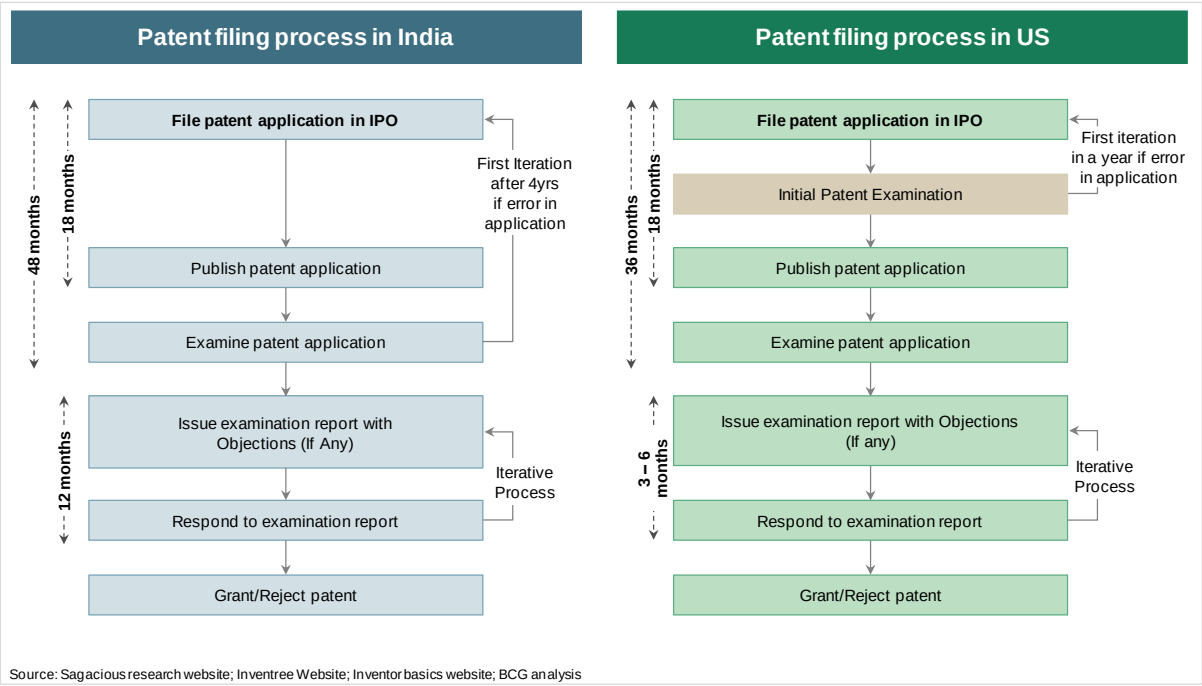
Intellectual Property (IP) creation in India has a lot of scope for improvement. The patents issued in India are far lower than most other countries (Exhibit 3e). The status with respect to the patent grant process and the enablers which would encourage innovation in India is not very encouraging. There are four key challenges identified for the same as listed below:

1. **Lengthy process:** The patent granting process in India is both cumbersome from a filing perspective and takes a very long time to award. Patent granting takes an average of ~6-8 years in India while the US averages around ~3-4 years (Exhibit 3f).
2. **Insufficient capacity and capability of patenting offices:** Almost 65% posts for officers, above the level of examiners, are vacant in the patent offices in India. This leads to very long lead times and backlogs (current ~4 years of backlog). In addition there is a clear need for more technical training and capability development on the IP topic in the patents office. In the year 2010, the number of patents examined in India was 6k while the patents pending were around 76k (Exhibit 3g).
3. **Lack of adequate incentives for innovators:** The incentives in India are limited to patent issuance and have no linkage with the commercialization of the research. In China, in contrast upon commercial exploitation of service invention, the employer will grant the employee 2% of the annual profits from such exploitation of invention patent or 10% of royalty fee if patents are licensed to others (Exhibit 3h).
4. **Inadequate enforcement infrastructure:** India is at par with IP laws with several other countries but lags behind in enforcement. The judicial framework lacks special IPR courts for timely justice. Further the lack of technical knowledge with judges leads to delays and inadequate punitive actions.



1. Patents granted to Indians in India and abroad(Projected to 2011 based on 5 year CAGR from 2005-09)
Source: FICCI-CLIC Batelle report on Industry Academia linkages - Nov 2011 Edition; WIPO Statistics on patent application by country of origin-Dec 2011; BCG analysis

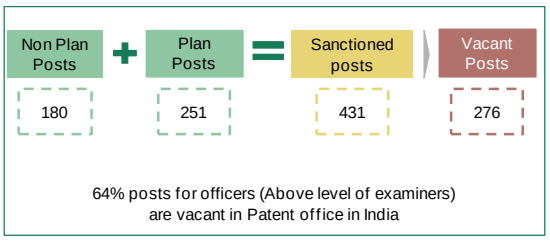
Exhibit 3e: Patents filed and granted to Indians against global benchmarks



Source: Sagacious research website; Inventree Website; Inventor basics website; BCG analysis

Exhibit 3f: Comparison of Indian patent filing process as against that of US

Insufficient manpower at patent office adds to the ever increasing backlog of applications



~700 patent applications/officer waiting to be examined at patent office in FY2010[2]

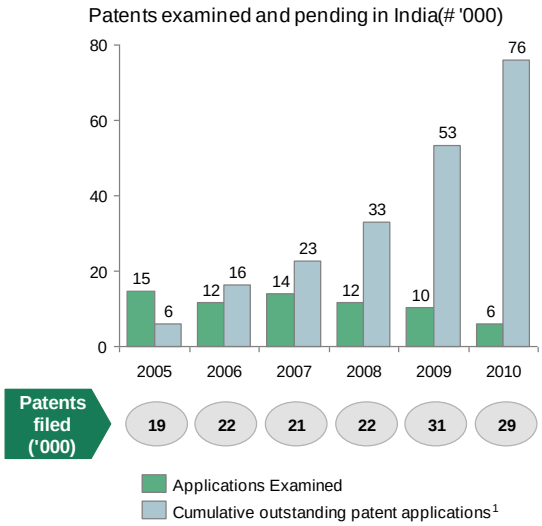
257 posts vacant for patent examiners

There is need for additional personnel apart from the sanctioned posts to manage existing backlog

Lack of technical knowledge of patent officers increase bottlenecks

- Patent examination is a technical role and requires qualifications as well as training

Very high pendency of cases with Indian patent office



1. Patent applications + last backlog - examined applications 2.76000 applications pending in 2010 with an annual filing rate of 30,000 and available capacity of 155 officers
Source: DIPP discussion paper on CGPDT structure; BCG analysis

Exhibit 3g: Manpower situation in patent office and backlog of patent applications

	Rewards and Remuneration in China	Rewards an remuneration in India
Rewards on patent issuance	**Rewards for Individuals** • Upon patent issuance of service invention, employer will grant the employee – USD 480 if it is an invention patent or – USD 160 if it is a utility model or design patent	**Rewards for Individual and companies** • Cash grant of upto a maximum of USD 450 which covers registration cost
Rewards on patent commercialization	• Upon commercial exploitation of service invention, employer will grant the employee – 2% of the annual profits from such exploitation of invention patent or – 0.2% of the annual profits from such exploitation of a design patent – 10% of royalty fee if patents are licensed to others	

Note: Currency conversion - 1 CNY = 0.16 USD, 1S$ = 0.78 USD, 1 INR= .018 USD
Source: ONC lawyers website(China);Singapore's Tax incentives for IPR by Rajah Tann

Exhibit 3h: Rewards and remuneration for patents in India in comparison with those in China

3.2. Existing Setup

To address the gaps in the R&D state of the country it becomes imperative to understand both the existing ecosystem and the incentive structure which is in place.

Existing ecosystem: There are several stakeholders which comprise the ecosystem. The Ministry of Science and Technology is the pivotal agency responsible for driving innovation in India which it undertakes through research grants (given by DST, DSIR, CSIR etc.) and providing legal as well as technical support (through entities such as TIFAC). The Commerce Ministry is responsible for grant of patents as well as handling revocation and other appeals apart from infringement cases (through the patent office and IPAB). The Ministry of Small and Medium Enterprises, also support innovation through cells such as IPFC that provide support to the MSME sector while filing patents. Tax incentives for R&D are granted by Ministry of Finance while the Ministry of Law takes care of infringement cases through the judicial courts (Exhibit 3i).

There is a clear need to create a common platform across above stakeholders to define and track various initiatives that are being run across entities and have a more integrated approach towards supporting innovation to stimulate manufacturing in the country.

Ministry	Office / Department	Responsibilities
Commerce	Patent office in DIPP	• Filing and grant of patent
	IPAB (Intellectual Property Appellate Board)	• Deciding authority on cases of revocation and other appeals but not infringement
Law	High courts	• Deciding authority on cases of infringement
Science & Technology	TIFAC (Technology Information Forecasting and Assessment Council)	• Technical and legal support for inventions by DST or academic or public institutions and database access
	DST[1], DSIR[2], CSIR[3]	• Research grants through programs like TePP[4], TDB[5], NMITLI[6]
MSME	IPFC (Intellectual Property Facilitation Centre)	• Provide services to MSME like patent filing support, database searches, legal advisory etc.
Finance	Tax	• Tax incentives given to companies

Strong need to design a coordination mechanism between all entities to track and monitor the success of initiatives

1. Department of Science & Technology 2. Department of Science and Industrial Research 3. Council of Scientific and Industrial Research 4. Techno-Entrepreneurs Promotion Program 5. Technology Development Board 6. New Millennium India Technology Leadership Initiative
Source: BCG analysis

Exhibit 3i: Current R&D ecosystem in India

Incentive structure: Major research grants and tax incentives (direct and indirect) are the two modes of financial instruments offered by the Government to boost R&D within the country (Exhibit 3j).

While these incentives represent a good starting point there are opportunities both to increase the population to which this is applicable (less restrictive qualifying conditions) and expand the methods available (cash grants, tax deferral options etc.) which are available in other countries to encourage innovation.

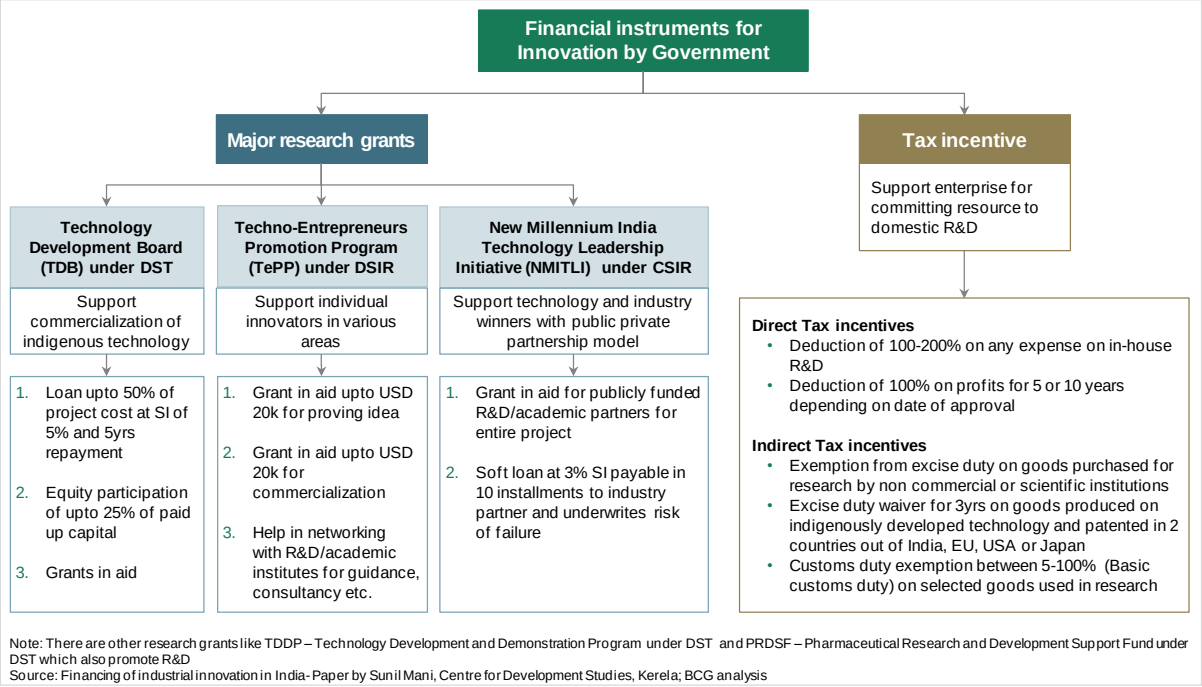


Exhibit 3j: Two kinds of incentives provided by the Government of India for boosting R&D within the country

3.3. Recommendations and Implementation Plan

There are 5 levers which have been identified to boost R&D. The core description and rationale of these levers has been highlighted (Exhibit 3k).

Reco.	Description	Rationale
1 Technology holding entity	Entity to acquire and license specific technologies to build R&D ecosystem	• Need to create a "push" mechanism for larger industry participation in R&D • Requirement for initial corpus for acquiring certain base technologies/IP for creating R&D ecosystem, esp. for MSMEs
2 R&D incentive realignment	Financial incentives to promote industry led R&D	• Despite incentives, current participation of industry very low • Need to expand the range of options available and reduce qualifying conditions
3 Academic innovation promotion entity	Entity to improve academic participation in R&D	• Will leverage R&D infrastructure that exists in leading technical institutes, but currently not generating IP • Need to boost participation of local MSMEs, who currently are not able to participate with the academic setup • Need to remove the hassles of IP filing from the academics, and greater incentives through commercialization of IP
4 Patent filing process re-engineering	Process change to reduce time required to obtain a patent	• Need to restructure current process to minimize IP grant time • Need to bridge current capability and capacity gaps in setup
5 IP filing process incentivization	Financial incentives to promote IP creation	• Need to create an ecosystem of based on incentives to reward IP commercialization rather than limited to issuance

Exhibit 3k: Description and Rationale for recommendations on R&D

One of the critical themes in the recommendation is to create a set of "push" mechanisms as compared to the "pull" mechanisms (e.g., incentives) which exist today to stimulate innovation. Two such levers are the ***Technology holding entity***, which would access technologies through a direct corpus available and the ***Academic innovation promotion entity*** that would leverage the research infrastructure and human capabilities present within the academic institutes which are underutilized.

An additional theme on incentives is to extend the focus from purely patent issuance and IP creation to actually encouraging commercial exploitation of the research. The two levers, ***R&D incentive realignment*** *and* ***IP filing process incentivization*** represent a step in this direction.

Finally, the lever on ***Patent filing process re-engineering*** represents a clear opportunity to improve on the current process and capabilities and remove current bottlenecks towards successful realization of innovation efforts undertaken by individuals and corporate.

Lever 1: Technology holding entity

The proposed Technology holding entity (Exhibit 3l) is an entity which gets created to acquire and license specific technologies to local companies (both public as well as in the

private space) in order to create a layer of base technology for further R&D by local entities, especially MSMEs. This will aid in creating an ecosystem for R&D.

In the *design phase* of this recommendation, the entity structure needs to be defined. A corpus needs to be established, through public funding, for funding acquisition and technology globally. Optimum models to acquire technology need to be evaluated and prioritized (E.g.: direct acquisition vs. licensing etc.). Clarity on sharing and licensing/ sub-licensing of technologies needs to be defined.

In the *implementation phase* of this recommendation, the entity should establish clear criteria for selecting technologies to be acquired based on expected demand and criticality. Also, partners for technology acquisition as well as licensing options including foreign players need to be selected. Source of revenue for the fund would be through license fees and technology resale. The model should be implemented with active involvement of the industrial sector (Exhibit 3m).

The suggested stakeholders to create and implement this recommendation are:

- *Anchor:* DST
- *Facilitator:* NMCC, Planning Commission

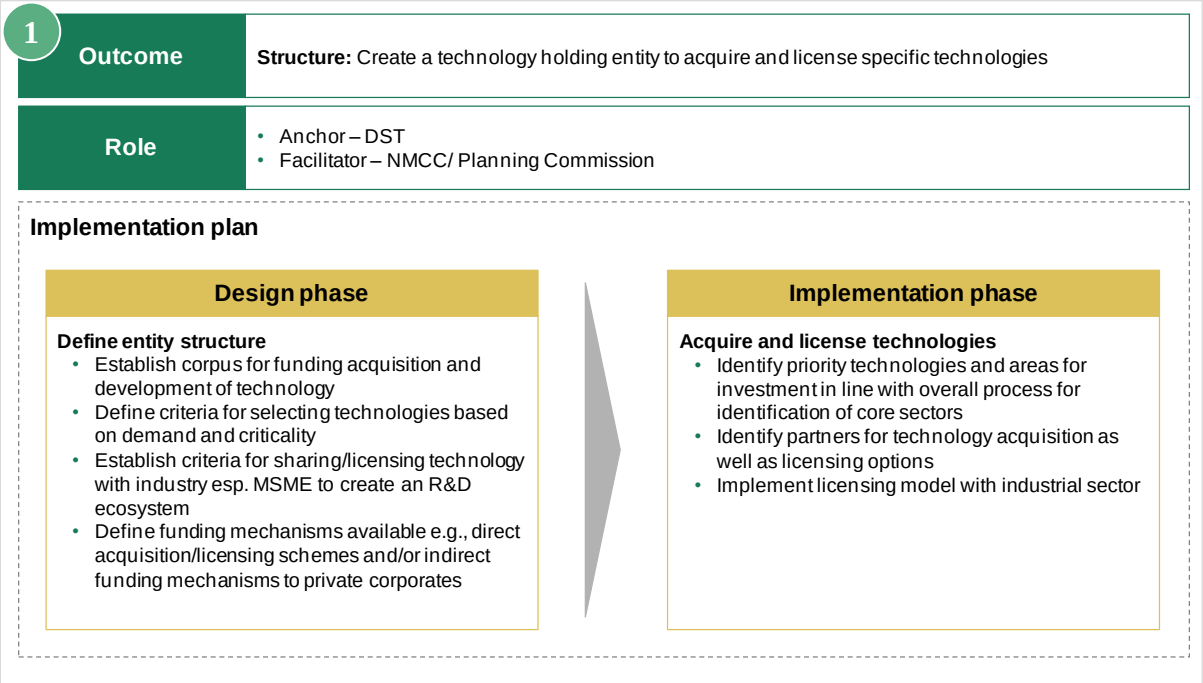


Exhibit 3l: Technology holding entity to acquire and license specific technologies to build R&D ecosystem

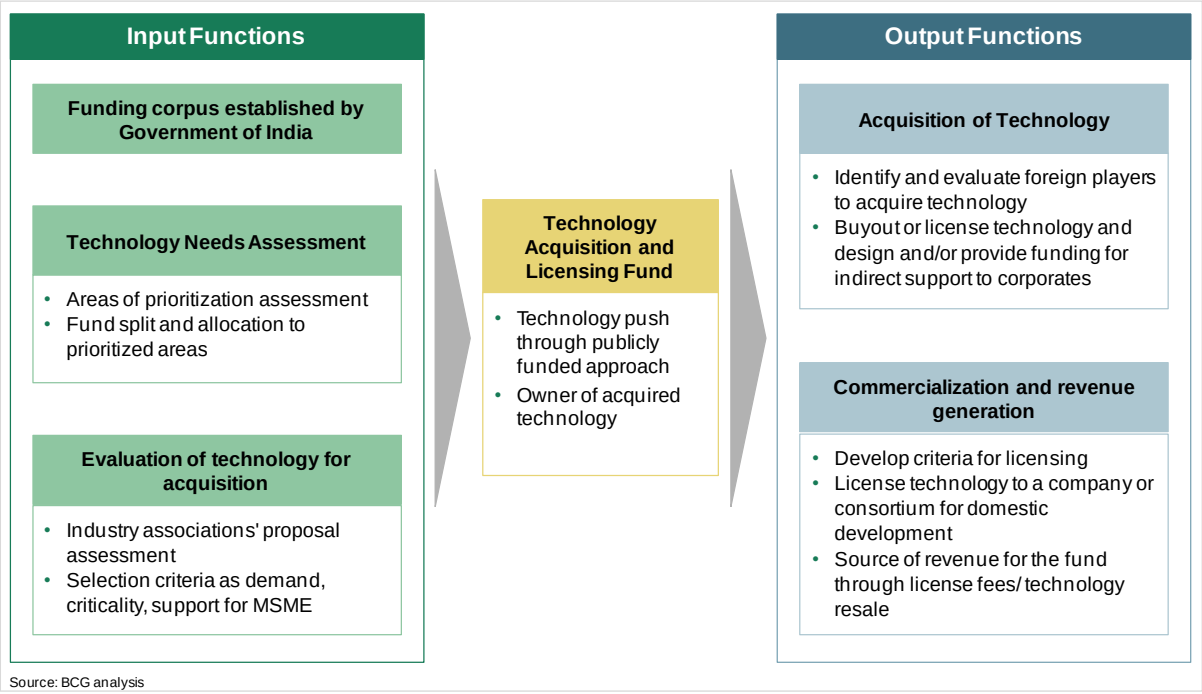


Exhibit 3m: Functions and features of the technology holding entity

Lever 2: R&D incentive realignment

The status quo incentive structure for research has not been able to generate enough pull for industries to participate, and hence there is a need to evaluate options for incentivizing R&D through new tax instruments and improve the qualifying conditions on existing schemes (Exhibit 3n).

In the *design phase* of the recommendation, the current incentives need to be reassessed for the impact created and alignment with industry metrics, and the incentives to be retained need to be identified. This has to be followed by agreement on new tax instruments to be implemented and sectoral preference schemes to be offered. Lastly, qualifying criteria and audit mechanisms need to be introduced to ensure streamlined availing of the benefits.

In the *implementation phase*, the schemes have to be rolled out by respective ministries and systematic review needs to be periodically performed to ensure implementation effectiveness.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: Finance Ministry and Commerce Ministry
- *Facilitator:* DST, NMCC

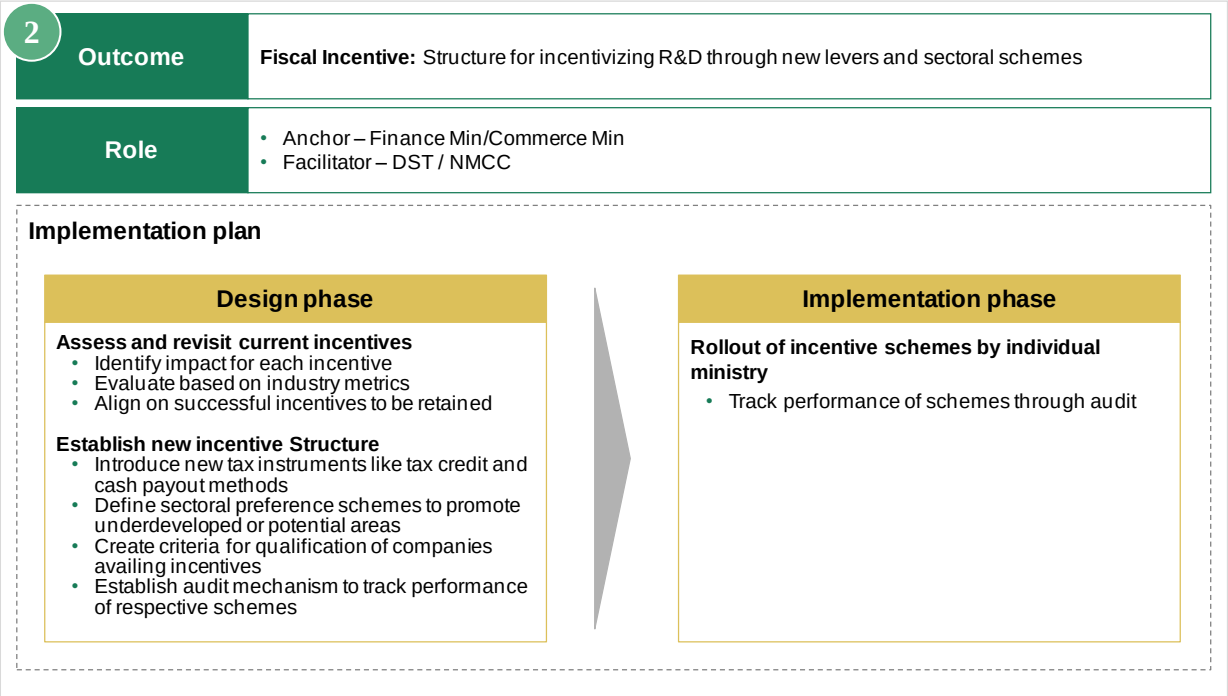


Exhibit 3n: Financial incentives realignment to promote industry led R&D

Lever 3: Academic innovation promotion entity

A need to foster greater participation by the academia in R&D is evident. The proposed Academic innovation promotion entity (Exhibit 3o) would be responsible for promoting, filing and commercialization of IP created by academic institutes.

In the *design phase* of the recommendation, the objectives and structure of the entity for academic participation in R&D needs to be established. The objectives of the entity will focus on defining the ownership structure of the patents created by the academic institutes. This body will be responsible for creating an incentive structure for students and academia that are involved in research as well as maintaining the infrastructure in partnering institutes like the Institute of National Importance (INI) and the Indian Institute of Technology (IIT). The entity would also be responsible for coming up with the lab to market strategy for technology. A corpus also needs to be created by the government of India (or through PPP) for funding development and instituting criteria for funding of projects. Also, criteria for incentivization and commercialization need to be created where there can be linkages established with corporate sector. Key functions and features of the aforementioned entity are summarized (Exhibit 3p).

The *implementation phase* would include the creation of a Technology development company with a clear organizational structure and qualifications of requisite personnel. Further, a defined revenue sharing mechanism with academia, and a partnership model with the industry partners needs to be instituted.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: MHRD
- *Facilitator:* NMCC, Planning Commission

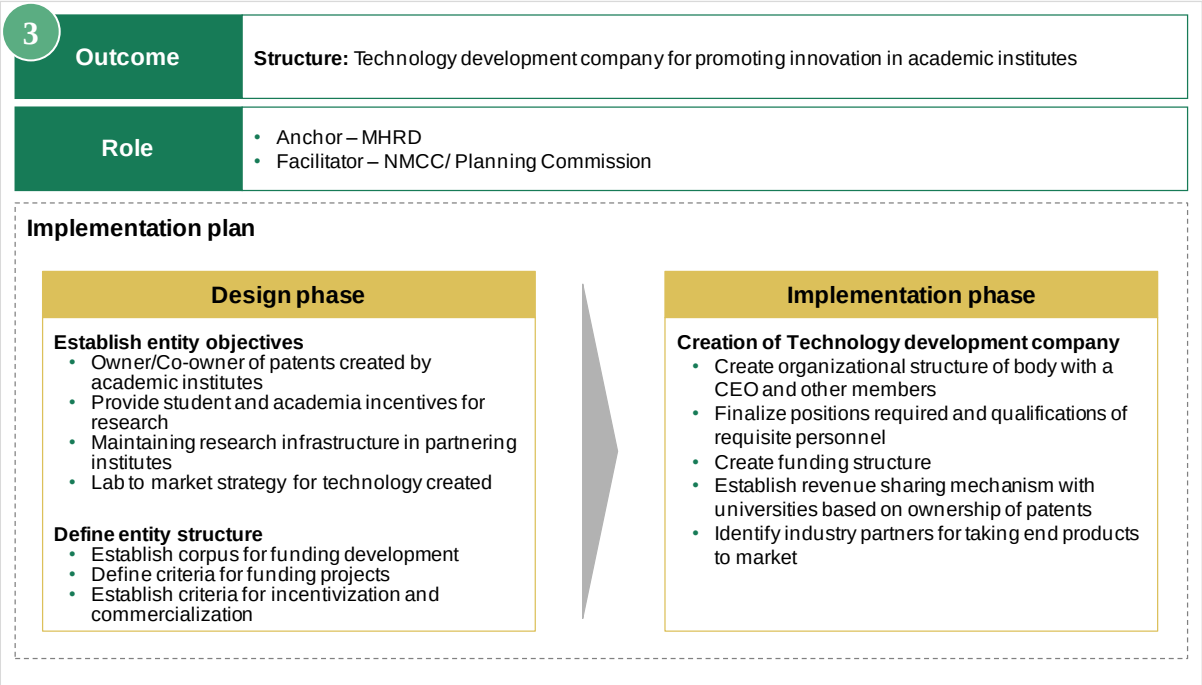


Exhibit 3o: Academic innovation promotion entity to improve academic participation in R&D

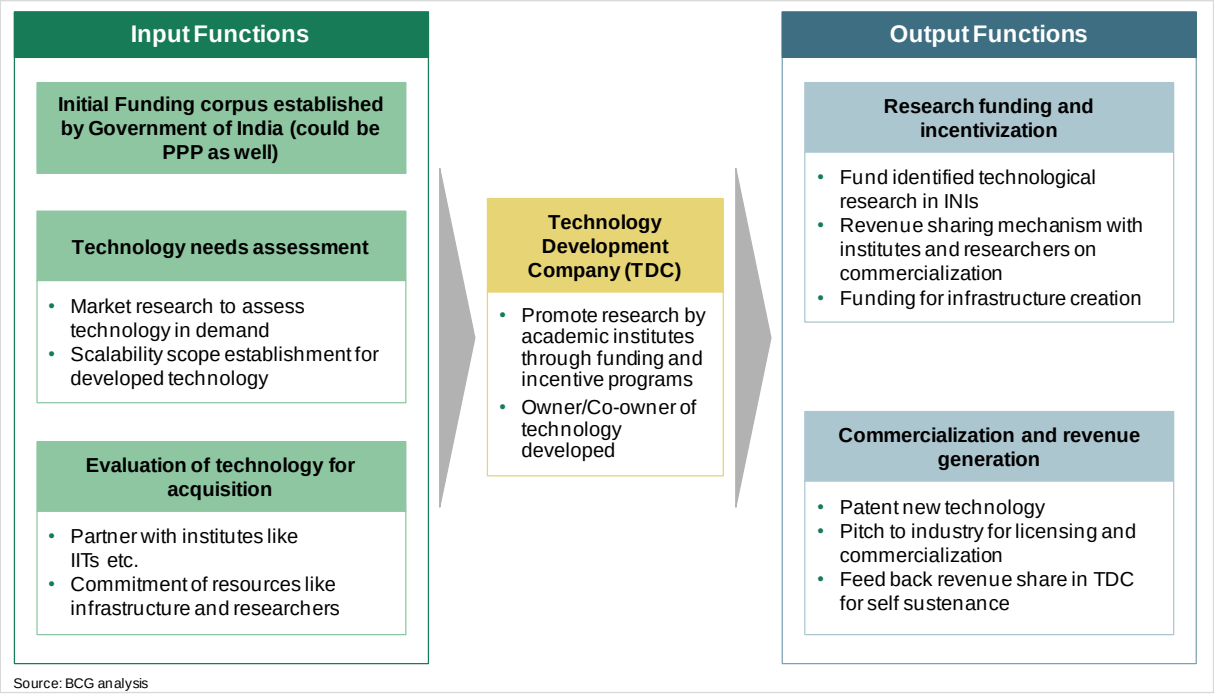


Exhibit 3p: Functions and features of the technology development company

Lever 4: Re-engineering the patent filing process

Process change is needed to reduce the time required to obtain a patent. The capability and capacity gaps in existing setup need to be bridged through a thorough re-engineering exercise (Exhibit 3q).

In the *design phase*, the patent filing process requires a re-examination and modification to address major bottlenecks and to make it more robust. Re-crafting the process will also include an assessment of officer capacity and capability with an organizational ramp up plan to address the gaps.

The *implementation phase* will involve hiring of officers, training programs and instituting of a tracker for progress.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: Department of Industrial Policy & Promotion (DIPP)
- *Facilitator:* Implementation can be run through the patent offices in India

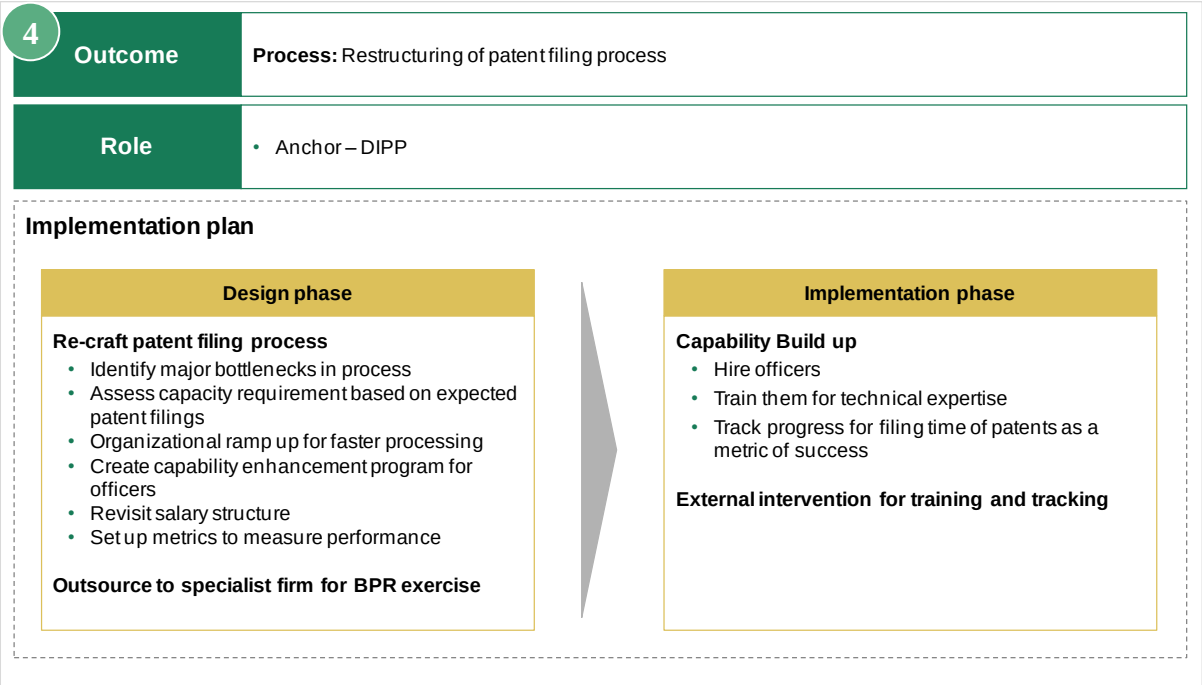


Exhibit 3q: Patent filing process re-engineering to address bottlenecks

Lever 5: IP filing process incentivization

Financial incentives to promote IP creation are required. An ecosystem needs to be created with a focus on not just the issuance of IP, but incentivizing the creation of IP and commercialization as well (Exhibit 3r).

In the *design phase*, a new structure for incentivizing outcome of IP should be created to provide separate incentive schemes for individual, MSME and large corporations. Schemes

to incentivize commercial application of IP for researchers in corporate sector need to be designed. The structure will also lay down qualifying criteria for availing incentives.

In the *implementation phase* of the new incentive structure, entities meeting qualifying criteria will be assessed and funds will be distributed to selected entities by the respective offices responsible for it. Audit structures for reviewing and monitoring of scheme implementation should also be clearly established.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: DST, Finance Ministry
- *Facilitator:* NMCC

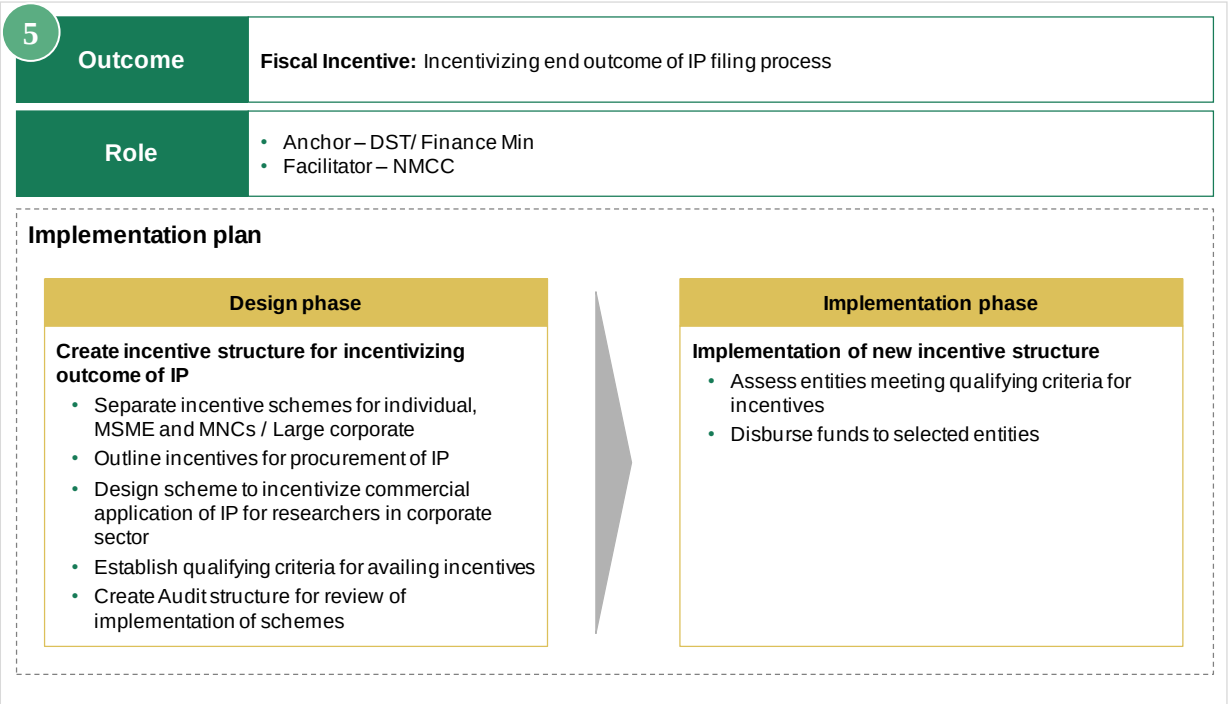
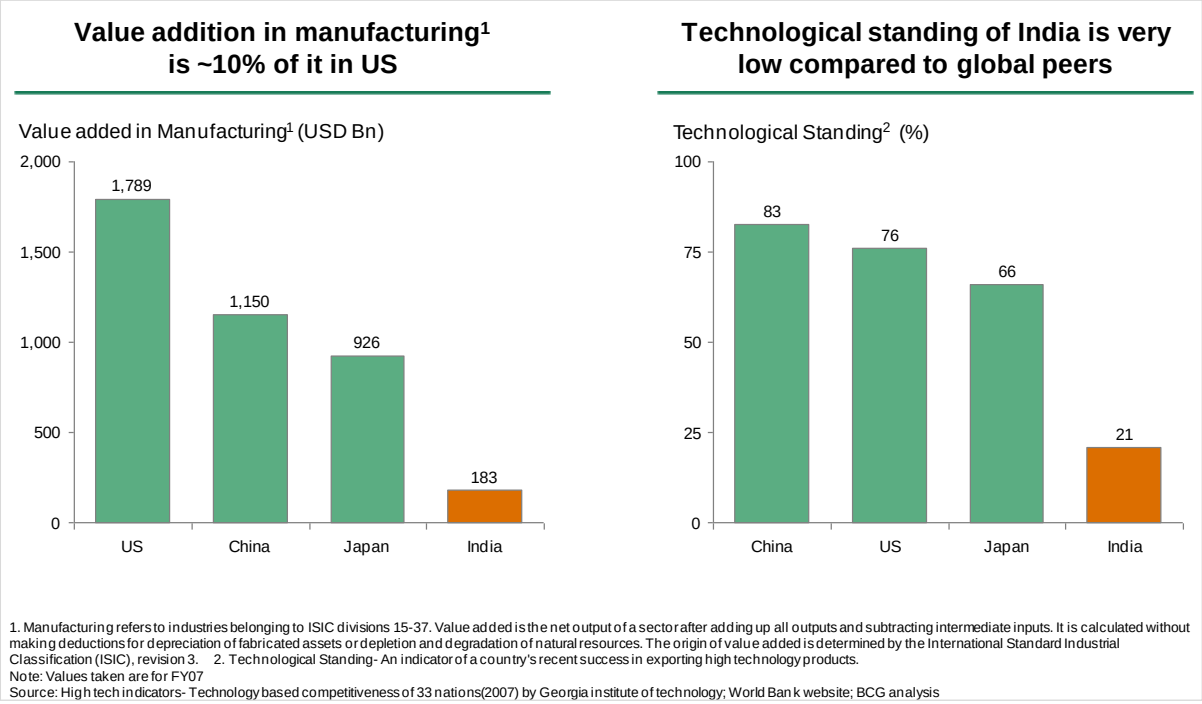


Exhibit 3r: Financial incentives to promote IP creation

4. Production

4.1. Current Status

India's value addition in manufacturing, estimated at ~USD 183Bn, is very low as compared to global peers such as USA (USD 1789Bn), China (USD 1150Bn) and Japan (USD 926Bn). India's technological standing which is an indicator of a country's success in exporting high technology products is 21%, which is lower as compared to USA, China, and Japan (Exhibit 4a).



1. Manufacturing refers to industries belonging to ISIC divisions 15-37. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3. 2. Technological Standing- An indicator of a country's recent success in exporting high technology products.
Note: Values taken are for FY07
Source: High tech indicators- Technology based competitiveness of 33 nations(2007) by Georgia institute of technology; World Bank website; BCG analysis

Exhibit 4a: India's position on value addition and technological advancement as compared to global peers

Despite a large demand base, Indian industry still imports a large proportion of their equipment requirements. For example, in the capital goods sector, the share of earth moving and mining equipment through imports is quite high (78% in high tech equipment and 35% in standard equipment) due to lack of locally available technology in engine, transmission and hydraulic systems. Further the growth of imports far exceeds exports in capital goods highlighting the lower levels of value addition and manufacturing taking place in India (Exhibit 4b). Another such sector is telecom equipment, where despite having the world's second largest mobile subscriber market, India still imports over ~77% of total equipment demand (Exhibit 4c).

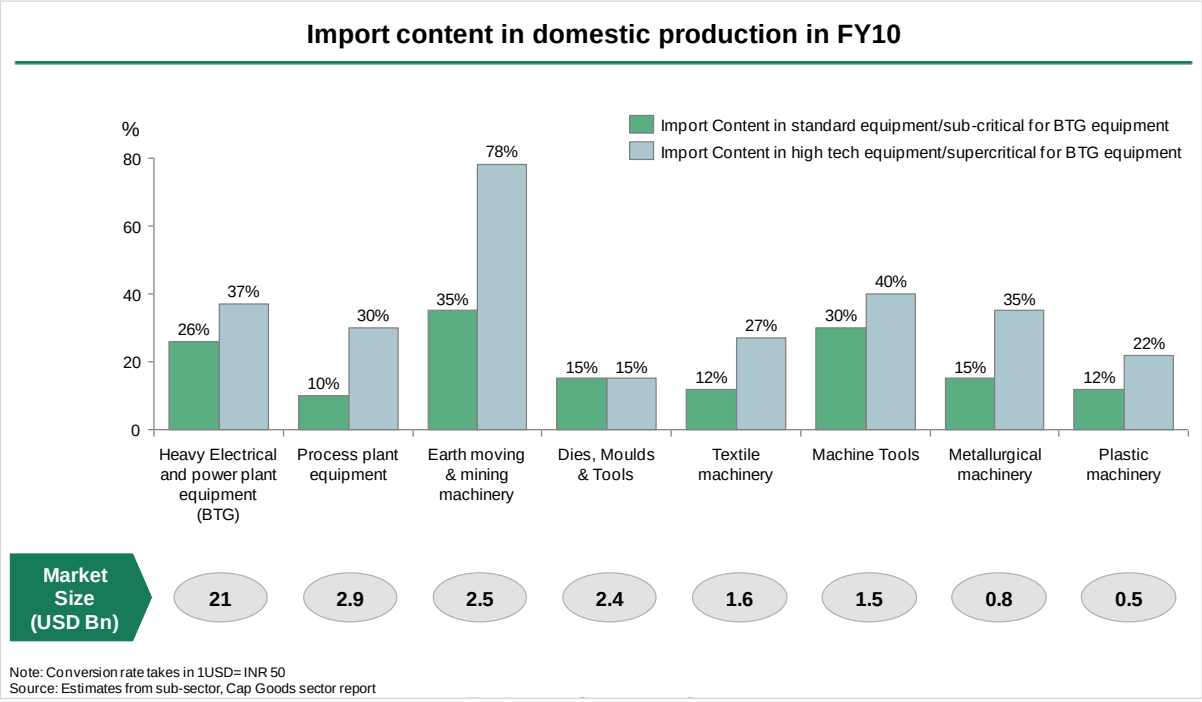


Exhibit 4b: Equipment imports by Indian industry across capital goods sector

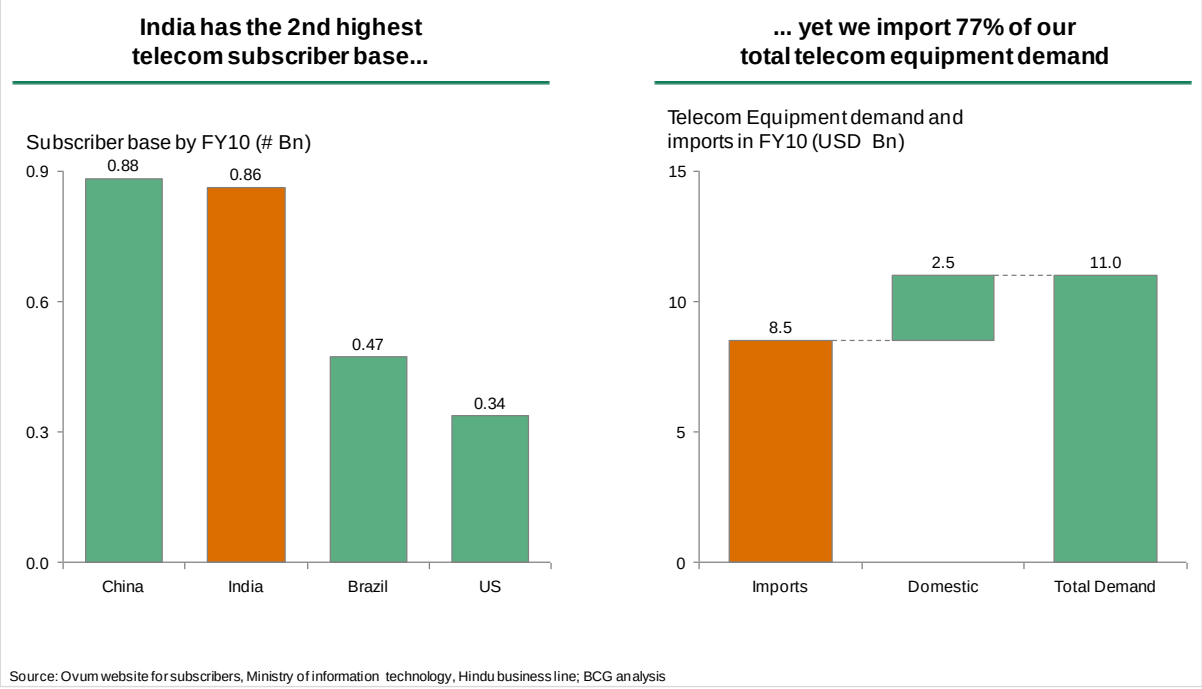


Exhibit 4c: Telecom equipment demand and imports in India on the back of its subscriber base

4.2. Existing Setup

To encourage local production and create scale economics the government of India has 3 levers at its disposal: Public procurement (both direct and indirect), Offset policy for new sectors where significant local demand exists and adjustment of duty structures across the value chain.

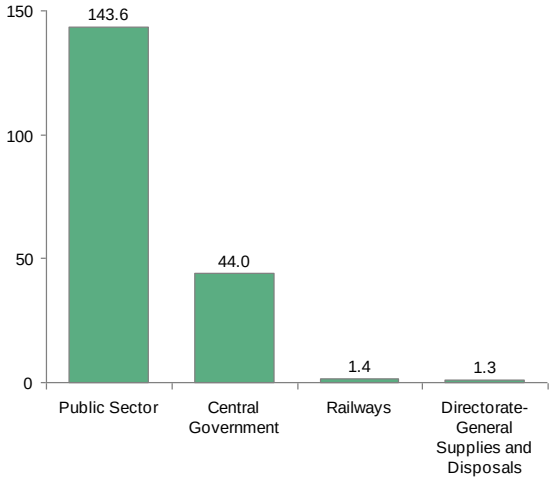
Public procurement today accounts for ~20% of Indian GDP. Presently the lever is not leveraged since there is no single agency that effectively monitors public procurement across all entities and there is an absence of a consistent policy to link this lever to local production. Further, most purchasing agencies focus more on acquiring goods at the lowest possible price and the absence of skilled professionals in these procuring agencies adds to the existing inefficiencies.

Public procurement can be made a very effective lever for promoting domestic value addition in several different ways. For example, there can be developmental contracts, through which a risk sharing mechanism can be created between the government and public or private companies for orders mandating a percentage of local value addition. Further, there can be special provisions in procurement contracts that promote indigenous products as well (Exhibit 4d).

Globally, countries have introduced procurement laws to favor domestic products over imported ones. For example, the Chinese government has laid out procurement laws which mandate public procurement through local sources and give a very strong preference to indigenously innovated products (Exhibit 4e). After the localization policy, China has witnessed a systemic indigenization of technology and over time has been able to localize critical technologies (Exhibit 4f). Similarly case examples can be seen in Brazil. Petrobras, the local Brazilian energy corporation, has made exceptional investments and commitments to increase local content requirements. Also, it has to pay severe penalties to the Brazilian Petroleum agency, if they do not comply with the minimum local content requirements. This has resulted in local content increasing from ~25% in 1999 to ~80% by 2007 in the petroleum industry (Exhibit 4g).

Public procurement accounts for ~16% of Indian GDP

Major procurement expenditure in FY10 (USD Bn)



Public procurement can become a very effective lever for domestic value addition

Public procurement can take place in 2 ways:
- Direct purchase of government from industry
- Indirect value addition through provision of an a scarce resource under government influence

"Development Contracts" for risk sharing partnership to develop technology with domestic manufacturers
- Readjust "Earlier supply" conditions in tender documents
- Made in India (manufactured and IP in India) and Made for India (manufactured in India with at least 40% local content) products could qualify for such preferential purchases

Special provisions in contracts to promote indigenous products, e.g.
- Indigenous innovation products may enjoy additional x% boost in technical and price evaluation
- y% purchase by all Government departments can be from local manufacturers

Note: Indian GDP is taken as USD 1.2trillion for FY10 in real terms
Source: Green Public procurement report- Policy and practice within the EU and India, working group report on Tech development and acquisition, EIU database, BCG analysis

Exhibit 4d: Public procurement as a lever for the Centre to promote domestic industry

Illustration: China

"Article 10: The government shall procure domestic goods, construction and services, except in one of the following situations:

1. *Where the goods, construction or services needed are not available within the territory of the People's Republic of China or, though available, cannot be acquired on reasonable commercial terms;*
2. *Where the items to be procured are for use abroad; and*
3. *Where otherwise provided for by other laws and administrative regulations."*

<Chinese Government Procurement Law>

Government procurement policies spell out the preference for domestic goods

Control over purchase of imported products
- Special procedures and approvals required if government departments or projects are to purchase imported products

Preference for indigenous innovation products
- Domestic innovation will be valued more than that developed overseas, in the eyes of the Government
- Local companies would get preferential treatment in tenders

Despite recent tightening in the procurement process, uncertain outlook remains
- China is seeking to join the Government Procurement Agreement (GPA) under the WTO framework
- On-going negotiation and battling between China and other WTO member countries

Source: The US-China Business Council, China Procurement Law, literature research

Exhibit 4e: Procurement laws to favor domestic products over imported ones in China

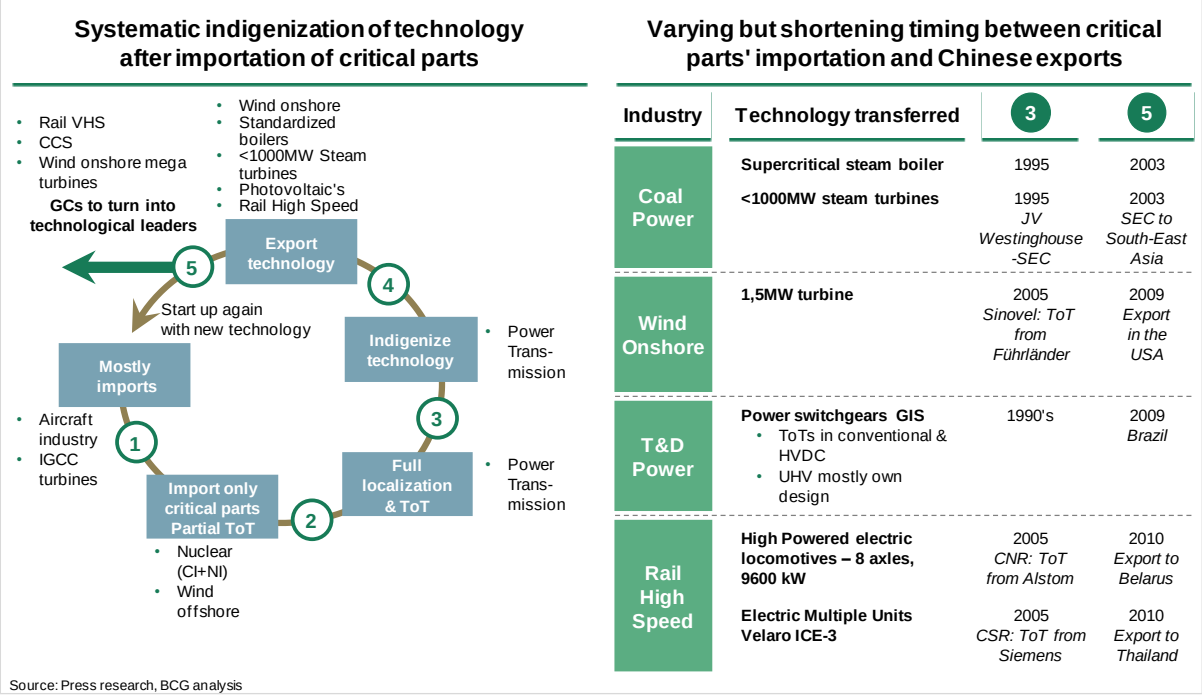


Exhibit 4f: After localization in China, all industries saw systematic transfer of technology

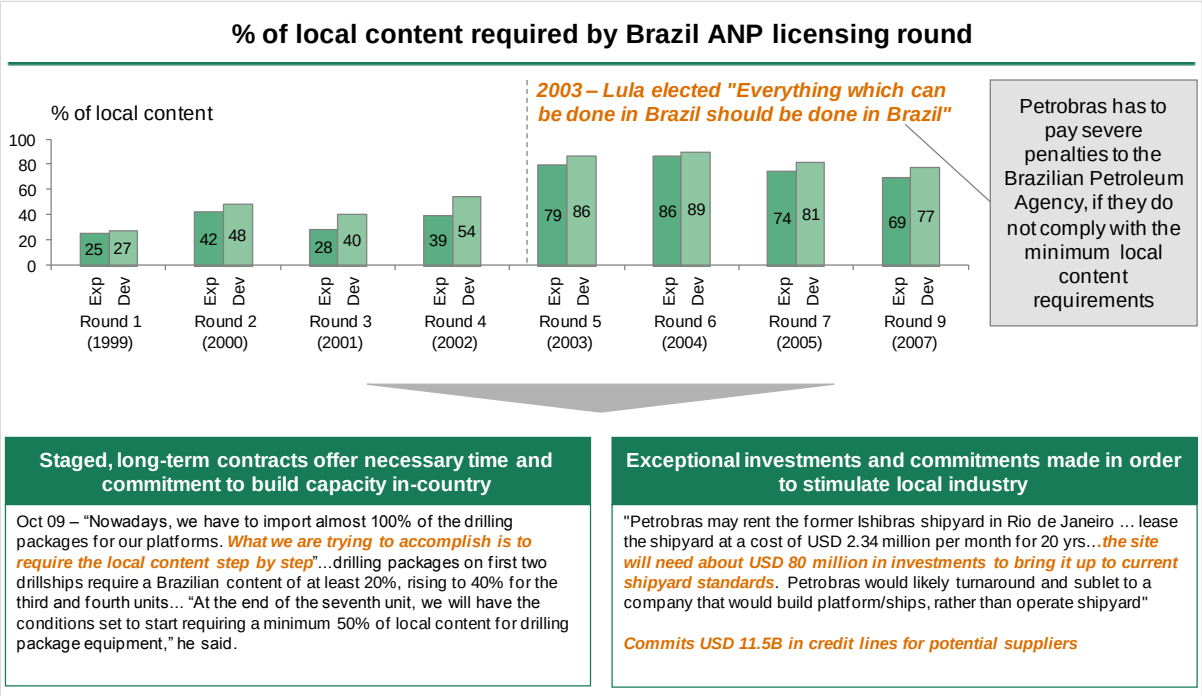


Exhibit 4g: Increase of local content in Brazil in oil & gas sector

In the recent past, the Indian government has leveraged Public Procurement as an effective lever to push for technology transfer and ensure larger value add through manufacturing in the country. One such example is that of the Indian Power Sector promoting localization through bulk tenders of supercritical power equipment. In recent power plant bids, only locally equipped players were allowed to participate in bulk tenders. This led to the

formation of super-critical JVs with commitment for time bound technology transfer to India and local value-add. Similar pathways can be leveraged across other sectors.

Another tool which will create an even playing field for domestic firms is to remove certain duty structure anomalies such as higher duty on intermediate goods compared to finished goods. Also, the current setup does not allow any one nodal agency to have a systemic view of duty structures across the value chain as periodic lobbying across value chain segments creates these duty anomalies over a period of time.

4.3. Recommendations and Implementation Plan

There are 4 levers which have been identified to boost Production. The core description and rationale of these levers have been highlighted (Exhibit 4h).

Reco.	Description	Rationale
6 Public procurement policy creation	Policy to promote local value addition and developmental contracts	• Current spends through public procurement large (~20% GDP) • Need to create an ecosystem for promoting local value addition • Need to push for developmental contracts through risk-sharing mechanism for systematic indigenization of technologies
7 Offset policy creation	Policy to build local technology and manufacturing in select areas	• Large public spend anticipated in several relatively new industries e.g., railways, infrastructure etc • Need to define an offset policy as a lever to leverage captive orders to develop new areas of technology within the country
8 Duty anomalies removal	Change of current duty structure to remove anomalies to promote local production	• Need to realign current duty structures to remove tax anomalies that exist which make intermediate goods costlier
9 Duty structure change for strategic raw material	Import/export duty structure change to maximize local value addition	• Need to reduce the barriers to import critical ingredients (strategic raw materials) that can boost local manufacturing • Need to enhance local value add restrictions/control exports of strategic raw materials to ensure higher value addition within the country

Exhibit 4h: Description and Rationale for recommendations on Production

One of the core themes in the recommendations above is to leverage spending (e.g., public procurement) and local demand to promote domestic value addition and indigenization of technologies. ***Public procurement policy creation*** *and* ***Offset policy*** for new industries represent two such levers in this direction.

Another theme is to use take a strategic view towards duty structures both for harmonization across the value chain to ensure competitiveness and also to control the impact on scarce and valuable raw materials which are critical for local production. ***Duty anomalies removal*** and ***Duty structure change for strategic raw material*** represent two such levers which address these issues.

Lever 6: Public procurement policy creation

Current public procurement budget is large (~20% GDP), and represents a powerful lever to create an ecosystem to promote local value addition. The public procurement policy can operate through developmental contracts and special preference clauses in the policy where government will mandate local content addition by companies. Further, one can extend this lever beyond direct procurement to indirect areas of influence as well (e.g., spectrum, coal blocks etc.) for sectors where direct government expenditure is not significant.

In the *design phase* of this recommendation (Exhibit 4i), the key stakeholders like individual ministries and industry associations need to be identified and brought together to create a policy framework that is robust. A draft policy containing key elements such as criteria for domestic industry promotion based on scale and scope of projects and conditions for developmental contracts needs to be created.

In the *implementation phase*, the policy draft along with implementation guidelines will be circulated to key stakeholders for feedback and approval. Further, a rigorous audit mechanism needs to be enforced to monitor the implementation of the policy.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: DIPP, Individual Ministries
- *Facilitator:* NMCC, Planning Commission

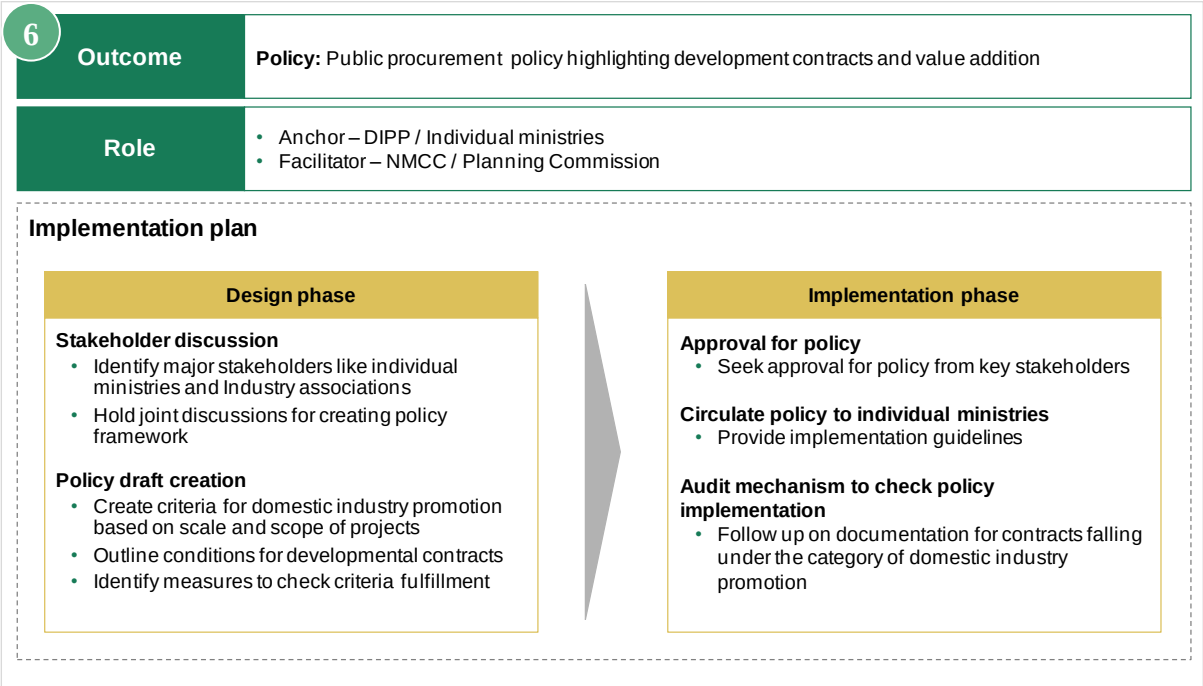


Exhibit 4i: Public procurement policy to promote local value addition and developmental contract

Lever 7: Offset policy creation

Large public spend is anticipated in several relatively new industries e.g., railways and infrastructure besides some traditionally high spending sectors e.g., defense. An offset policy can be defined to leverage captive orders to develop new areas of technology within the country.

In the *design phase* of the policy creation (Exhibit 4j), new industries which need significant technology development need to be identified. After short listing industries, key elements of the offset policy needs to be defined such as order size criteria and criteria for percent offset requirement. Further, multipliers based on importance of technologies need to be created to promote transfer of technology.

In the *implementation phase*, a prioritized list of technologies along with areas of offset investment will be highlighted to the relevant ministry. The guidelines on offset criteria will also be communicated to individual ministries for offset implementation. Audit mechanisms will also be enforced to ensure streamlined implementation of the policy.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: DIPP, Individual ministries
- *Facilitator:* NMCC, Planning Commission

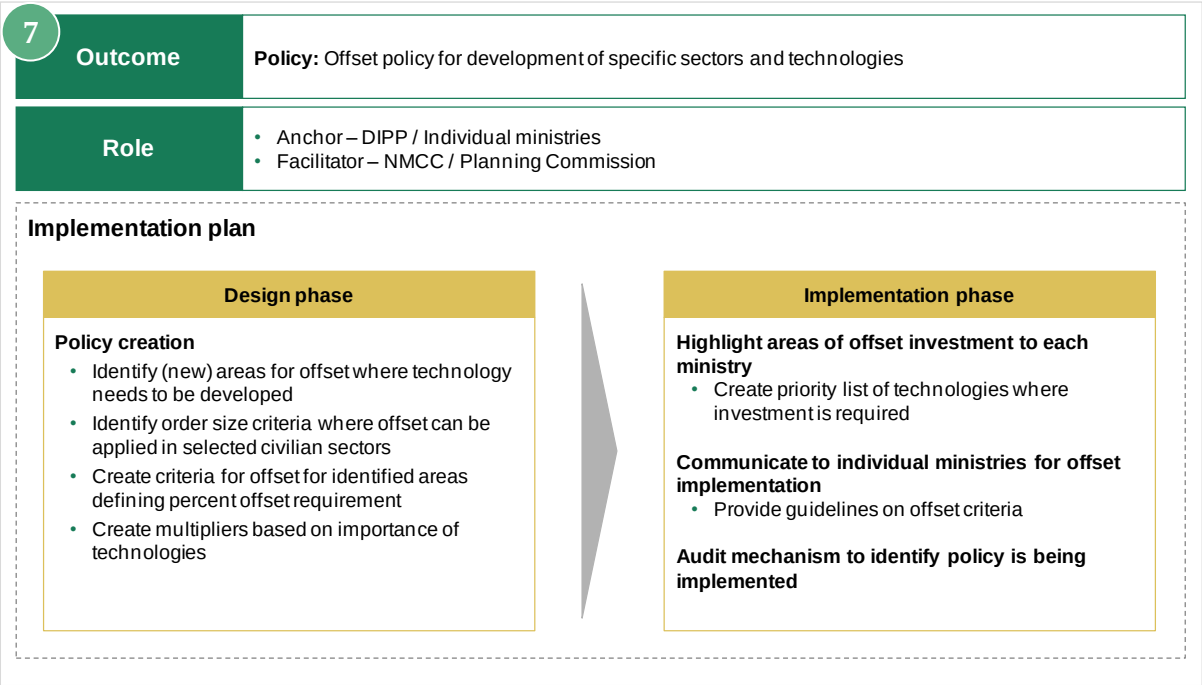


Exhibit 4j: Offset policy to build local technology and manufacturing

Lever 8: Duty anomalies removal

In the status quo duty structure for intermediate and finished goods, there are anomalies which at places make components costlier for domestic manufacturers, while reducing import duty on finished goods and making them overall cheaper for importers. Several such cases exist in various sectors, and there is a need for a systemic review of the overall value chain for harmonization.

In the *design phase,* discussions between industry and ministries need to be conducted to identify major anomalies in duty structure across various sectors (Exhibit 4k). A reformed structure with a systemic view of value chain can be created to ensure domestic industry is not disadvantaged. Comments on the reformed structure from ministries and industry associations can be invited.

In the *implementation phase*, the reformed duty structure will be communicated to ministries and industry bodies. Periodic review of duty structures should be institutionalized.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: Finance Ministry
- *Facilitator:* NMCC, Tax Research Unit

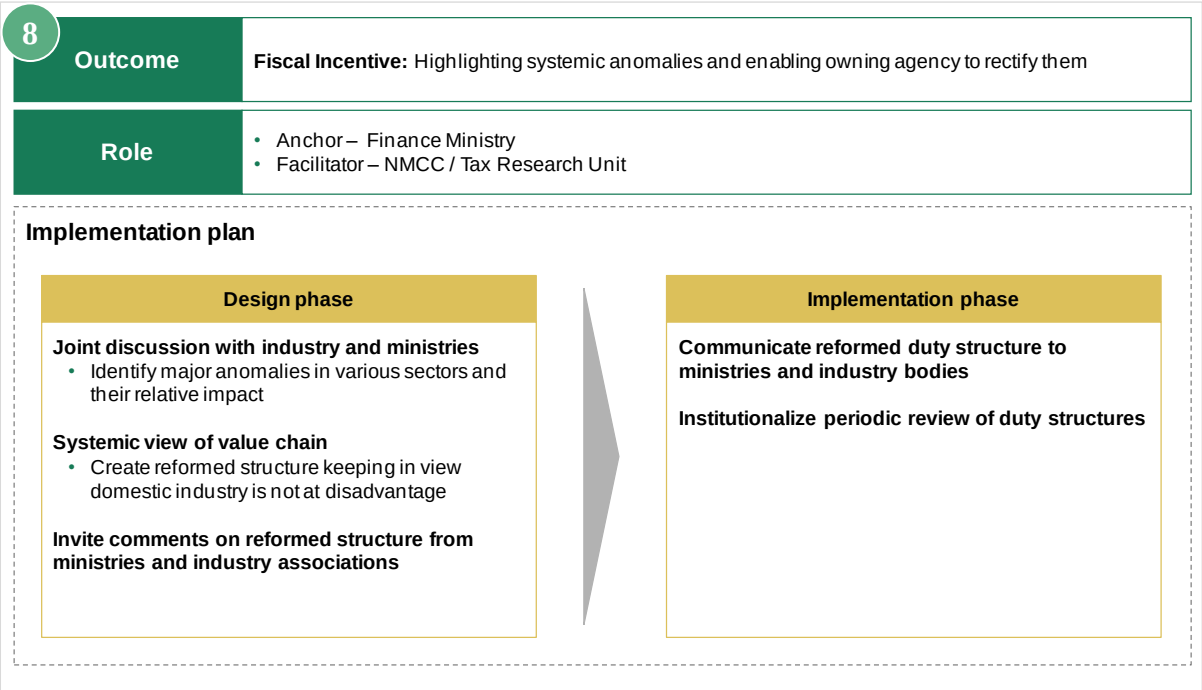


Exhibit 4k: Remove systemic anomalies in current duty design to promote local production

Lever 9: Duty structure change for strategic raw material

There is an absence of a strategic view on duty structures for scarce and critical raw material that is required for local production to ensure competitiveness. On a similar note for raw material that is available in India and has high requirement abroad there is an opportunity to adjust duty structures which encourage export in the form of higher local value addition.

In the *design phase* of the implementation (Exhibit 4l), strategic raw materials and equipments need to be assessed to identify areas where either India holds advantage (with respect to exports) or those that are critical for manufacturers (with respect to imports). For the shortlisted list sensitivity of duty change on demand needs to be assessed. New duty structures can then be created after holding joint discussions with related ministries and industry associations. While the duty on strategic export materials should be increased, it should be reduced on critical import materials.

In the *implementation phase*, reformed duty structure should be communicated to ministries, industry bodies and countries of export as well as import. Periodic review of duty structures should be institutionalized.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: Commerce Ministry
- *Facilitator:* NMCC

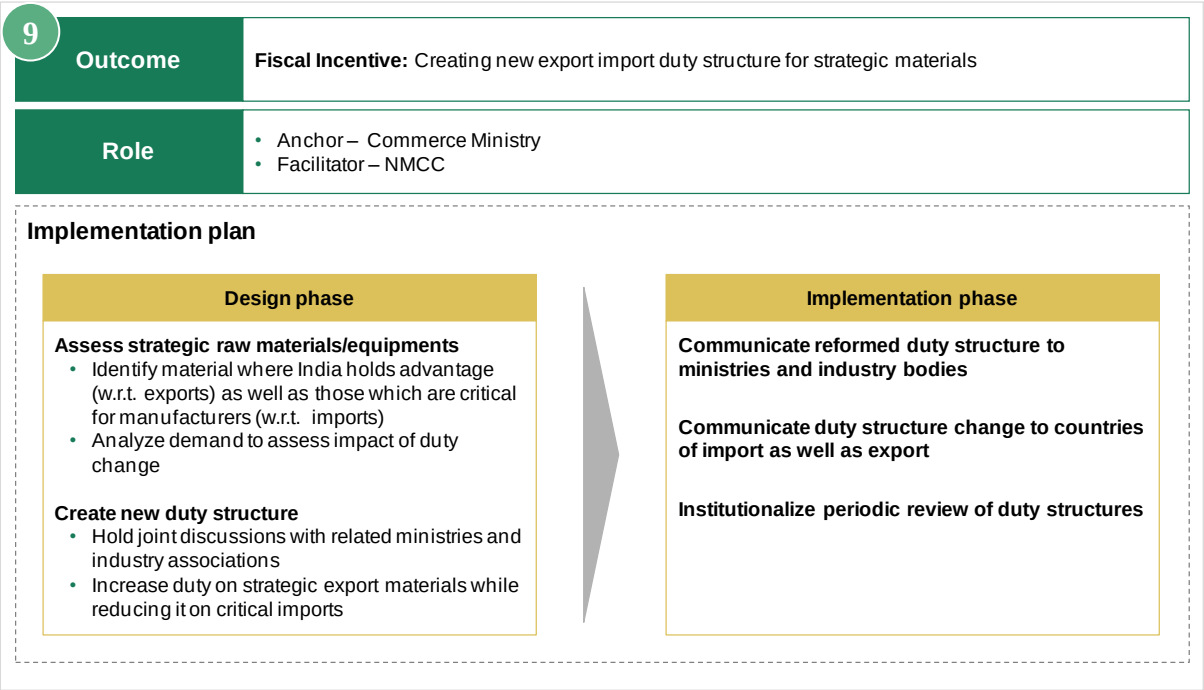


Exhibit 4l: Change import/ export duty structure for strategic raw materials to maximize local value addition

5. Standards

5.1. Current Status

Standards promote technological advancement in a country. Higher technical standards in a country lead to increased assimilation of technology by firms through sharing, wider market for inspection bodies leading to better infrastructure for compliance and ease of adoption to market demand. A good regulatory and compliance framework leads to better product quality and higher international acceptance. There is reduction of trade barriers as well as product dumping if there are adequate standards and compliance present.

Strong standard ecosystem offers a number of benefits like greater market access through higher exports and customer confidence, product differentiation based on quality, reduction in dumping due to higher acceptance of standards in a country and promotion and dissemination of best practices (Exhibit 5a).

Key benefits for having a strong standard ecosystem in the country

Market access	• Removes trade barriers by global conformance leading to wider market access and exports increase • Regulations may vary based on country and are hence restrictive but standards can provide necessary information for world wide trading of products and services • Increases customer confidence in a company
Differentiation	• Provides competitive advantage that becomes deciding factor between two comparable suppliers • Innovators can differentiate products based on various quality standards
Dumping reduction	• Acceptance of standards by industry reduces dumping as standards act as a barrier for products that are non compliant
Best practices and innovation	• Supports innovation as businesses need not reinvent wheel of reaching a level of technology first but can directly focus on newer technology • Increases absorption of technology by stepping upto a level of standards which the industry is using • Collaborative nature of standards promote growth for entire industry

Exhibit 5a: Standards promote innovation and technological development

Improving standards encourage the industry to invest in local value add and technology localization. An example can be taken for contact seal technology upgradation through standards. In Oil and Gas industry in India, there were mechanical seals in use a few years back. After API 610 standard was introduced the mechanical seals changed to bearing isolators which are a more sophisticated and technologically advanced product with better life time. Given local demand for high technology products, some companies have invested in local production of the new seals thus improving the technology value addition in the

country. This is an illustration where not just the product quality improved but domestic manufacturing became technically more advanced (Exhibit 5b).

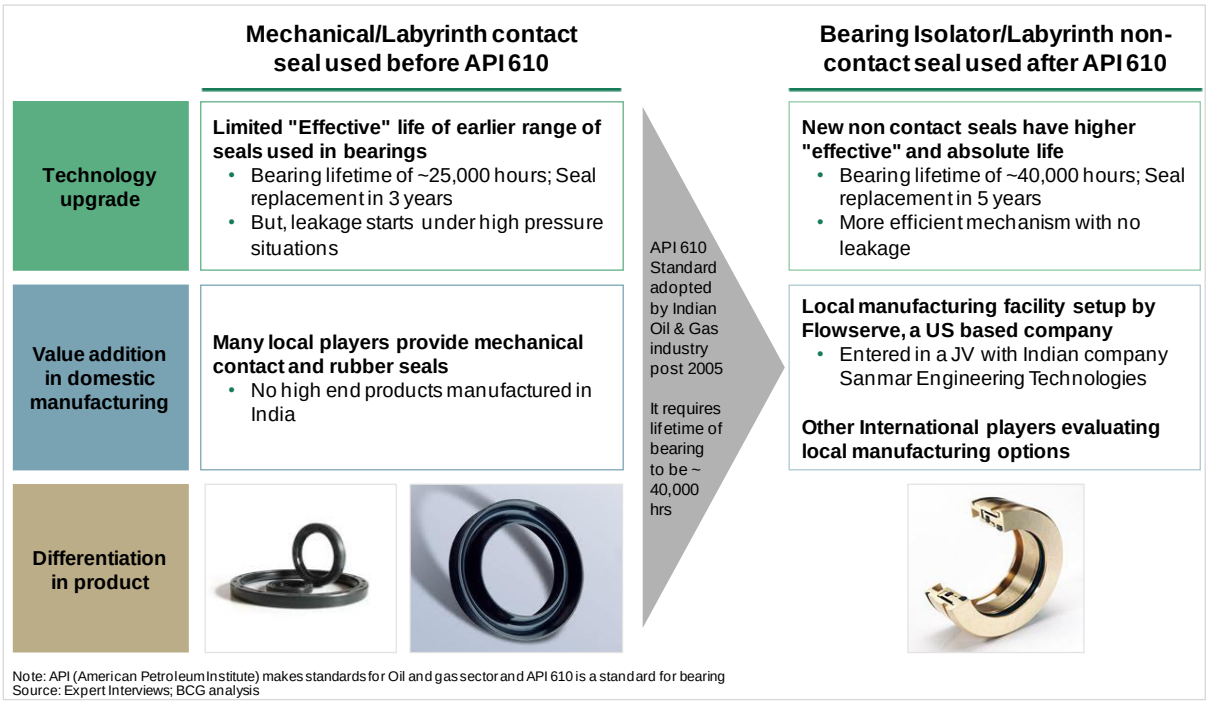


Exhibit 5b: Illustration: Technology upgrade and manufacturing value addition through standards

Standards evolve across the range from internal company standards, to those adopted by the industry, to those which get defined in regulations and finally get created as laws of the land. Hence there is a clear need for close involvement of the industry with the regulators in shaping regulation and driving industry standards (Exhibit 5c).

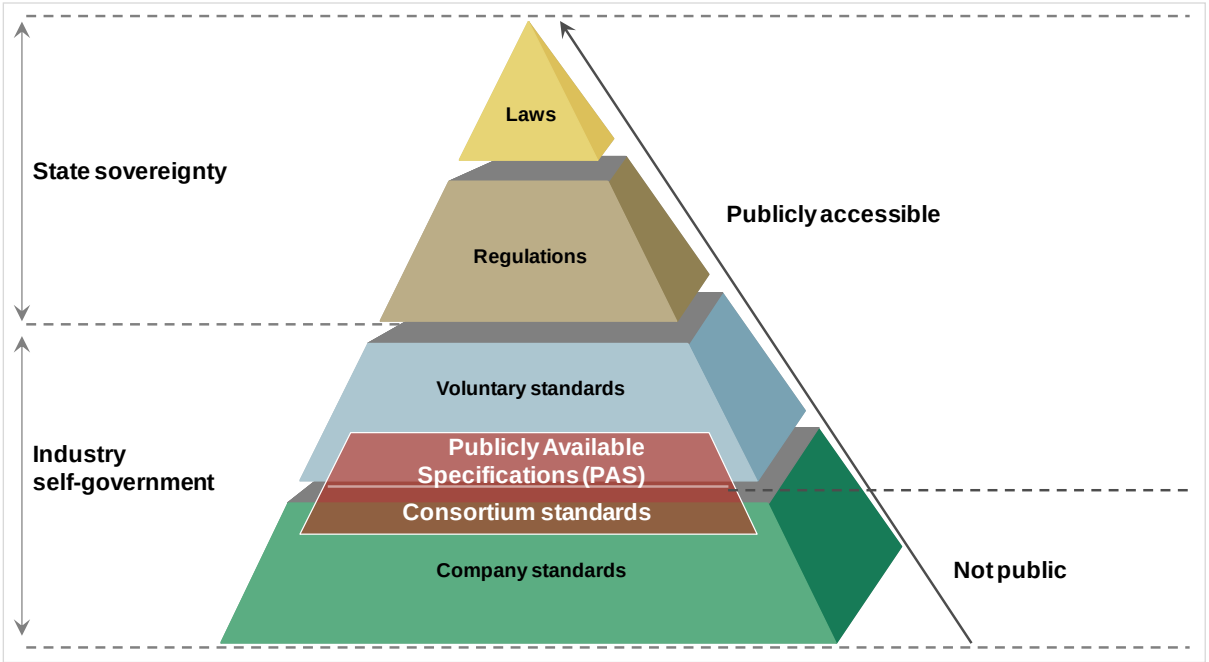


Exhibit 5c: Hierarchy of standards

5.2. Existing Setup

Presently in India, there are multiple entities involved in the process of developing, regulating and implementing standards. The broad structure of the existing setup is illustrated and explained (Exhibit 5d).

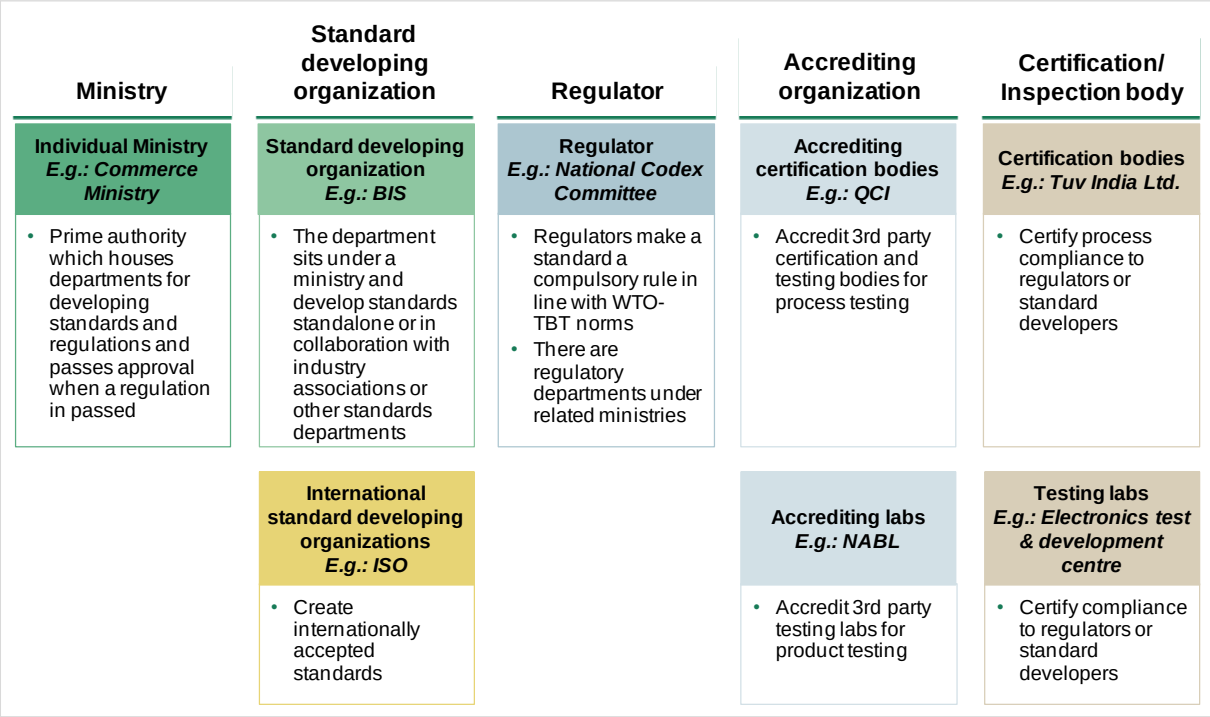


Exhibit 5d: Several entities involved in the standards ecosystem in India

However, gaps exist at multiple levels across the standards value chain. They have been defined across two areas (Exhibit 5e):

People and infrastructure: SDOs suffer from manpower shortage and absence of specialist skill sets. Training is required for expertise in industry standards and awareness of global norms. Regulators need training for expertise in WTO norms for drafting regulations as WTO documentation is a process where in compliance is inadequate due to lack of awareness. Also the inspection bodies need labs with better infrastructure.

Guiding principles: Several Indian standards do not match and conform to world class standards given absence of clear guidelines. Further, the standard development process lacks participation and involvement from industry bodies. Indian exporters find it difficult to match global standard due to lack of awareness and low appetite for technology absorption. Limited audit mechanisms exist to track creation, upgradation and implementation of standards leading to several gaps in conformance.

Exhibit 5e: Gap assessment in the standards ecosystem

5.3. Recommendations and Implementation Plan

There are 4 levers which have been identified to boost Standards. The core description and rationale of these levers have been highlighted (Exhibit 5f).

Reco.	Description	Rationale
10 Improve quality and conformance	Improve the quality of existing / future standard creation and conformance	• Need to constantly update standards to push the industry to invest in R&D/technology upgradation • Need to align Indian standards with global benchmarks to improve the quality perception of Indian manufactured goods
11 Enhance capacity and capability	Build the appropriate capacity, capability and infrastructure for world class standard creation	• Need to significantly enhance the capacity, capability and infrastructure of the standards ecosystem • Need for experts in regulators, SDOs and certification bodies with specialist skill set to design best-in-class standards
12 Promote industry led standards	Significantly increase the participation of industry in creating and upgrading standards	• Globally industry plays a much larger role in standard creation than in India • Need to ensure greater participation of the industry since it is closest to new technologies and evolving standards across geographies
13 Build global acceptance of Indian standards	Improve conformity of Indian products to global standards	• Higher conformance with global standards will reduce trade barriers for exporters and provide wider market access conformance homogenous • Need greater and a conformity testing mechanism to increase export potential of Indian manufactured goods

Exhibit 5f: Description and Rationale for recommendations on Standards

One of the themes in the above recommendation is in the process of creation of standards where there is a need to increase quality and consistency, conformance with global best practices and closer involvement of industry. Three levers, ***Improving quality and conformance, Promote industry led standards*** and ***Build global acceptance of Indian standards*** represent actions in this direction.

An additional area for action is to ***Enhance capacity and capability*** across the entire standard ecosystem.

Lever 10: Improve quality and conformance

There are multiple SDOs, regulators as well as certifiers in the country, with little uniformity across processes. There are also no existing guidelines on best practices for a robust standard, regulation and certification process. In order to improve the quality and conformance of standards in the country as well as to align them with global benchmarks, there has to be a policy outlining these guidelines and best practices (Exhibit 5g).

In the *design phase* of the recommendation, policies need to be created for SDOs and regulators to ensure robust and uniform standards. Such a policy would enable regulators to draft regulations in line with WTO norms. Further, process guidelines would need to be drafted for testing and certification bodies to boost regulator confidence.

In the *implementation phase,* the policies and guidelines need to be communicated to the respective ministries and departments. It is also important to create audit checks to monitor compliance by SDOs, regulators and certification/ testing bodies.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor:* BIS (other SDOs) and QCI (other accrediting bodies)
- *Facilitator:* NMCC

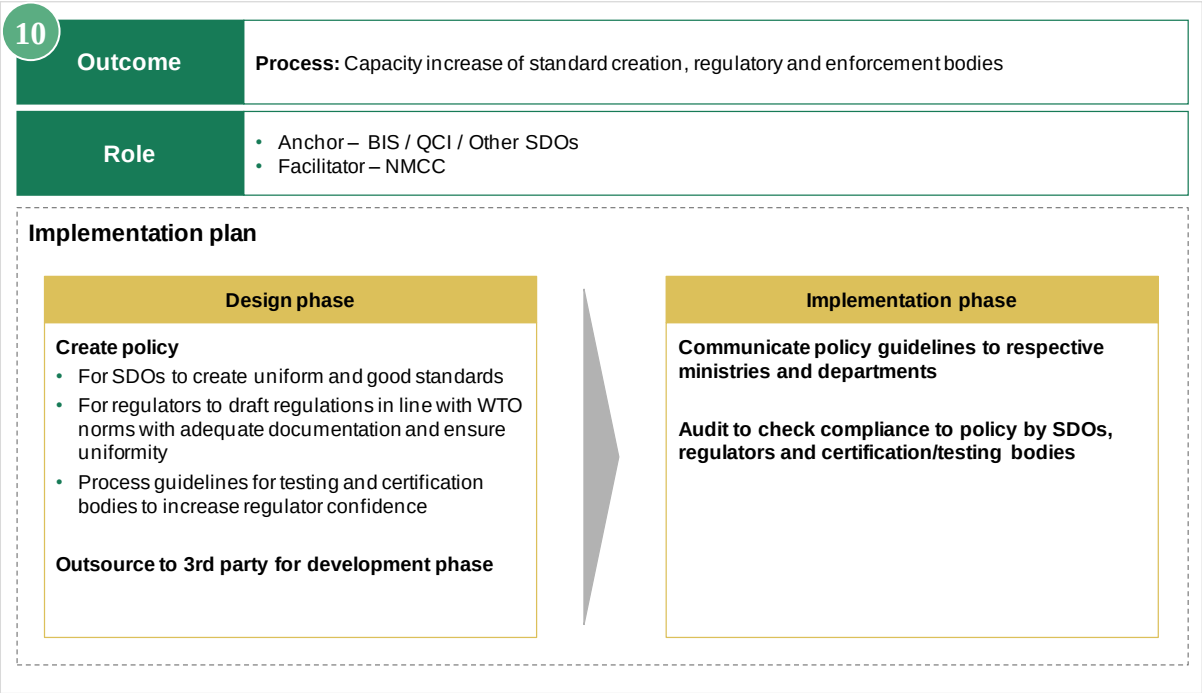


Exhibit 5g: Improve quality and conformance of standards

Lever 11: Enhance capacity and capability

The capacity, capability and infrastructure of the standards ecosystem need to be enhanced in order to design best-in-class standards. The lever to enhance capacity and capability (Exhibit 5h) looks at assessment of quality of manpower in the standard ecosystem and identifies an approach for improvement.

In the *design phase* of the recommendation, key capacity gaps need to be identified across bodies. Accordingly training structures would be created to enhance staff skills for new standards and regulations. There is also a need to identify and appoint dedicated personnel for conducting capacity enhancement programs. Once these programs are in place, there is also a requirement to place an audit mechanism so that the effectiveness of the programs in enhancing manpower skills can be assessed.

The *implementation phase* for the recommendation will start with hiring of personnel across bodies. Skill enhancement programs can be promoted through partnerships with industry

associations for conducting dedicated training programs. Lastly, regular audit mechanism should be enforced to monitor the effectiveness of capacity enhancement programs.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: BIS (other SDOs) and QCI (other accrediting bodies)
- *Facilitator:* NMCC

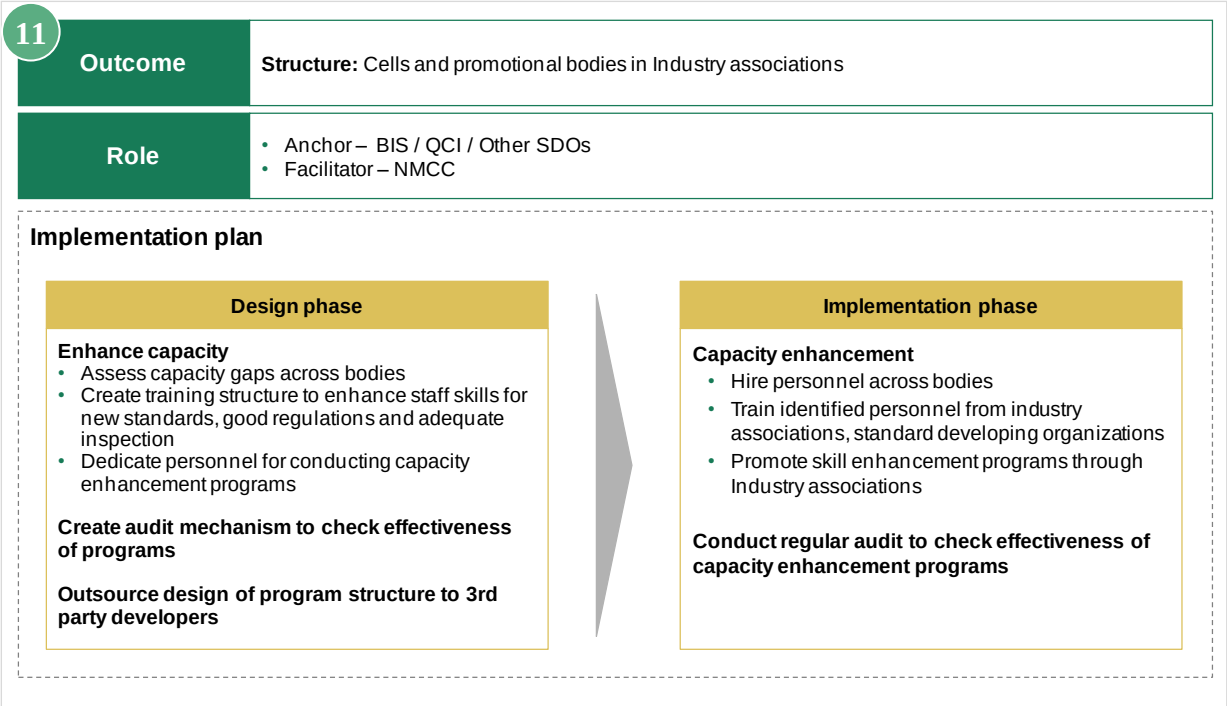


Exhibit 5h: Increase capacity and capability of the standards ecosystem

Lever 12: Promote industry led standards

Contrary to the situation in India, industry plays a much greater role in standard creation globally. Industry is always at the forefront of new technologies and evolving standards across geographies. Hence, it is critical to increase industry participation in creation and upgradation of standards (Exhibit 5i).

In the *design phase* of the recommendation, dedicated cells and promotional bodies need to be created or revived within industry associations to focus on standard development. The functioning and responsibilities of the cells should be developed in conjunction with BIS and other stakeholders. It would fall under the purview of these cells to engage with industry personnel in creation of standards. Promotional campaigns also need to be executed to generate greater awareness and acceptance of standards in the industry.

In the *implementation phase*, the starting point would be to get the cells amongst industry associations, which will then conduct regular programs with companies to spread awareness and to upgrade existing standards. Select set of standards most adequate for lobbying also need to be evaluated.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: Industry associations, BIS
- *Facilitator:* NMCC with the support of industry associations

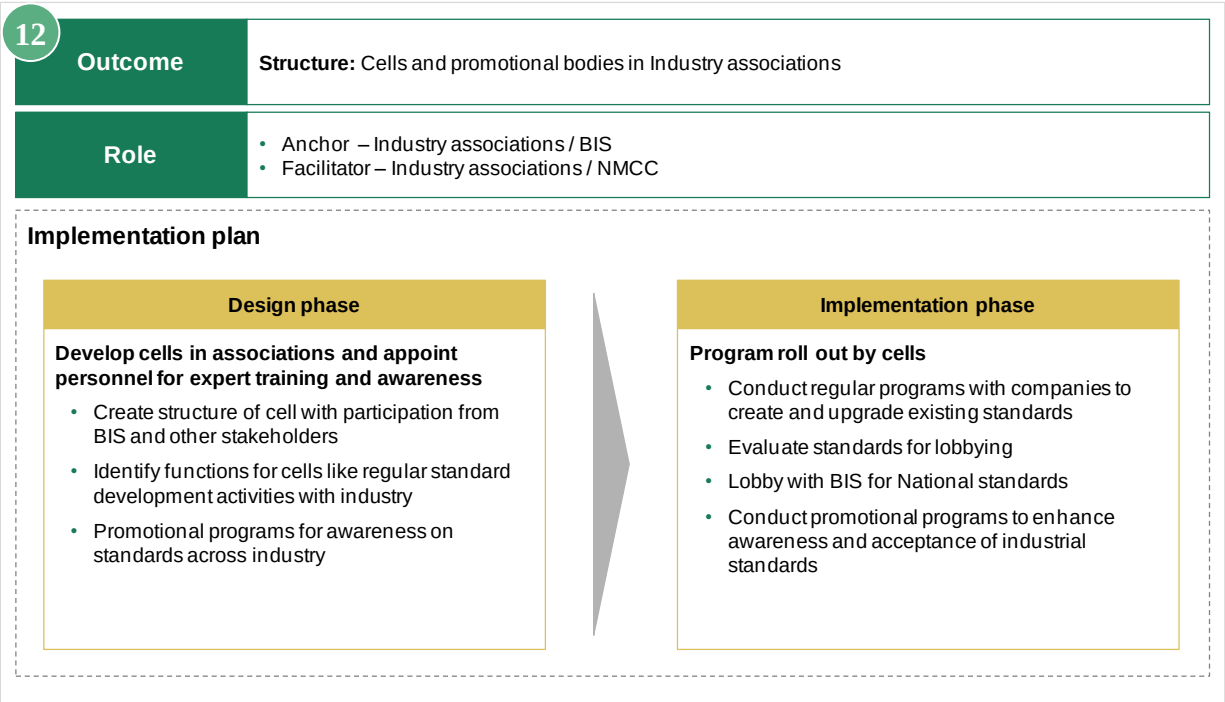


Exhibit 5i: Promote industry led standards

Lever 13: Build global acceptance of Indian standards

Higher acceptance of Indian standards at international forums (Exhibit 5j) will help reduce trade barriers and would provide wider market access to Indian exporters. This can be achieved through fostering stronger participation of Indian companies and SDOs in international standard development conferences.

In *design phase* of the recommendation, a program structure for promoting SDOs and industry participants to interact with international standard bodies need to be created. Indian organizations that can represent the country in international forums should be identified and encouraged. Further, there are several areas where there are Indian standards but international standards don't exist – such areas need to be identified and defined, and a strategy needs to be drafted promoting these criteria amongst the international communities. Guidelines on evolution of standards need to also be drafted to ensure a representation of Indian viewpoint at such events.

In *implementation phase,* those cases should be promoted where Indian organizations can take lead and promote their standards in regional and international standard development committees. This will reinforce the level of confidence of other countries in Indian standards and help foster exports. It is also important to ensure presence and participation of SDOs and industry in ISO and lobbying to regional standard bodies for acceptance of Indian standards.

The suggested stakeholders to create and implement this recommendation are:

- *Anchor*: Industry associations, BIS
- *Facilitator:* NMCC

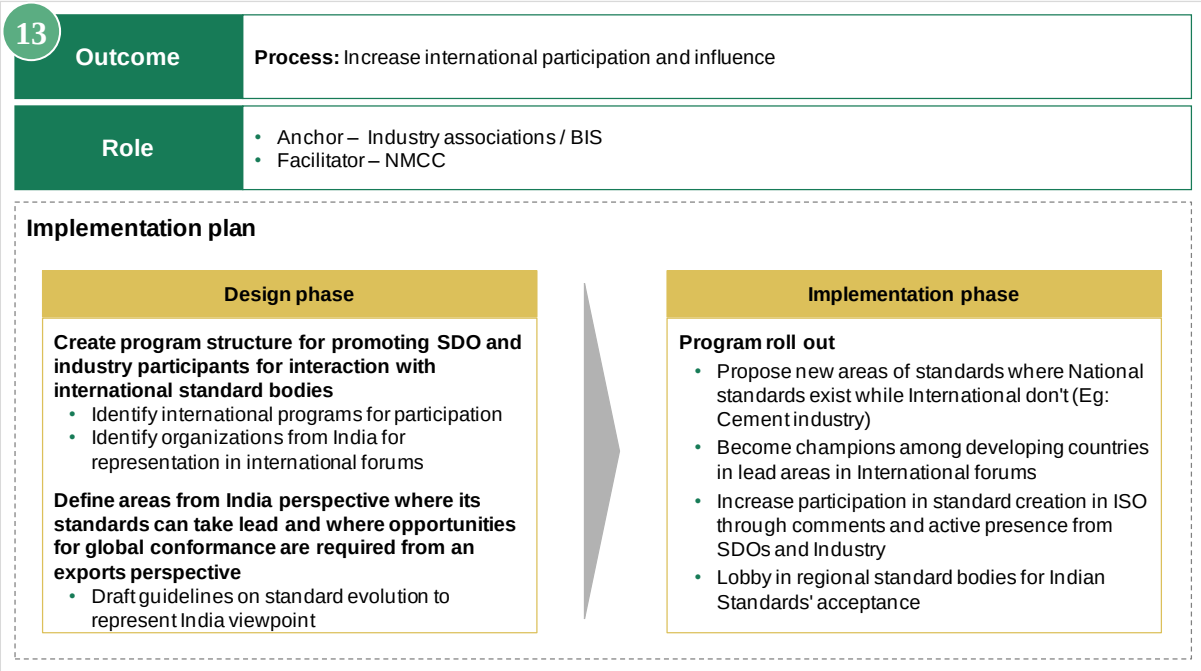


Exhibit 5j: Build global acceptance of Indian standards

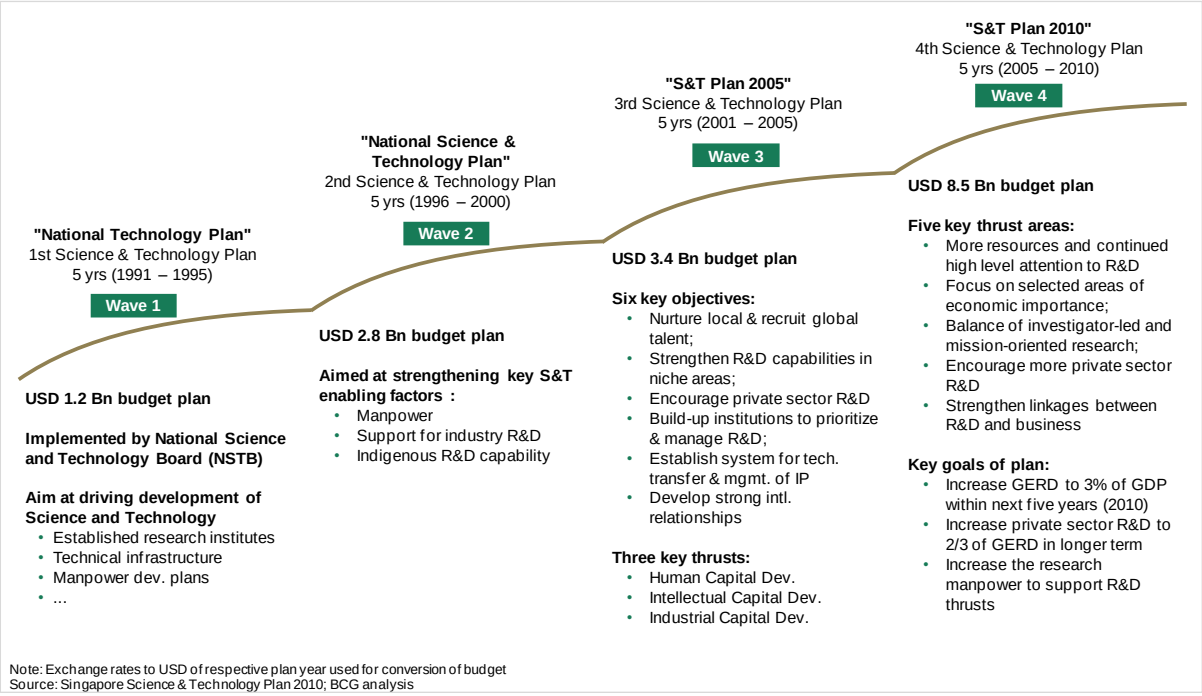
6. Prioritization: Areas & Technologies

One of the themes that emerge across almost all the levers is the need to create a process to **prioritize areas and technologies by the country (lever 14)**. This is required to direct the valuable resources (capital, time and effort) in the right direction to ensure that India becomes a global leader leveraging local scale and market demand. These sectors can be of prime national importance, or can be ones where India can be the early adopter.

While implementing policies across the levers highlighted, there is a strong need to prioritize the areas where the recommendations should be implemented. For example, levers such as offset policy, public procurement, strategic raw material duty structure, prioritization of industries is critical. Similarly technology acquisition and development fund should be channeled to priority areas to enhance capabilities of the country in these select sectors.

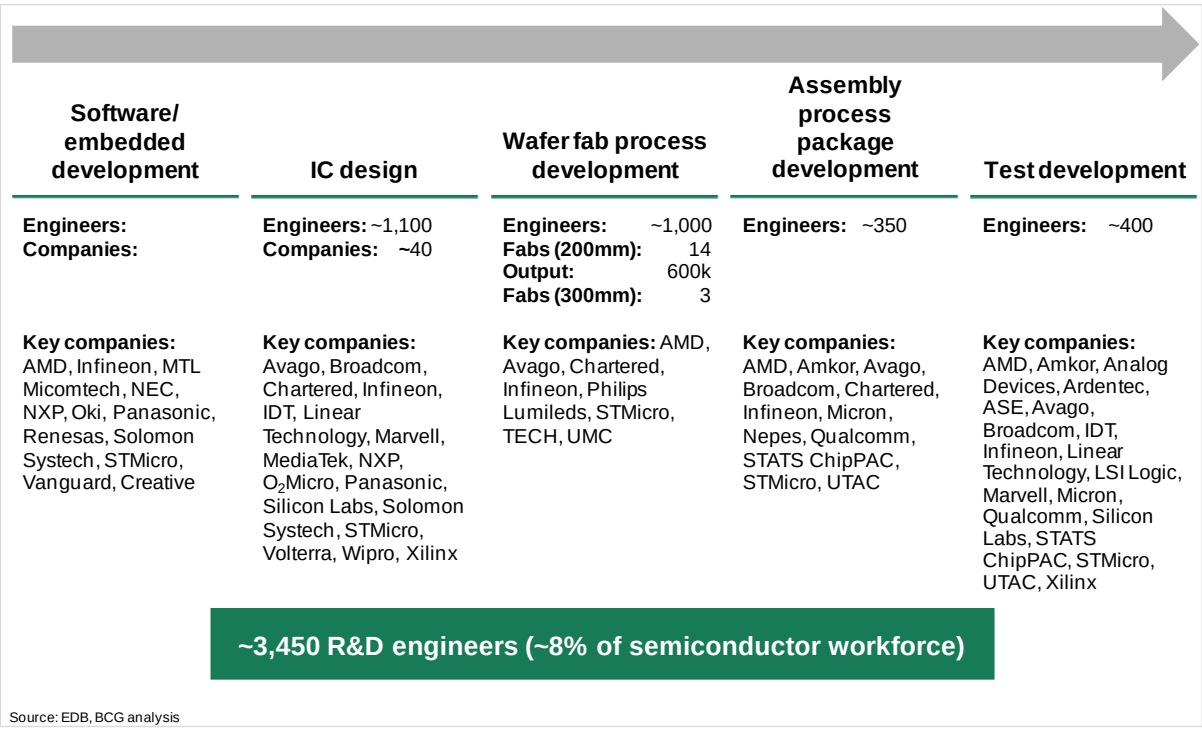
Also, there is a requirement to create linkages amongst assemblers, component producers and machine builders to increase technological strength of India's manufacturing sector. Since they have conflicting interests, the linkage can come through institutions that can coax and coordinate actions amongst multiple independent organizations. This task becomes difficult for governments since most actors in a sector are private organizations rather than government organizations, as is the case in India. In such situations, coordination can be brought about only through processes of coordination, rather than imposition through state authority. Concerted action on priority areas for technological development as well as selection of these areas needs to happen through a more systematic engagement of the producers and the various policy organs of the government. The strength of these processes of coordination will determine the speed with which the country can develop technological depth and strength in manufacturing.

There are global benchmarks of similar prioritization efforts being implemented to identify key thrust areas. One such example is Singapore, which in the past 2 decades has leveraged constant prioritization to provide thrust to key areas (Exhibit 6a). Creating such a roadmap has benefited Singapore to develop it as one of the world's hub for semiconductor technology, which was highlighted as one of the key priority areas (Exhibit 6b) and has resulted in creating a strong ecosystem for technology creation in the country (Exhibit 6c).



Note: Exchange rates to USD of respective plan year used for conversion of budget
Source: Singapore Science & Technology Plan 2010; BCG analysis

Exhibit 6a: Illustration of Singapore's Science and Technology roadmap



Source: EDB, BCG analysis

Exhibit 6b: Singapore now has the complete semiconductor ecosystem

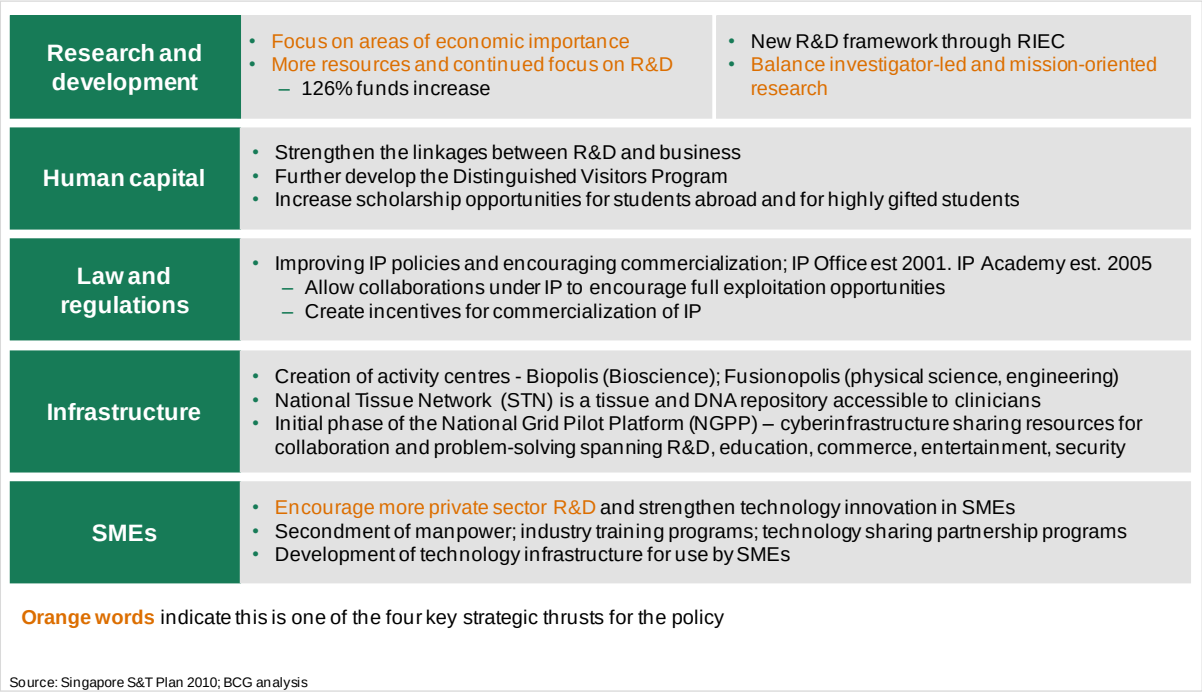


Exhibit 6c: Singapore policy design has created technology creation ecosystem

Lever 14: Prioritization of areas and technologies

There is a need to develop a process that can explore and prioritize areas and technologies on a regular basis. This process needs to be defined based on inputs from key stakeholders, industry associations and experts. The emphasis of this lever is not to create a onetime prioritized list, but to constantly review and prioritize the list and also track successful implementation across the country.

In the *design phase*, the process needs to be laid out that has to be followed. This stage should also prioritize the sectors that the levers should push, and also highlight the mechanisms to push them – tax incentives, government funding, grants etc. The process should also define a monitoring mechanism to measure the impact of prioritization.

In the *implementation phase*, the prioritized list should be circulated to the key stakeholders (E.g.: Ministries, departments etc.) so that they can follow it up with appropriate measures. On an ongoing basis, results of these actions should be measured and a feedback loop created to revisit either the choice of the priority area, or the choice of the mechanism. Periodically the process should repeat itself and revisit the prioritized list in a structured manner (Exhibit 6d).

Suggested Stakeholders:

- *Anchor:* PMO
- *Facilitator:* NMCC, Planning Commission

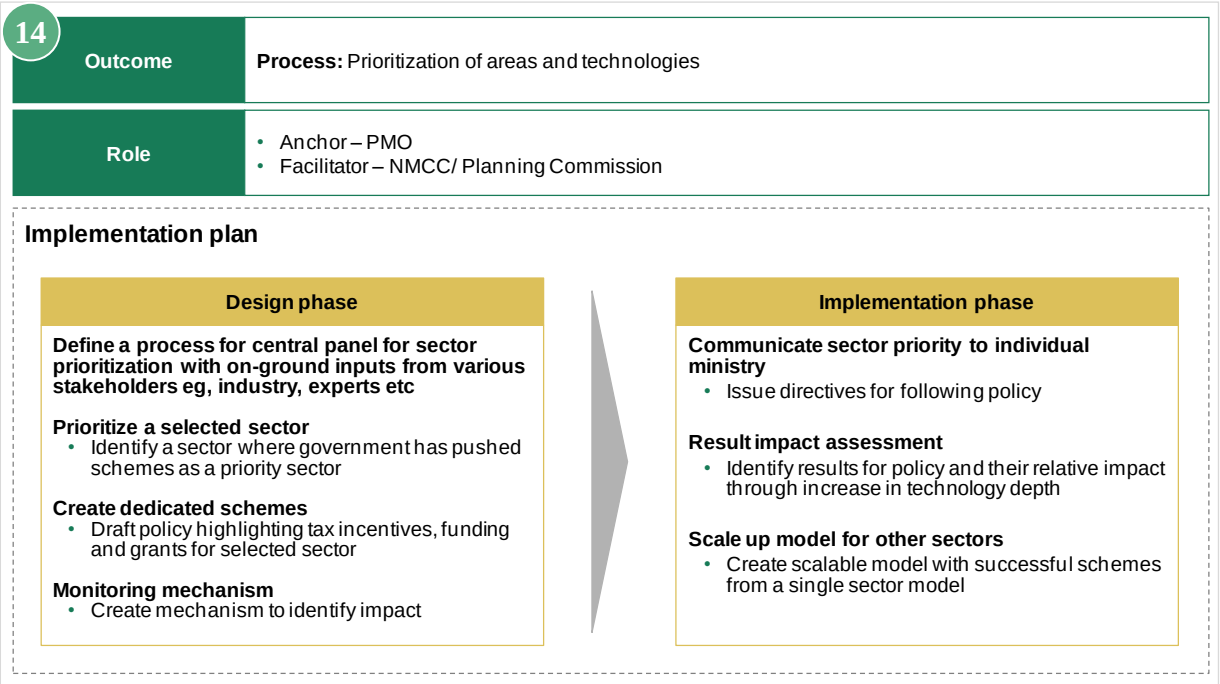


Exhibit 6d: Process creation for defining prioritized areas and technologies to enhance focus on them

7. Action Plan

Each of the 14 recommendations would impact through the following four outcomes: creation of an entity, change in the policies and fiscal incentives in place or through modification of processes being followed. The following table summarizes the possible outcomes due to each recommendation.

Recommendation Area	Possible Outcome
Structure	• Creation of a new structure/ cell/ company/ task force with a very specific mandate to push a set of mission goals • Could be owned and operated by government or industry associations
Policy	• New policy highlighting framework and guidelines to implement the specific recommendation
Fiscal Incentive	• Specific financial support to promote a mandate/ recommendation • Realignment of current incentives, introducing new incentives • Relooking at duty structures
Process	• Creation of new step wise processes, or modification of existing processes to streamline operations • Recommendations on capacity and capability enhancement through recruitment and training

All 14 levers have been classified across two dimensions: *Impact* that they create in increasing T&D in the country and *Feasibility* while implementing them.

The *Impact* is measured on the basis of criteria such as time to fructify, sustainability of impact, affected industries, and scope of technology transfer.

Feasibility is measured through criteria such as current ecosystem setup, number of stakeholders, acceptability of change, and political consensus on the agenda.

Criteria for impact feasibility assessment of all levers have been defined (Exhibit 7a).

		1-High	2- Medium	3- Low
Impact	Time to fructify	• Short to medium term (1-3 years)	• Medium to Long term (3 – 5 years)	• Very long term (>5 years)
	Sustainability	• For long term	• For medium term	• For short term
	Affected industries	• Multiple	• Few or specific industries	• Limited scope
	Scope for tech transfer	• Large	• Medium	• Small
Feasibility	Eco system setup	• Well in place and les time required	• Exists but ineffective and longer time required	• Does not Exist and long time requirement
	No. of stakeholders	• Single	• More than one	• Multiparty involvement
	Acceptability of change	• Progress already underway	• Understand need for change	• Change not acceptable
	Political consensus	• High	• Involving debates and ambiguity	• Favouring one side may negatively impact others

Exhibit 7a: Criteria for Impact Feasibility assessment

Using the above framework the 14 levers were ranked on a matrix of Impact vs. Feasibility and the below chart summarizes the results (Exhibit 7b).

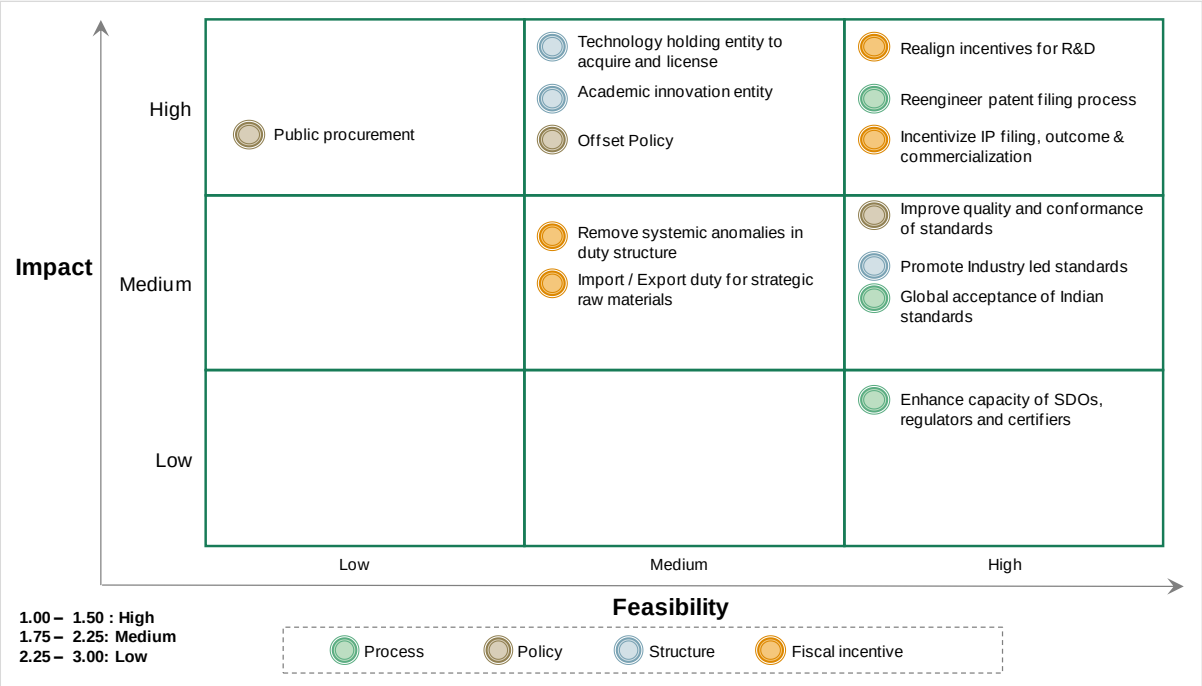


Exhibit 7b: Impact Feasibility Assessment matrix

From the impact feasibility assessment of the 14 levers, they can be divided into 4 broad categories:

- Strategic importance: Levers which are very high on impact and focus on creation of a new entity or a major policy change and should represent the highest priority. Recommendations include the following:
  - Public Procurement policy
  - Offset policy
  - Technology holding entity to acquire and license
  - Academic innovation entity
- Quick wins: Levers which are high on impact as well as feasibility and thus can be implemented on an immediate timeframe. Recommendations include the following:
  - Realignment of incentives for R&D
  - Re-engineering of patent filing process
  - Incentivization of IP filing, outcome and commercialization
- Ease of implementation: Levers which are either low or medium on impact but high on feasibility. The recommendations focus on standards which can be implemented in a shorter timeframe given few stakeholders and high acceptance of change. They can be taken up on a medium term basis for implementation. Recommendations include the following:
  - Improving quality and conformance of standards
  - Promotion of industry led standards
  - Global acceptance of Indian standards
  - Enhance capacity of SDOs, regulators and certifiers
- Indirect impact: Levers which have medium impact as well as feasibility. The recommendations focus on harmonization and taking a strategic view of duty structures and once implemented will take a longer time frame for showing impact on transfer of technology. Recommendations include the following:
  - Remove systemic anomalies in duty structures
  - Import/export duty for strategic raw materials

8. The Way Forward

The report provides a comprehensive framework and a set of recommendations on increasing T&D in manufacturing in India. Implementation plans have been defined and a set of suggested stakeholders have been identified to take these initiatives forward. Further, the assessment of levers on the impact-feasibility matrix allows for further prioritization and focuses on the levers of strategic importance and quick wins in the immediate timeframe.

The next steps for taking the implementation forward for each of the initiatives will involve the following:

- Advocacy of levers proposed and alignment on suggested stakeholders and implementation outcomes
- Creation of an implementation roadmap from the owners of the implementation
- Program management setup to track progress of implementation plans with defined timelines for completion of each initiative

The aspiration to take the manufacturing sector growth to 2-3% higher than that of the Indian GDP is a bold and inspiring vision. For manufacturing to reach this scale and remain competitive on sustained basis requires a significant increase in technological innovation and increase in "depth" in the manufacturing base in India. This represents one of the most critical levers to be undertaken and for the nation to meet the above aspiration it is imperative that all involved stakeholders take the lead in working with each other to ensure the recommendations are implemented.

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