



Confederation of Indian Industry

MNCs R&D in India - A glimpse

2017



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Project Completion Report

MNCs R&D in India - A glimpse

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Executive Summary

Given the recent “Make in India” campaign and the commitments made by various MNCs to set up R&D centres in India, this study has focused on understanding and suggesting ways to improve the ecosystem of research & development in India being performed by multinational companies. The study, through a primary survey as well as a series of roundtable discussions, has attempted to capture the current context of MNC R&D in India and concludes by suggesting necessary policies that have the potential to effect positive spillovers on the economy for long-term sustainable economic growth.

According to our primary survey, the priority for MNC R&D centres appears to be product development. The factors that make India a preferred destination for MNC R&D are the availability of R&D talent pool at a low cost, cost of operations, and the opportunity to address India and similar markets. In terms of qualification levels of R&D manpower, a majority of respondents indicated that at least 60% of their R&D personnel have a Bachelor’s degree.

For a majority of the respondents, the Indian R&D centre contributes less than 10% of the total patents filed by the parent company, with a few outliers reporting higher figures. In terms of research collaborations, 45% of the respondents indicated that collaboration is on single project basis, while only one-fourth engage in continuous collaboration through MoUs.

Based on our survey responses and coupled with key takeaways from the MNC and R&D landscape in China, our report concludes with recommendations that the government could consider putting in place to capitalize on the presence of MNC R&D centres in India. The policy recommendations include:

- Developing Human Capital for R&D work
- Improving Contract Enforcement
- Better linkages between MNCs and local entities
- Improving Land and Infrastructure
- Incentives based on expectations of MNCs

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“CII would like to acknowledge the contribution of Mr. Janak Nabar, Mr. Ashwin Shankar and Ms. Amrita Brahmo of the Centre for Technology, Innovation and Economic Research, Pune towards the production of the report - in particular in conducting the four round table discussions, subsequent data analysis as well as research inputs towards writing of the report. We are also grateful to the Local Project Advisory Committee (Mrs. Namita Gupta, Scientist 'F', Department of Science & Technology; Mr. Munesh Makhija, Director and Head, GE Technology Centre; Mr. Soumendra Banerjee, R&D Director, UOP India Pvt. Ltd. (Honeywell); Mr. Harish Krishnan, Director – Global Policy & Govt. Affairs, Cisco Systems (India) Pvt Ltd; Mr. Anil Reddy, Strategy Lead, Microsoft India Pvt Ltd; Ms. Anuja Kadian, Head of Government Relations – India, Rolls-Royce India Ltd; Mr. Shubhankar Lahiri, Business Head, Manufacturing Vertical, Ricoh India Limited; Mr. Vivek Sharma, Vice President, STMicroelectronics; Dr. Purnima Sharma, Managing Director, Biotech Consortium Ltd; Dr. Ashwani Gupta, Scientist –'G', Department of Scientific and Industrial Research; Dr. S K Deshpande, Scientist –'G', Department of Scientific and Industrial Research; Dr. (Ms) N. Mrinalini, Chief Scientist, National Institute of Science, Technology & Development Studies; Prof. Pradosh Nath, Director, Centre for Knowledge, Ideas, and Development Studies (KnIDS); Mr. Deepak Bisht, UOP India Pvt. Ltd. (Honeywell); Dr. Pramod Arya, Department of Science & Technology) chaired by Dr. Praveen Arora, Head - (NSTMIS), Department of Science & Technology in the formulation of the study and steering the study with critical inputs. We would also like to thank CII National Committee on Technology for their comments. We would like to thank Prof. Pradosh Nath for sparing his valuable time and providing guidance since the project's inception including the primary survey.”

CHAPTER 1

India – A Bright Spot in the Global Economy

01

India – A Bright Spot in the Global Economy

Against the back drop of significant uncertainty in the global economy, the Indian economy's growth of 7.6% in FY2016 has clearly stood out. The Indian economy is expected to grow at around 7% in FY2017 according to market estimates. For medium and long term investors, improvements across a number of key macroeconomic variables have also contributed to their optimism about the Indian economy. The inflation targeting framework adopted by the Reserve Bank of India has been viewed by investors as a sign that the central bank will be committed to keeping inflation in check, thus creating conditions for stable and sustainable growth over a longer period. The economy, however, is not without risks – concerns about corporate and bank balance sheets still persist, and it is not immune to developments in the global economy.

With India being touted as one of the bright spots in the global economy, Prime Minister Modi's vision of "Make in India" has garnered significant attention globally. The 'Make in India' campaign, has targeted both domestic as well as multinational corporations (MNCs) to manufacture in India and export from India. 'Make in India' is meant to:

- a. **Depict India as a true business partner and not just as a permission granter**
- b. **Channel the flow of capital into the economy**
- c. **Make India a hub for innovation with highly skilled personnel and best in class infrastructure**

To achieve the stated objectives, the government would need to take a multi-pronged approach. It would need to ensure a continued improvement in the ease of doing business, an improvement in the quality of infrastructure, better aligned fiscal and monetary policies geared towards enhancing India's productivity growth and better enforcement of contracts amongst a host of other issues that need to be addressed. For instance, while there is a liberal policy for FDI in R&D, it is part of the government's overall FDI strategy. There are no explicit policies or incentives in place to promote FDI in R&D in India.

Factbox 1: Some recent measures that have been introduced to improve ease of doing business

Today, businesses can get through red-tape and get essential clearances at the click of a button. They can now apply for environmental licences and file taxes through a common online form.

In an effort to further reduce red-tape and improve the ease of doing business:

- A single electronic register will replace all registers that businesses are required to maintain.
- The permission of the head of department will be required for any government inspection.
- System of self-certification will be introduced for non-risk, non-hazardous businesses.

The initiative should be seen as a second big push to propel India onto a faster economic growth path via an increased focus on improving India's productivity growth. To attain the objectives laid out for the "Make in India" initiative, and to translate this vision into reality, Multinational R&D centers will have to be major players in contributing to the growth of India's innovation eco-system. The initiative aims to attract investments to the tune of several billion dollars from multinational companies into India. Apart from the potential knowledge spill-over, a rough back of the envelope calculation suggests that for every US \$1 million invested in India per year for the purpose of R&D by MNCs, it is likely to create demand for around 8-10 researchers.¹ So, for example, a US \$10 billion R&D investment by MNCs in India will likely mean an increase of 80,000 – 100,000 high quality researchers per year.

¹ Assuming a 15% spend on investment in human resources, and an average salary of Rs. 10 lakh per year for a high quality researcher

Factbox 2: By the mid-2000s, India was already among the top 3 most attractive destinations for MNC R&D centres.

1. Although Texas Instruments was one of the first to set up an R&D Centre in India in 1985, it was the reforms that began in 1991 that have seen companies like Microsoft, Oracle, Motorola, Intel, IBM, and GE set up Research & Development or Design centres in India.²
2. IT Service Vendors from India had a considerable share in solving the Y2K problem globally which brought them to the world's attention.
3. Amendments were made in 2005 to the Indian Patent Act to make India TRIPs (Trade Related Aspects of Intellectual Property Rights) compliant.³

The above factors are likely to have contributed to India emerging as one of the top 3 destinations for prospective R&D investments.

Today, from among the top 100 global R&D spenders, around 83 of them have a presence in India in some shape or form.

The focus of this study has been to grasp what we know about MNC R&D activity in India, and to make certain policy recommendations. It is hoped that these recommendations would help harness the tremendous potential that MNCs have to offer and help propel India on a more productive and sustainable growth path. The sections are organised as follows: Section 2 briefly outlines the methodology used, including primary and secondary data sources. Sections 3 and 4 present the key findings and observations from our Primary Survey and Round table discussions respectively. Section 5 looks for lessons from MNC R&D activity in China; and in conclusion, Section 6 presents a set of policy recommendations based on the primary survey findings.

² <https://www.pwc.in/assets/pdfs/publications/2014/india-as-a-destination-for-sourcing-of-services.pdf>

³ (<http://www.wipo.int/wipolex/en/details.jsp?id=2407>)

CHAPTER 2

Methodology and Sources

Methodology and Sources

In light of the Prime Minister's vision for "Make in India" coupled with the new found optimism over India's future growth prospects, this study is based on a primary survey that was conducted in 2015 with 101 MNC R&D centres (Refer to Appendix 5 for the detailed methodology). We found that many MNCs are not in a position to respond to certain questions as the information may be confidential and requires approval from their respective headquarters.

To complement the primary survey responses, a series of roundtable discussions were also organized with participation from MNC representatives across four cities- Ahmedabad, Bangalore, Pune and Hyderabad. (See Section 4)

The secondary data sources and publicly available data were also incorporated into the formulation of the survey questions. A brief overview of the MNC R&D activity in India that served as a backdrop to the questionnaire is presented in section 2.1 below.

2.1 MNC R&D activity: Backdrop to Survey and Roundtable discussions

Of the top 100 R&D spenders⁴ worldwide, over 80% of them have a presence in India in some shape or form. It is estimated that there are close to 1,100 MNC R&D centres that are present in India. According to a study by Zinnov [12], in 2015, out of all the new offshore technology centres established globally, around 69% of them were established in India. Furthermore, India also attracted a significant chunk of the globalized engineering and R&D in 2015. The research activities of captive R&D centres according to the report largely focused on software & internet (around 35%), followed by telecom & networking (around 14%) and semiconductors (around 12%).

The importance of India as a destination for MNC R&D can also be seen in the expansion of R&D teams, with some companies like GE and Bosch now having their largest and second largest R&D facilities respectively in India. This compares favourably to an earlier study by Basant and Mani [1] that found the average size of R&D projects both in terms of size of investment as well as personnel tended to generally be small.

Some of the observed trends of MNC activity in India, for example being a significant contributor to technology payments from India, rising export of R&D and testing services, and their contribution to patents from India are expected to continue. (See Appendix 2 for the contribution by a select sample of MNCs to the domestic (Indian) patents obtained from the USPTO)

The key findings from our primary survey and round table discussions (Chapters 3 and 4) suggest there are significant opportunities that could benefit India's R&D innovation system if exploited to

⁴ The 2015 EU Industrial R&D Investment Scoreboard.

the fullest. It would be in the interest of policy makers to maintain a regular database of MNC R&D centers in India, and even have a special window to address their specific needs while ensuring a proper monitoring mechanism to capture the spillovers and benefits to India's innovation system.

Table 1: Growing importance of India as R&D destination

Company	Location of R&D lab in India	R&D Personnel	Remarks
Astra Zeneca	Bangalore		One of the largest R&D labs outside Sweden. Most of Astra Zeneca's tropical disease R&D happens here
Cummins	Pune		Second Largest R&D Centre (after the US)
Emerson	Pune	4000	
Bosch	Multiple locations	13,500	Second largest facility
General Electric	Bangalore	5,300	Largest GE R&D facility in the world. Highest concentration of Chemistry and Chemical Engineering PhDs
Schneider Electric SE	Bangalore	1500	For Schneider Electric, in terms of number of people employed in R&D, India ranks 3 rd .

Source: 1. Compiled from Forbes, Naushad (2016), 'India's National Innovation System: Transformed or Half-formed?' CTIER Working Paper WP/16/02, forthcoming in Rakesh Mohan (Editor) 'A Quarter Century of Transformation: The Indian Reforms Story'
 2. <http://www.livemint.com/Companies/RgZAsR7xYWmCiQPzUM6XhJ/India-at-the-core-of-Schneiders-global-manufacturing-plans.html>



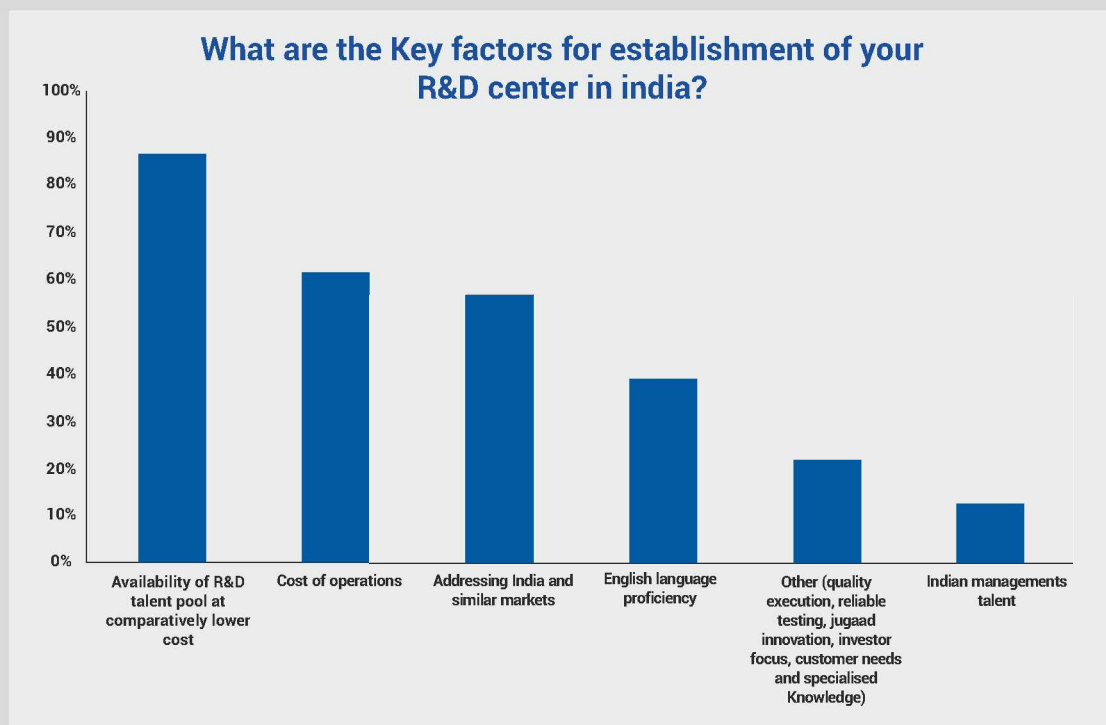
CHAPTER 3

Key Findings from Primary Survey

03

Key Findings from Primary Survey

3.1 India as a preferred destination for R&D



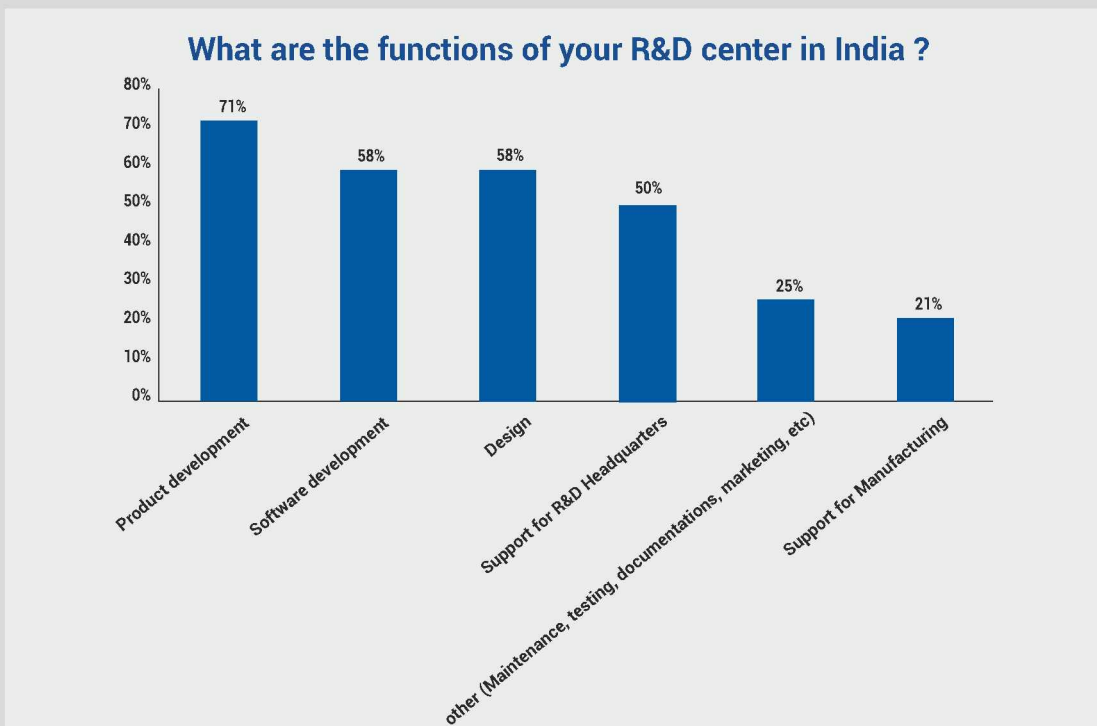
Note: Data labels indicate the % of respondents who consider this a priority⁵
 Source: Primary Survey

The primary factors that make India a preferred destination for MNC R&D are the availability of R&D talent pool at a low cost, cost of operations, and the opportunity to address India and similar markets. This third factor seems to reflect a favourable shift in priorities when we consider that in the previous study [1] it had been found that MNCs had a preference for developing new technologies for different markets than adapting existing technologies for local markets. Despite R&D talent pool being a key factor for basing R&D operations in India, some of the participants in the round table discussions expressed concerns regarding the gap between the requirements of corporate entities and the way college curricula are structured in general.

Available R&D talent pool, low cost of operations and addressing India and similar markets are some of the most important drivers

⁵ Multiple responses were permitted- hence numbers need not add up to 100%

3.2 Nature of R&D activity carried out by MNCs in India



Source: Primary Survey

According to our primary survey, the priority for MNC R&D centres appears to be product development followed by software

Product development is a priority.

development and design. This is in line with the previous findings [1] that new product development, product design, advanced and basic research and new process development were among the top focus areas for MNCs in India.

General Electric

Sector: Diversified (Healthcare, Energy, Aviation and Transportation)

Home Country: United States

Number of Employees in India: 6000

Patents filed from India: 855 [USPTO]

“GE established its first research center in Bangalore in 2000. Apart from Bangalore, research centers are located in Hyderabad, Mumbai and Chennai. The John F Welch Technology Center in Bangalore is GE's

Fact Box 3: Innovation for the Indian market

There have been some examples of “frugal” innovations by MNCs that are developed for the local Indian market focusing on affordability, simplicity, quality, and sustainability. Most “frugal” innovation efforts have been taking place in the form of medical devices that cater to consumers at the bottom of the pyramid. Examples include startups that have spawned out of the Stanford-India Biodesign project (involving Stanford University, USA) and the GE portable ECG machine. “Frugal” innovation in areas outside the medical device space includes Kwid by Renault and the Solar/coconut husk energy source by Siemens. As MNCs stand to benefit from products developed for the Indian market, that can also cater to the changing demands in the advanced economies, we may see an increasing trend in “frugal” innovation by MNCs.

3.3 R&D manpower in MNCs

In terms of qualification levels of R&D manpower, a majority of respondents indicated that 60% of their R&D personnel have at least a Bachelor’s degree. The percentage of R&D personnel having a Master’s degree is 40% or lower for a majority of the respondents, and no more than 20% of R&D personnel have a PhD degree.

When it came to training, our primary survey revealed that most employees at the R&D centres were trained in India. For a majority of respondents, the proportion of researchers who have undergone some training outside India is 20% or lower.

largest R&D center in the world. They have developed products both independently and in combination with global teams. New areas of technology development include Materials, Imaging, Nanotechnology, Sensing, Renewable Energy and Energy Storage.”

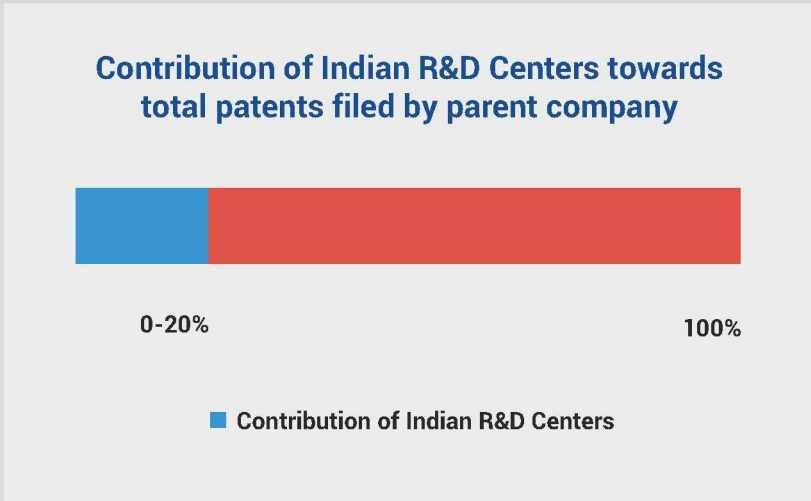
Source: <http://www.geglobalresearch.com/>

The profile was pulled out on June 27th 2016.



Note: For a majority of the responding MNCs

3.4 Patenting pattern of MNCs



Note: For a majority of respondents

Patents filed from the local R&D centre might reflect that a large part of the R&D has been performed in that centre. For a majority of the respondents, the Indian R&D centre contributes less

than 10% of the total patents filed by the parent company, with a few outliers reporting higher figures. Further, a majority of

For a majority of the respondents, the Indian R&D centre contributes less than 10% of the total patents filed by the parent company

respondents also indicated that less than one-fifth of the patents filed by the Indian R&D centre were commercialized in India.

3.5 MNC-University collaborations

The priority areas when it comes to the nature of collaboration are internships

45% of the respondents indicated that collaboration is on single project basis, while only one-fourth engage in continuous collaboration through MoUs.

followed by information sessions, workshops and hackathons, and development of new technologies. In terms of research collaborations, 45% of the respondents indicated that collaboration is on single project basis, while only one-fourth engage in continuous collaboration through MoUs.

Some of the respondents are involved in both single-project and continuous collaborations. Other interactions with local entities may also take place based on areas of mutual interest between organisations, and in the form of PhD sponsorships.

IBM

Sector: Consulting, IT services, Hardware

Home Country: United States

Number of Employees in India: ~150,000

Patents filed from India: 1477 [USPTO]

"IBM Research Centre in India was established in April 1998. It is co-located in New Delhi and Bangalore and blends pure and applied research to deliver IT and software solutions to IBM's clients worldwide. Research projects at IBM India include: semantics based system monitoring solutions, integration of structured and unstructured information, speech recognition in Hindi, autonomic computing, model driven business transformation, business intelligence for CRM solutions and semantics extraction from low entropy text."

Source: <https://www.research.ibm.com/labs/india/>

The profile was pulled out on June 27th 2016.

Texas Instruments

Sector: Semiconductors

Home Country: United States

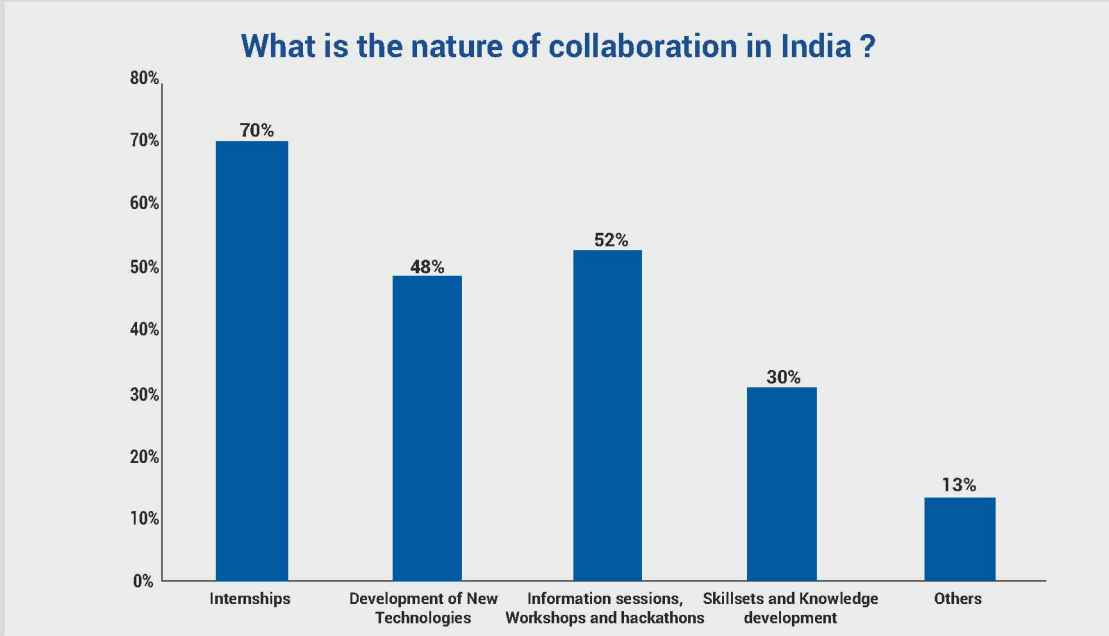
Number of Employees in India: 1500

Patents filed from India: 660 [USPTO]

"In August 1985, Texas Instruments set up its R&D centre in Bangalore. The R&D centre has developed solutions for applications like wireless handsets, wireless infrastructure (base stations), video (security and surveillance, IP phones, set-top boxes), High Performance Analog, etc. More recently, they have focused efforts to build semiconductor solutions to address customers in India in sectors such as industrial electronics (UPS, inverters, energy meters, lighting, etc.), medical electronics (ultrasound scanners, x-ray machines, ECG machines, MRI scanners, etc.), consumer, telecom and automotive."

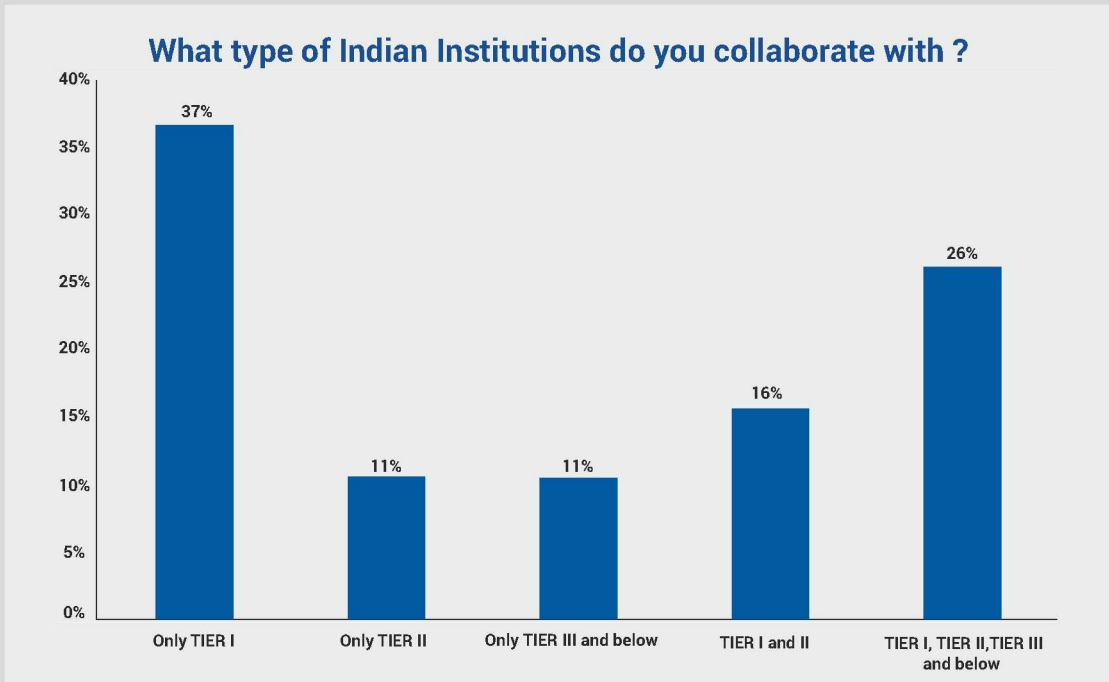
Source: http://www.ti.com/lscs/in/company_info.page

The profile was pulled out on June 27th 2016.



Source: Primary Survey

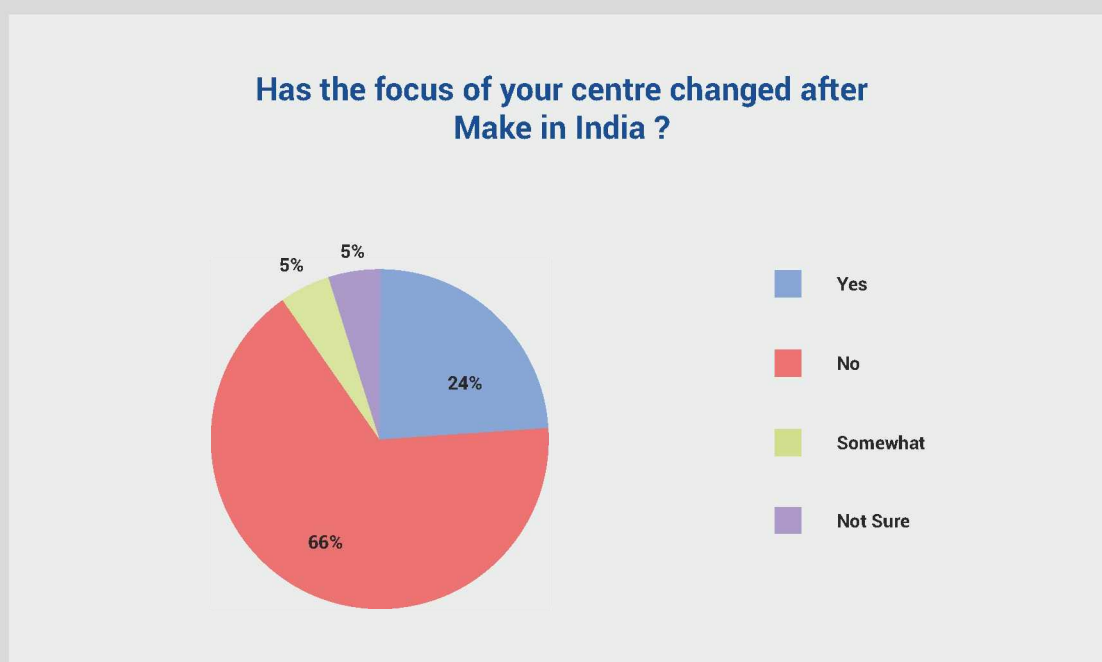
37% of respondents indicated that they collaborate only with TIER I institutions, 16% of respondents with TIER I as well as TIER II and 26% of respondents collaborate with all three Tiers.



Source: Primary Survey

When it comes to government incentives for industry –academia collaboration, a majority of the respondents indicated that they were not aware of such schemes. Among the respondents who are aware of such schemes, some have been unable to utilize them because of IP issues and complexities in application procedure. Several respondents mentioned that the benefits from such schemes are not significant enough to be a priority for business. A majority of respondents also said that they do not support any incubation centres or acceleration funds.

3.6 MNC R&D after “Make in India” announcement



Source: Primary Survey

Respondents indicated that 'Make in India' should be oriented towards design in India from an R&D perspective.

Our primary study concluded that the focus of R&D activities does not seem to have changed significantly with the introduction of 'Make in India' for a majority of the responding MNCs. Existing government support is mainly in terms of tax benefits, land and infrastructure. Respondents indicated that 'Make in India' should be

oriented towards design in India from an R&D perspective.

While thus far, MNC R&D investments in India appear to have been largely focused on the IT sector, the commitments post the Prime Minister's "Make in India" announcement reveal an interesting pattern and potentially a new trend. Most commitments are in the electronics and hardware domain, highlighting India's potential as a manufacturing hub. This new trend needs be capitalized upon, especially if India would like to see a significant increase in the share of high tech exports as percent of its total manufactured exports. (See Appendix on Commitments post Make in India)

Honeywell

Sector: Diversified (Aerospace, Energy, Security)

Number of Employees in India: ~8000

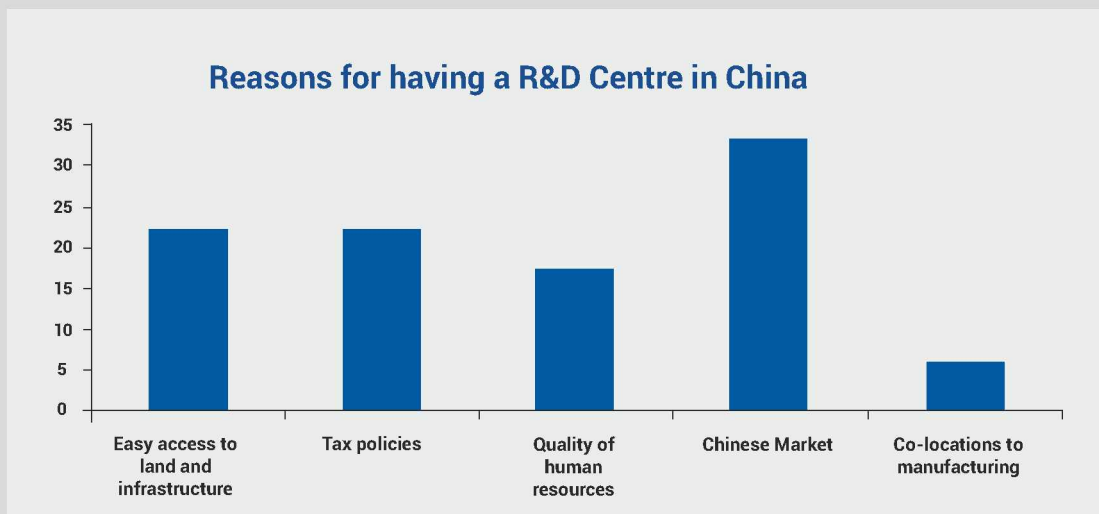
Patents filed from India: 403 [USPTO]

"Honeywell has technology development centres in Bangalore, Gurgaon, Hyderabad and Madurai. The technology development centres support Honeywell's aerospace, automation and performance materials businesses. Over 3000 applications and products have been engineered in India."

Source:
<https://honeywell.com/country/in/About/Pages/our-company.aspx>

The profile was pulled out on June 27th 2016.

3.7 Reasons for MNC R&D in China



Source: Primary Survey

Nearly two-thirds of the respondents indicated that they have an R&D centre in China. The primary factor influencing this decision seems to be access to the Chinese market, followed by factors such as ease of access in terms of land, infrastructure and favourable tax policies. In addition, some MNCs have had preferences for China given the size of the market and the potential for higher profit margins. The significant investment by the Chinese government in MNC R&D centres and also the opportunity to co-innovate have been an attraction for some MNCs.

(See Section 5 for an overview of the R&D landscape in China)

Samsung

Sector: Electronics

Home Country: South Korea

Number of Employees in India: 11500

Patents filed from India: 146 [USPTO]

"Samsung has 3 R&D centres in India located in Bangalore, Noida and New Delhi. The Bangalore R&D centre was the first to be established in 1996. The R&D centres work on technologies that support all of Samsung's businesses. Samsung Research Institute-Delhi develops emerging solutions for high-end televisions and digital media products, SRI-Noida is focused on Smartphone development. SRI-Bangalore is the Centre of Excellence in Mobile Terminal & Infrastructure, Multimedia, SoC, Server Development contributing towards Smartphone, Semiconductors & Digital Printing Solutions business."

Source:

<http://www.samsung.com/in/aboutsamsung/samsungelectronics/india/rnd/>

The profile was pulled out on June 27th 2016.

The background of the lower half of the page features a network graphic of interconnected nodes and lines in various shades of blue, set against a dark blue gradient. A prominent yellow diagonal stripe runs from the bottom right towards the center, crossing the network graphic.

CHAPTER 4

Insights from MNC Roundtable Discussions

Insights from MNC Roundtable Discussions

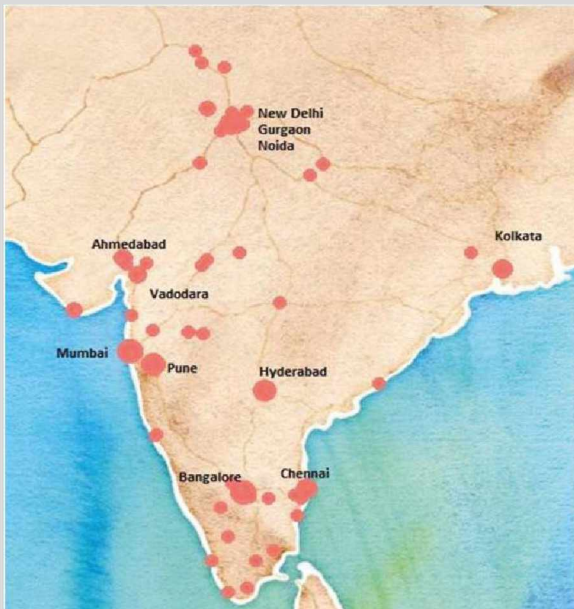


Fig 1 : Regional Clusters for MNC R&D Centres

Source: Innovacer

In order to give a comprehensive picture of the MNC R&D landscape in India, four Roundtable discussions were organized in Bangalore, Ahmedabad, Pune and Hyderabad with a total of twenty-seven responding MNCs (See Appendix 7 for a list of MNCs). These locations were chosen based on the prominent MNC clusters that exist in India as shown in the map above. The MNCs participating in the roundtable discussions were based across ICT, Pharmaceutical, Automotive, Industrial Engineering and Other Manufacturing sectors.

Following are the key insights and comments that emerged from the discussions-

Make and design for India

Most participants expressed an opinion that Make in India should focus more on design in India from an R&D perspective, rather than a simple task-based approach that erodes the 'value chain'.

- Several MNCs focus their R&D activities in India to create products and designs for the Indian market. In doing so, they do not necessarily replicate the R&D done by parent company.

Need to simplify procedures for government support

There was a general consensus on the fact the existing procedure for government approval and support is somewhat complicated and time-consuming.

- There is a huge bottleneck when it comes to obtaining licenses for R&D and testing and the process often takes five months or more. Also, MNC R&D centers are not eligible for any duty waivers.
- The paperwork for getting recognition as an R&D center by DSIR takes up to two years in some cases and the benefits accruing from this recognition are generally not worth the resources expended to obtain it.
- It was however indicated by some MNCs that while accounting/paperwork for availing of tax benefits and getting official government certifications might be inconvenient, there is an intangible value associated with government recognition.
- Patents filed from the local R&D centers tend to reflect that most of the R&D is done in the local centre. Currently, however, some MNCs are deterred from filing for patents at the India office owing to a lack of target dates or organized databases for IPs.
- Royalty payments for the use of IP are usually one-way but there may be cases where it is a two-way equation.
- Apart from patents, discussions should also revolve around protection of trade secrets that are often not formalized into intellectual property.

Scope for Industry-Academia/ Public research collaboration

When it comes to industry-academia collaboration, there is a significant gap between corporates and academic institutions in a number of areas:

- As per the AICTE-mandated curriculum, universities are mostly oriented towards teaching and not research. Further, not all teachers may be of the highest calibre, which dilutes quality of teaching at academic institutes. As a result, a considerable proportion of the young professionals joining the industry have sub-par training as well as poor 'soft skills'.
- The success of schemes such as the Prime Minister's Fellowship is impeded by the fact that the research topics for such programmes are not of good quality and often do not reflect mutual industry-academia interests.
- For public institutions such as CSIR and other such organisations, despite the success of research, there tend to be limited opportunities for commercialization.

Lessons from China

Given that most participating MNCs have an R&D center in China, they highlighted several areas in which the Chinese innovation ecosystem fares better than its Indian counterpart in terms of having an assured perception.

- In terms of patents, every Chinese national filing for a patent abroad is obligated to file in the home office as well.
- Further, it is mandatory for MNCs in China to partner with local companies for R&D, via a process of co-development.
- Chinese officials are efficient and well-connected with the MNCs operating within their territory and have credibility in terms of delivering on incentives and payments.



CHAPTER 5

MNC and R&D Landscape in China

MNC and R&D Landscape in China

China and India remain among the most favored destinations for MNC R&D. Our survey indicated that MNCs prefer setting up an R&D center in China in order to access and develop for the market. Below are the key takeaways from the Chinese R&D ecosystem as revealed through various sources:

- The Chinese government, in 2006, released the 'National Medium- and Long-term Program for Science and Technology Development' (2006-2020) to attract investments in R&D. Today China is well on its way to achieving its goal for GERD as a percent of GDP to be 2.5% by 2020. China's GERD as a share of GDP currently stands at 2.08%.
- Foreign MNCs choose China as a destination for their R&D centers to support local manufacturing facilities.
- Increasing consumer demand for certain technologies in the Chinese economy has led MNCs to tap the potential in this market. MNCs are using R&D teams comprising local Chinese researchers to build and design products specifically meant for the Chinese market.
- Even though both India and China have improved their US patenting record, the difference between the two countries' patenting record has increased over time in favour of China. Increasingly, a large share of the Chinese patents filed in the US which were design patents previously (nearly one third of the total) have now seen a surge in utility patents. India's patents are mostly composed of utility patents with design patents accounting for a very small share.
- China has incentive programs to encourage R&D and innovation such as the super tax deduction, exemptions related to the Value-Added Tax (VAT) law and incentives for "high and new technology" enterprises that include reduced corporate tax rates.
- MNCs in China have strengthened their ties with the local innovation system through linkages with local universities and partnership agreements with Think Tanks and Local Governments.

CHAPTER 6

Policy Recommendations

Policy Recommendations

"Make in India" has the potential to create an innovative economy centred on manufacturing. In order to capitalize on the presence of these MNC R&D centres and to attract further investments in R&D, the government would need to initiate policies that effectively address grievances and incentivize a positive spillover in the local economy. It is hoped that this would increase India's share of high-tech goods in overall output as well as a share of its manufactured exports.

Tracking of MNC R&D activity

- A database should be developed for MNC R&D in India to constantly provide updates on their activities. The proposed initiatives would cater to strike a balance for improving R&D Ecosystem in India and support Make in India.
- It might be worthwhile to monitor the positive spillover from MNCs by tracking the R&D talent pool in terms of going from working in the parent company to the establishment of start-ups in the same or a different sector.

Developing Human Capital for R&D work

- The government should consider involving MNCs in the drafting of curricula for institutes so that the output from academic institutes can be of the quality demanded for R&D work.
- Soft skills like communication and collaborative ability of the talent pool also need to be improved through the curriculum to make them employable in industry and become part of the global value chain.
- India generates over 8 Lakh engineers every year. To best make use of this talent pool, the government needs to invest in developing this human capital in certain high-technology, high priority sectors like nanotechnology, biotechnology, aerospace etc. There are already specialized courses in biotechnology/nanotechnology in India.

Fact Box 4 : Developing Human Capital in high priority sectors

India ranks 65th in the world in the number of nanotechnology articles per million habitants. In order to improve the current state of nanotechnology research and to invite private players to invest in the Indian nanotechnology sector, the government is instituting postgraduate programmes in nanotechnology at 16 institutes and universities across India. Further, a Rs. 100 billion Nanomission project was initiated by the government to develop R&D infrastructure around nanotechnology in India.)

Improving Contract Enforcement

- A strong IP policy with greater ease of access of filing for IP protection combined with a more efficient judicial system for resolving commercial disputes would go a long way in creating a positive spillover on the Indian economy as MNCs would not shy away from including local technology players in their R&D chain.

Fact Box 5: IP issues

India ranks 172 in the world in rankings for contract enforcements and dispute resolution. While India has a strong judicial system, processes for commercial dispute resolutions can take an average of 1420 days. Source: World Bank, 2016

Fostering Linkages between MNCs and local entities

- Holistic collaborative research between MNC R&D units, universities and research institutes need to be stimulated through government policy.
- Academics and institutional technical expertise in specific technologies need to be identified and their collaborations with MNCs must be encouraged and facilitated through tax benefits and grants. To facilitate these linkages, Measures such as Faculty index and Citation index can be used to rank institutions by quality of research.
- It is important to encourage multiple levels of engagement between universities and companies over and above recruitment, especially for institutions that are TIER II and below.
- Initiatives like the PM's fellowship to encourage industry-academia collaboration need to be scaled up and the research themes need to have a more industry-oriented focus. Policies should also be redesigned to promote better commercialization of research in national labs.

Improving Land and Infrastructure

Growth of the MNC R&D sector is hampered by delays in obtaining land approvals as well as the lack of adequate infrastructure to sustain operations. Most R&D centres in India are primarily concentrated in the Tier-I cities. Tier-II cities tend to lack the infrastructure to sustain R&D activity.

- The government needs to make the process of approval more efficient in terms of required permissions for land use.
- An approach of establishing R&D parks with the latest high quality infrastructure could attract more MNCs to open up their centres in India.

Providing incentives based on expectations of MNCs

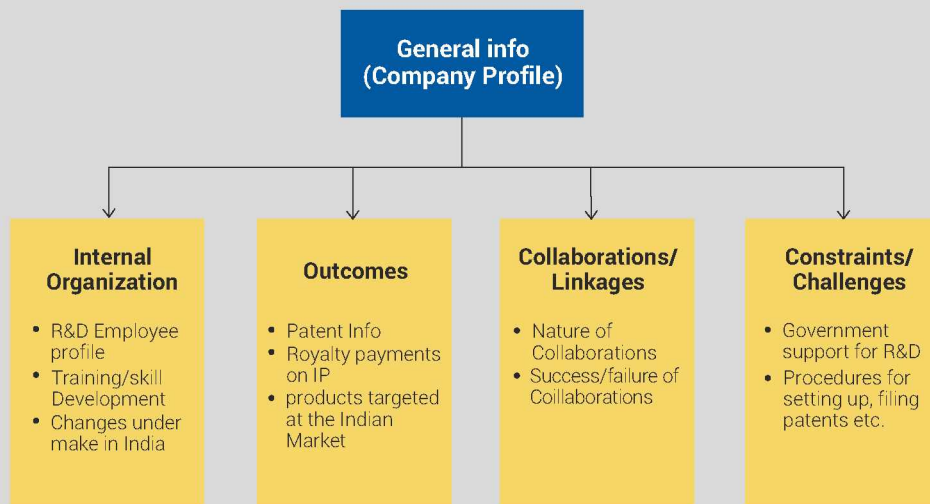
- To encourage MNC R&D activity and promote their positive spillover to the economy, there should be greater inclusivity of MNCs when it comes to benefits of schemes and incentives to enable them to design for India (rather than merely engaging in contract-based R&D).
- The process of getting recognition for new R&D centers needs to be streamlined and approval of schemes and incentives need to happen in a time-bound and transparent manner.
- Further, better dissemination of information about government schemes and incentives needs to happen through one portal.
- Certain policies may also need to be put in place to incentivize high priority areas. An example of such a policy is China's tax incentives for High and New Technology Enterprises that have encouraged MNCs to work on high technology areas in the Chinese economy.
- A key target for India is increasing its share of high tech goods in total exports. It may be worth considering an incentive along the lines of the said policy in China. Apart from boosting India's share of high tech goods in manufactured exports, it may also improve domestic production capabilities. This is imperative given the interest shown by MNCs in manufacturing electronics and hardware products through the "Make In India" initiative. (M-SIPS)

Summary Recommendations

- A platform should be developed to better capture MNC R&D information in India. This platform can be used to engage with MNCs, obtain updates on their activities as well as provide inputs to policy makers.
- The government may wish to consider taking on board MNC feedback - this will contribute towards developing a global workforce as well as improving output from academic institutes needed for world class R&D. This will also help the economy integrate better into the global value chain. Holistic collaborative research between MNC R&D units, universities and research institutes need to be stimulated through government policy. Measures such as Faculty index and Citation index can be used for benchmarking of institutions.
- Along the lines of the Chinese policy, the government must consider putting in place policies that incentivize certain high priority sectors in order to boost India's share of high-tech goods in manufactured exports as well as boost domestic production capabilities.
- As in China, MNCs should consider using local Indian researchers to build and design for the Indian market. MNCs should also strengthen their ties with the innovation system through universities, think tanks and local governments.
- A strong IP policy with an efficient judicial process need to be put in place to encourage MNCs to include local technology players in the R&D chain. This is a necessity to effect a positive spillover from MNC R&D activity in India.
- Academics and institutional technical expertise in specific technologies need to be identified and their collaborations with MNCs must be encouraged and facilitated through tax benefits and grants.
- R&D parks with high-quality infrastructure might be a good alternative to the long process of obtaining land approvals for R&D centres.
- Better dissemination of information about government schemes and incentives needs to happen through one portal.

APPENDIX

Appendix 1: Structure of database for MNC R&D



Source: Primary Survey

*At this point, the primary survey and secondary data sources have yielded the following data for the surveyed MNCs.:

1. **Profile (year of establishment, focus area, reason for R&D in India, functions of R&D)**
2. **Internal Organization**
 - a. R&D Employee Profile (Universities recruited from)
 - b. Training/Skill Development(Number of trainings in India/Outside India)
 - c. Changes and new commitments under Make in India
3. **Outcomes**
 - a. Patents(filed from India, total world patents, design or utility?)
 - b. Royalty Payments (Royalty payments on domestic sold goods, exports)
 - c. Products targeted at Indian markets

As outlined in the flowchart and as seen in the questionnaire on Appendix 6, additional data needs to be captured by following up with MNCs or searching additional secondary databases. This would be necessary to create an exhaustive list of MNC R&D centres in India.

Appendix 2: Patents filed out of India by MNCs in the USPTO (As %share of total patents)

COMPANY NAME	2010	2011	2012	2013	2014	2015
INTERNATIONAL BUSINESS MACHINES CORPORATION	1.5	1.9	2.1	3.5	4.3	4.5
HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P.	1.8	3.4	4.0	2.9	4.4	7.1
SYMANTEC CORPORATION	3.0	6.5	10.2	20.3	21.1	30.2
CISCO TECHNOLOGY, INC.	3.0	2.9	1.8	3.2	3.1	4.5
ORACLE INTERNATIONAL CORPORATION	3.5	6.2	7.4	9.3	9.4	8.0
MICROSOFT CORPORATION	0.7	1.4	1.4	1.5	1.7	1.8
INTEL CORPORATION	2.4	0.8	0.9	1.2	1.3	1.5
STMICROELECTRONICS INTERNATIONAL N.V.	0.0	0.0	4.5	8.0	10.9	9.1
BROADCOM CORPORATION	1.3	1.7	0.9	0.8	1.9	2.2
SAMSUNG ELECTRONICS CO., LTD.	0.1	0.2	0.4	0.4	0.5	1.2
YAHOO, INC.	4.5	5.4	8.1	5.8	10.4	8.3
CITRIX SYSTEMS, INC.	6.3	7.7	15.0	20.0	19.3	21.4
CADENCE DESIGN SYSTEMS, INC.	4.7	9.6	9.6	16.3	13.2	13.7
GM GLOBAL TECHNOLOGY OPERATIONS LLC	1.3	0.4	1.2	2.3	1.6	1.5
EMC CORPORATION	2.0	1.1	1.9	3.5	4.4	6.3
GOOGLE, INC.	0.7	0.9	1.8	1.3	0.9	0.8
JUNIPER NETWORKS, INC.	0.5	0.4	4.2	8.8	7.6	11.2
DELL PRODUCTS, L.P.	1.1	1.8	2.1	2.4	3.2	7.9

COMPANY NAME	2010	2011	2012	2013	2014	2015
ANALOG DEVICES, INC.	5.6	1.6	4.3	1.0	5.6	4.9
TELEFONAKTIEBOLAGET L M ERICSSON (PUBL.)	0.0	0.0	0.1	0.1	0.6	1.2
ST-ERICSSON SA	2.6	3.6	2.3	1.9	7.6	7.6
MICROSOFT TECHNOLOGY LICENSING, LLC.					0.0	1.1
TEVA PHARMACEUTICAL INDUSTRIES, LTD.	10.5	20.7	8.3	0.0	0.0	5.6
TERADATA US, INC.	1.4	3.9	7.4	8.5	6.5	7.7
SIEMENS AKTIENGESELLSCHAFT	0.0	0.5	0.2	0.3	0.6	0.0
AIRBUS ENGINEERING CENTRE INDIA	0.0	0.0	0.5	2.5	2.3	1.5
KONINKLIJKE PHILIPS N.V.				0.2	0.6	0.9
KONINKLIJKE PHILIPS ELECTRONICS N.V.	0.3	0.6	0.1	0.4	0.0	0.0
COLGATE-PALMOLIVE COMPANY	2.9	0.0	0.0	4.1	1.0	5.4
DOW GLOBAL TECHNOLOGIES LLC	0.0	0.0	0.0	1.8	1.0	0.3
CATERPILLAR INC.	0.0	0.0	0.4	1.2	0.3	0.6
SIEMENS MEDICAL SOLUTIONS USA, INC.	0.4	0.0	1.1	1.4	0.0	1.1
MONSANTO COMPANY, INC.		0.0	0.0			
NOVARTIS AG (FORMERLY SANDOZ LTD.)	0.0	0.0	0.0	1.4	1.2	0.0
EMERSON CLIMATE TECHNOLOGIES, INC.	0.0	0.0	5.6	8.1	0.0	5.1
MITSUBISHI ELECTRIC RESEARCH LABORATORIES, INC.	0.0	0.0	1.0	0.0	3.9	1.2
SIEMENS PRODUCT LIFECYCLE MANAGEMENT SOFTWARE INC.	12.5	0.0	5.3	0.0	3.4	3.3

Source: USPTO (Computed from 1. https://www.uspto.gov/web/offices/ac/ido/oeip/taf/stcasg/inx_stcorg.htm and 2. https://www.uspto.gov/web/offices/ac/ido/oeip/taf/stcasg/all_stcorg.htm)

APPENDIX 3A: MNC commitments after “Make in India” announcement (R&D)

S. No	Name of the Company	Parent Country	Industry	Nature of Commitments	Amount in Indian Rupees
1	Qualcomm	USA	Telecommunication, Mobile	“Design in India” programme to mentor select hardware companies. They have also set up an innovation lab in Bangalore.	
2	Foxconn	China	Electronics	R&D and hi-tech semiconductor manufacturing facility set up in Maharashtra	Rs 34,000 Cr (USD 5 billion over 5 years)
3	Huawei	China	Information Technology	New R&D campus opened in Bengaluru and telecom hardware manufacturing plant to be set up in Chennai.	Rs 1,130 Cr (USD 170 million)

Compiled from various news reports [See references]

Appendix 3B: MNC commitments after “Make in India” announcement (Manufacturing)

S. No	Name of the Company	Parent Country	Industry	Nature of Commitments	Amount in Indian Rupees
1	Spice Group and the Government of Uttar Pradesh (MoU)	Singapore	Telecommunication, Mobile	Manufacturing unit for mobile phones in Uttar Pradesh	Rs. 500 Cr (USD 75 million)
2	Samsung	South Korea	Telecommunication, Mobile	Samsung Z1 to be manufactured in the Noida plant	
3	Hitachi	Japan	Information Technology	Number of employees to be increased from 10,000 to 13,000 and an auto-component plant to be set up in Chennai.	
4	Xiaomi	China	Telecommunication, Mobile	First manufacturing plant set up in India for assembling Xiaomi phones	
5	LH Aviation	France	Aerospace, Aviation	Drone manufacturing plant to be set up in India. MoU signed with OIS Advanced Technology	
6	General Motors	United States	Automobile, Auto Ancillaries	Automobile manufacturing plant in Maharashtra	Rs 6,700 Cr (USD 1 billion)
7	Lenovo	China	Information Technology	Manufacturing of Motorola and Lenovo phones in Sriperumbudur.	
8	Wistron Corp	Taiwan	Original Design Manufacturing	Manufacturing the devices at a new factory in Noida, Uttar Pradesh	

S. No	Name of the Company	Parent Country	Industry	Nature of Commitments	Amount in Indian Rupees
9	Ministry of railways in agreements with Alstom and GE Transport	France and USA	Power, Energy	Locomotive manufacturing factories in Madhepura and Marhaura in Bihar	Rs. 40,000 Cr (USD 5.9 billion)
10	Micromax	India	Telecommunication, Mobile	New manufacturing units to be set up in Rajasthan, Telangana and Andhra Pradesh	Rs 300 Cr (\$44 million)
11	Vivo Mobile India	China	Telecommunication, Mobile	Smartphone manufacturing at a plant in Greater Noida.	
12		Japan		Japan has set up a fund called "Japan-India Make-in-India Special Finance Facility"	Rs 8,000 Cr (USD12 billion)

Compiled from various news reports [See references]

Appendix 4

Survey Design and Methodology

A sample of 196 multinational companies were chosen to be surveyed of which 101 chose to respond. The sample was a national representation of our R&D Database having details of 600 Foreign MNC R&D centres. Respondents were selected based on three layers of stratification:

1. Geographic location of the R&D centre.
2. Industry sector of the R&D Centre.
3. Financial revenue of the parent company for the year 2014-15.

The primary survey questionnaire had 51 open and close ended questions categorized into 5 sections, namely:

1. General Information: There are 9 questions in this section which provide us general information about the respondent like establishment year of R&D centre, address, year of establishment, focus area of R&D activities, etc.
2. Internal Organization: There are 11 questions in this section which provide us information regarding the establishment, functions and other operational methods of the R&D centre. This section also provides us information regarding patenting, employee strength, hiring preferences, training, etc.
3. Collaboration and Linkages: There are 12 questions in this section which provide us analyze the nature of collaborate with Indian organizations. Open ended question in this section highlight issues faced by R&D centres in collaboration.
4. Outcomes & Output: There are 9 questions in this section which provide us information on the outcomes of the R&D centre. The outcomes include patenting, development of new products, spinoffs & knowledge transfer.
5. Constrains & Suggestions: There are 10 questions in this section to let the respondent express their thoughts about the Indian policies and provide us with suggestion to make them better. Suggestions on Policies of Establishment, Patenting Policies & Make-in-India policies are captured in this section.

The last question is open ended for the respondent to comment on their R&D centres 5-year plan.

*As the surveyed MNCs are a part of larger corporations, the operations in India do not have complete autonomy to respond to our survey. In many cases, we have found that these MNCs are not in a position to respond to certain questions in the survey as they may either not have the freedom or are worried about divulging confidential information. We have therefore tried to back the limited information from the survey with past studies and secondary data sources. The process of collecting information and maintaining a database of companies will be ongoing.

Appendix 5

List of MNCs approached for our Survey

1. ST Microelectronics Pvt Ltd
2. Rolls-Royce India Pvt Ltd
3. Microsoft India Development Centre
4. Abbott Healthcare Pvt. Ltd.
5. Analog Devices, Inc.
6. Cadence Design Systems
7. Capgemini
8. CG-PPI Adhesive Products Ltd
9. Cummins India
10. Danaher Corp.
11. Dow Chemical International Private Limited (Dow India)
12. EMC Corporation
13. Emerson Electric Co.
14. Endo Labs Ltd.
15. Ericsson
16. Exide Industries Ltd
17. Expedia, Inc.
18. EXXONMOBIL LUBRICANTS PVT LTD
19. FAG Bearings India Ltd.
20. Fiserv India Private Limited
21. Ford Motor Private Ltd.
22. Gennova Biopharmaceuticals Ltd.
23. Gillette Products Pvt Ltd
24. Godrej & Boyce Mfg. Co. Ltd.
25. Groupon India Pvt Ltd
26. H E G Ltd.
27. Hydro S&S Industries Limited
28. iGate Clinical Research India Limited
29. Juniper Networks
30. Kellogg (India) Pvt Ltd
31. Kodak India Pvt. Ltd.
32. LOREAL INDIA PVT LTD
33. Mitsubishi Electric India Private Limited
34. Monsanto Research Centre
35. Nissan Motor India Private Ltd
36. Novartis India
37. Oracle Advanced Customer Services
38. PACCAR
39. Pfizer Limited
40. Pliva Research India Private Limited
41. Quintiles Spectral (India) Ltd.
42. Roche Diagnostics India Pvt Ltd
43. Rochees Breweries Ltd.
44. Rolcon Engineering Co. Ltd.
45. Royal Philips, Philips Software
46. Samsung Electronics
47. Schlafhorst Engineering (India) Ltd.
48. Siemens Ltd.
49. Sungard Availability Services, India
50. Symantec

51. Syngenta India Ltd
52. Teradata India
53. Teva Pharmaceutical Ltd
54. Valmont Structures Private Limited
55. Yahoo India
56. ZycusInfotech Private Limited
57. Zydus Wellness Ltd.
58. Fiat India Pvt. Ltd.
59. General Motors India Pvt. Ltd.
60. Goodyear India Ltd.
61. Honda Motorcycle & Scooter
62. Honda Siel Power Products Ltd.
63. Mercedes-Benz Research and Development India Pvt. Ltd.
64. Renault Nissan Automotive (India) Pvt Ltd
65. Volkswagen
66. Volvo India Pvt. Ltd.
67. Yamaha Motor India Pvt. Ltd.
68. Broadcom Corporation
69. Cisco Global Development
70. Citrix Systems R&D India
71. Cognizant Technologies
72. Cyberoam
73. Dell India R&D Centre
74. Google India
75. GXS India Technology Centre Pvt. Ltd
76. Hewlett-Packard Globalsoft Ltd.
77. Huawei Technologies India Pvt. Ltd. (R&D Centre)
78. IBM India Ltd.
79. Intel Technology
80. 3M Company
81. Airbus
82. Alstom T&D India Limited
83. Bacardi-Martini India Ltd.
84. Cadbury India Ltd.
85. Caterpillar Power India Pvt. Ltd
86. Coca Cola (India) Pvt Ltd
87. Colgate-Palmolive (India) Ltd.
88. E.I.Dupont Ltd.
89. Procter & Gamble Home
90. RICOH INDIA LTD
91. ALLERGAN INDIA PRIVATE LIMITED
92. Baxter Global Research Centre
93. Bayer CropScience Ltd
94. Carl Zeiss India Private Ltd
95. Eli Research India Pvt Ltd
96. MedreichSterilab Ltd
97. Medtronic India Development Centre (MIDC)
98. Merck Development Centre
99. Novozymes India Corporate Office
100. Ranbaxy

Appendix 6

List of MNC respondents for the Roundtable Discussions

Bangalore

1. Roca Bathroom Products Pvt. Ltd.
2. GE India Technology Center
3. Continental Automotive India
4. Ingersoll Rand
5. Mindtree Ltd.
6. Volvo Construction Equipment
7. MSC Software Corporation India Pvt. Ltd.
8. Shoretel Communication Pvt. Ltd.
9. Dell India R&D Center

Ahmedabad

1. Hydroflex Pipe Pvt. Ltd.
2. Schaeffler Group
3. Ferromatik Milacron India Ltd.
4. Erhardt + Leimer India Pvt. Ltd.
5. Klockner Desma Machinery Pvt. Ltd.
6. KHS Machinery Pvt. Ltd.
7. Bosch Rexroth India Pvt. Ltd.
8. Hanning Motors India Pvt. Ltd.
9. Natreon Inc.

Pune

1. Thyssenkrupp Industries India
2. Cummins Technologies India Pvt. Ltd.
3. Dow Chemicals International Pvt. Ltd.
4. Emerson Innovation Center

Hyderabad

1. Hyundai Motor India
2. Ventureast Venture Capital
3. Steinbeis Centre For Technology Transfer India
4. UPL Ltd
5. ADP India

Appendix 7

Survey Questions- 1

General Information

1. Year of establishment of R&D centre in India
2. Please select focus areas of your R&D activities
3. Key factors for establishment of your R&D centre in India
4. Functions of your R&D centre in India
5. Contribution of your R&D centre towards the total patents filed by your parent company?
6. Please mention your R&D investment for the past 3 years (2014-15, 2013-14, 2012-13)
7. How has your investment in R&D changed over the past 3 years
8. Name 5 Indian institutions which you approach for recruiting researchers
9. Strength of the R&D Centre

Internal Organization

10. Total employ in India
11. Percentage of R&D researchers with respect to your total employee strength
12. What percentage of graduates are employed in your R&D centre?
13. What percentage of post graduates are employed in your R&D centre?
14. What percentage of doctorates are employed in your R&D centre?
15. How do you train/develop skills of your researchers
16. Percentage of researchers that have been trained in a facility outside India
17. Duration of training in your R&D centre What is the ratio of lateral to fresh candidates
18. What is the attrition rate of employees in your R&D centre
19. What are the issues faced in employee retention
20. Has the focus of your R&D centre changed due to Make-in-India?
21. Please explain the changes brought into the focus of your R&D activities based on Make-in-India

Collaboration and Linkages

22. What type of Indian Institutions do you collaborate with?
23. Nature of collaboration in India?
24. Basis of collaboration
25. Average duration of collaboration
26. What is your overall perception of collaboration models in India
27. What is your perception of collaboration models in China
28. Describe your most successful collaboration with an Indian Institutions

29. Suggest changes how collaborations with educational institutions be made better
30. Suggest changes how collaborations with private sector organizations be made better
31. Suggest changes how collaborations with public sector organizations be made better
32. Suggest changes how collaborations with industrial institutions be made better

Outcomes & Output

33. Percentage of total patents filed in India with respect to parent company
34. Out of the patents filed by your R&D centre in India, how many are commercialized in India?
35. What percentage of your total products are developed specifically for Indian market
36. Describe the top 5 products developed by your Indian R&D centre specifically for Indian market
37. Does your R&D centre support incubation centres/acceleration funds?
38. If yes, then how many have been supported till date
39. Share a best case where your R&D centre supported an incubatee?
40. Please mention the top 5 contribution of your R&D centre on the Indian R&D ecosystem
41. Share a case study describing the biggest achievement of your R&D centre in India

Constraints & Suggestions

42. Select the type of support received from Government for establishment of R&D centre in India
43. How easy is it to receive support from the Government organizations?
44. Suggest some improvements, if any to ease the process of accessing Government support
45. Do you have a R&D centre in China?
46. If yes, describe the advantages of establishing an R&D centre in China
47. Describe the advantages of establishing an R&D centre in India
48. How easy are the procedures to file a patent in India
49. What would facilitate more Hi-Tech R&D from your Indian R&D centre?
50. Please suggest improvements in Make-in-India program and Indian Govt. policies which will promote establishment of more foreign R&D centres in India
51. Describe the plans of your R&D centre for the next 5 years

Appendix 8 Survey Questions- 2

1. What are the Key factors for establishment of your R&D centre in India?

- Availability of R&D talent pool at comparatively lower cost
- Cost of operations
- Addressing India and similar markets
- English language proficiency
- Indian Management talent
- Others (Please specify)

2. What are the Functions of your R&D centre in India?

- Design
- Manufacturing
- Product development
- Software development
- Support for R&D headquarters
- Others(Please specify)

3. What percentage of graduates, post graduates and doctorates are employed in your R&D centre?

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%Graduates

%Post Grad

%Doctorates

4. What is the Percentage of researchers that have been trained in a facility outside India?

_____ %

5. What is the Contribution of your R&D centre towards the total patents filed by your parent company?

_____ %

6. What is the Percentage of total patents filed in India with respect to parent company?

_____ %

7. Out of the patents filed by your R&D centre in India, what percentage is commercialized in India?

_____ %

8. What type of Indian Institutions do you collaborate with?

- Tier I (Old IITs, BITS, IISc, NIT- W,K,T, IIT-BHU)
- Tier II (New IITs, Manipal, SRM, etc)
- Tier III and lower

9. What is the Nature of collaboration in India? (e.g. internships, faculty engagement)
- Development of new technologies
 - Skillsets and knowledge development through syllabus
 - Information sessions , workshops and hackathons
 - Internships
 - Others (Please Specify) _____
10. What is the Basis of collaboration?
- Single Project
 - Continuous through MOU
 - Others (Please Specify) _____
11. Are you aware of any government schemes for academia-industry collaborations? (e.g. Prime Minister's Fellowship Scheme for Doctoral Research, Uchcharat Avishkar Yojana, Multiplier Grant Scheme etc.) (Y/N)
12. If you are aware of these schemes but have not leveraged them, what are the main reasons for the same (e.g. IP issues, talent availability etc.)?
- _____
13. Does your R&D centre support incubation centres/acceleration funds? (Y/N) If yes, then how many have been supported till date? _____
14. Do you have an R&D centre in China? (Y/N)
15. If yes, describe the advantages of establishing an R&D centre in China.
- Easy access to land and infrastructure
 - Tax policies
 - Quality of human resources
 - Others (Please Specify) _____
16. Has the focus of your R&D centre changed due to Make-in-India? (Y/N)
17. Select the type of support received from Government for establishment of R&D centre in India.
- Financial support-funding
 - Tax incentives
 - Land and infrastructure
 - Others (Please Specify) _____

Other Comments

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**Department of Science and Technology
Government of India**

The Department of Science and Technology (DST), Government of India was established on the 3rd of May 1971 following the success of Green revolution, that signified innovative deployment of scientific methodologies. Over the last forty three years, DST developed several streams that later established themselves as departments or even ministries with focused goals. Some of these include the Department of Biotechnology (DBT), Department of Scientific and Industrial Research (DSIR), Ministry of Environment & Forests (MoEF), Ministry of New & Renewable Energy (MNRE), Department of Electronics (DoE) and Ministry of Earth Sciences (MoES).

The DST serves as a nodal agency connecting the science sector to the Government verticals. The roles played by DST are varied and these evolved with time. DST is accordingly (a) Develops S&T policies, (b) Strengthens human resources and institutional capacities, (c) Enables development & deployment of technologies, (d) Creates opportunities for societal interventions through S & T & (e) Establishes and engages in mechanisms of cooperation, partnerships & alliances. These approaches that reflect its mission ensure a holistic systemic influence, immediate, medium and long term relevance/ gains. It enables cross cutting impacts across sectors to sustain growth/ development and synergies to optimize on time, human, institutional and financial resources. The DST has consistently enabled transformational changes through appropriate responses and often non-participative roles. DST accordingly played the role of an extra mural research funding agency wherein competitive grants for research was provided to investigators based on technical merit. This system was in vogue for nearly three decades. DST also took cognizance of several changes in approaches around the world, over the years and evolved its own systems adapted to India's needs. This resulted in some directional changes that evolved into proactive functions and participative actions. These are evident in DST's robust facets including proactive identification of gap areas and development of new programmes and schemes, evidence based approaches to define gaps / needs balancing competitive and development models, championing for larger resource allocations for science, expansion of stakeholder variety and base, interactions centered on value of stakeholder engagement, internal connectivity of various programmes, effective planning and coordination to optimize use and delivery of resources, gain a deeper understanding of local needs and establish a dynamic balance among three basic priorities of an integrated vision to synthesize equity, expansion and excellence in the science sector.

DST ensures a synthesis of the outcome of policies, plans, programmes and projects through appropriate forward and backward linkages. International S&T cooperation with friendly countries had become a national priority and DST was assigned the task. Thus, DST establishes strategically important systems / mechanisms to stimulate and foster excellence and leadership in scientific research and development. These are aligned with India's developmental aspirations and will further help consolidate the niche it has established in several frontiers at the national, regional and global levels.



Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process. Founded in 1895, India's premier business association has over 8,300 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 200,000 enterprises from around 250 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, healthcare, education, livelihood, diversity management, skill development, empowerment of women, and water, to name a few.

The CII theme for 2017-18, **India Together: Inclusive. Ahead. Responsible** emphasizes Industry's role in partnering Government to accelerate India's growth and development. The focus will be on key enablers such as job creation; skill development and training; affirmative action; women parity; new models of development; sustainability; corporate social responsibility, governance and transparency.

With 67 offices, including 9 Centres of Excellence, in India, and 10 overseas offices in Australia, Bahrain, China, Egypt, France, Germany, Singapore, South Africa, UK, and USA, as well as institutional partnerships with 344 counterpart organizations in 129 countries, CII serves as a reference point for Indian industry and the international business community.

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