# Chapter I

## Introduction

### 1.1 Background:

Globalisation and liberalisation policies have accelerated the internationalisation of productive services and technologies, as well as capital flows. Many large companies and trans-national corporations have now opened up R&D centres or developed R&D partnerships in developing countries such as India for competitive advantage. India is being considered a hub for foreign R&D. R&D and R&D capabilities are key devices for enhancing innovations and competitiveness in a knowledge based economy such as India. Therefore, a study on the activities of the Foreign R&D Centres in India has been perceived to be very much required and welcome at this time in economic history of India. Confirming to the trend around many other countries of the world, India has been experiencing an increase in inflow of funds in the form of Foreign Direct Investment for research and development activities. In the era of globalization, the phenomenon of globalization of production is reshaping the international economic landscape. With that, the conventional wisdom of developed countries as capital and technology exporters and developing countries as importers is gradually giving way to a more complex set of relationships. Not only the importance of developing countries, as recipients of foreign direct investment in more knowledge-intensive activities is increasing, but also developing countries are emerging as outward investors. Changing role of the developing countries in the production and research, development and designing activities of the trans-national corporations are now a visible trend.

Today, corporations in industries such as automobiles, electronics, biotechnology and pharmaceuticals are establishing research and development facilities in select developing countries. They do this to enhance their efficiency, to access expanding pools of scientists and engineers, and to meet the demands of

increasingly sophisticated markets in these countries. These recent trends have important implications for the international division of labour. The traditional view, of more complex production activities being undertaken in the North and simpler ones in the South, is no longer a true reflection of the reality. Firms now view parts of the developing world as key sources not only of cheap labour, but also of growth, skills and even new technologies. Currently, only a few developing countries attract such activities on a significant scale. India is one of them.

With the above in view, a study on the foreign R&D centres in India was taken up at IIFT with the funding from Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India.

### 1.2 Objective of the study:

The internationalization of research and development by transnational corporations and other R&D organizations has important implications for policy-making particularly in the areas of science, technology and innovation, education and investment – to ensure greater benefits from this evolution. However, very limited data and studies appear to be available so far, for the foreign R&D centres in India. UNCTAD world development report (2005) was specifically themed for foreign investments in R&D and TIFAC report (2006) seems to be the first attempt detailing foreign R&D centres in India, while DST studies (2006) on R&D in India have also briefly covered the subject. But these studies tend to be more of a general nature. Sector-wise details and analysis related to the contributions or the input of these R&D centres on S&T capabilities of Indian economy are limited. In these circumstances we have taken up this study of reviewing the status and activities of the foreign R&D centres in select sectors and for finding out their role in domestic S&T capacity building in India.

## 1.3 Terms of Reference & Scope of the Study:

### 1.3.1 Terms of Reference

The terms of reference were as follows:

1. To carry out a study of the foreign R&D centres in India and their contribution in domestic capacity building in select sectors.
2. To find out the type of manpower required by them in near future.
3. Difficulties being faced by them and to recommend appropriate measures thereby creating more conducive environment for attracting more FDI in R&D sector.

### 1.3.2 Scope of the Study

This study is limited to foreign R&D centres established in India in select sectors. The sectors included are the following:

1 Agriculture
2. Automobile
3. Bio-technology & Pharmaceuticals
4. Chemical
5. Computer Software & Hardware
6. Others (including electronic / mechanical)

1.3.3 Based on the data available, analysis and findings of the study, recommendations have been made. Very limited data could be obtained or has been made available by the respondents as most of them have been hesitant in supplying information or responding to a well designed questionnaire or even for our visit to their R&D centres. As such the report cannot be considered as exhaustive and further studies are needed to have an in-depth view of the contributions of foreign R&D centres to Indian S&T and economy. Nevertheless, the study does indicate a trend. It is hoped that the report would be useful to policy makers, industry, academicians and scientific community and all others concerned with the subject.

1.3.4 The project team at IIFT was guided and encouraged by Mr. Prabir Sengupta, Director (IIFT) and consisted of Dr. S. P. Agarwal, Mr. R. Dayal and Ms. Arundhati Sarkar Bose. Madam Arundhati left IIFT in July, 2006 and Mr. Vikas Gupta joined the project team at IIFT in September, 2006. Mr. Ashwani Gupta (Scientist- 'G'), DSIR and Dr S.K Khatter (Scientist- 'C'), DSIR have all the way provided technical support and gave useful inputs from time to time. Project Review Committee of DSIR for CITT reviewed, advised, and made useful suggestions during the study. The respondents during the survey provided information and data for the study. A presentation of the objectives, scope and findings, of the project was also made to the IIFT faculty and useful suggestions were received. The faculty forum was chaired by the Director, IIFT.

## 1.4 Methodology:

The following methodology was adopted for the study:

Step -I Desk Research (survey of literature & identification of foreign R&D centres)
Step -II Identification of the research questions & framing of questionnaire.
Step -III Data Collection through responses received from foreign R&D centres and information / data collected from their web-sites and wetting of the data thus collected by the foreign R&D centres.
Step -IV Compilation and analysis of data.
Step –V Findings and recommendations.

### Step- I Desk Research

Desk Research included:

1. Literature survey of the relevant issues and framing the research questions for our survey with the help of available literature. The literature survey has been presented in Chapter II of this report where as the research questions framed have been discussed in subsequent pages of this chapter.

2. Identifying of the foreign R&D centres situated in various parts of India. The data sources used for this purpose are given below:

1) Compilation of Foreign Collaboration Approvals, DSIR.
2) List of Fortune 500 companies
3) Website of Ministry of Company Affairs,
4) Yahoo, India Focus, Contract-Pharma Web Journal.
5) India Brand Equity Foundation.
6) NASSCOM, BCIL, IDMA, ICMR, IEEMA etc., Government departments and other organizations
7) Company Websites
8) News Papers, Magazines etc
9) The references used for this identification are as follows
10) "Globalisation of R&D and its impact on industrial R&D in India" - Thesis (Raj Kumar R. Hirwani, (2004) IIT Bombay)
11) "Study on Status of foreign participation in R&D activities of selected organisations in India" - a study conducted by National Foundation of Indian Engineers
12) "R&D in India" – Dr. R Bowonder, (2003), Centre for Technology Management. Administrative Staff College of India.
13) UNCTAD World Investment Report (2005)
14) Business Today-Evalueserve
15) FDI in R&D sector: A study by Academy of Business Studies, New Delhi, prepared for TIFAC

In all 119 R&D centres were selected in the identified sectors, based on the objectives given by them in their FDI applications / approvals.

**Step-II Identification of the research questions & framing of questionnaire**

**Research Questions:**

The survey of the literature and the desk study led to the framing of the research questions. As discussed earlier in this chapter, the primary objective of the study has been to review the activities of the foreign owned R&D centres in

India in select sector and to come up with a policy prescription after making a careful study of the characteristics of R&D activities of selected Foreign R&D centres in India and their role in domestic R&D capacity building.

To meet the objectives of the study the information with respect to the available infrastructures, objectives of the company to established R&D centres in India and characteristics of the R&D activities of the selected foreign R&D centres and the activities that these R&D centres are contributing to the capacity building of the Indian industry and Indian S&T were tabulated.

**Characteristics of the R&D activities of the foreign R&D centres:**

To identify the characteristics of the R&D activities of the foreign R&D centres the following aspects of their activities were looked into and the questions on each aspect were included in the questionnaire.

**1. Location characteristics**

The questions relevant to location characteristics were as follows:

1) Where in India the R&D centre is situated?
2) Why was India chosen as a destination for setting up an R&D centre?
3) Is there any other R&D centre of the parent company situated outside India?

The answer to the first question signify whether proximity to other R&D centres of the same industry or proximity to the related downstream industry has been an important consideration behind setting up of the centre in a particular location.

As for the reason for setting up the R&D centre in India, the plausible reasons are (a) political and social stability of India relative to the home country of the parent firm; (b) Availability of skilled manpower in a labour surplus country like India at an economical rate; (c) Proximity to the Indian market; (d) to avail Science & Technology infrastructure available in India; (e) Policy of the government of India that had been conducive to the establishment of the R&D centre in India.

The questionnaire included question on the major reason as to why India was chosen as a destination for establishing R&D centres. The five plausible reasons mentioned above were included as options and respondents were asked to choose the most important of the reason(s) applicable in their case. A further option of "any other reasons" was also included so as to bring out and accommodate the possibility of one or more additional reason for such establishment.

As for the third question on the existence of any other R&D centre of the parent company situated outside India, the primary reasons for including this question were to get an indication of (a) the strength and volume of the R&D activities carried out by any particular organisation; (b) the relative importance of India as a R&D destination as perceived by the organisation and also (c) the relative importance of India as R&D destination for the particular sector.

**2. Research characteristics**

The questions relevant to the research characteristics of the R&D centres were as follows.

1) What are the primary fields of research operations undertaken by the R&D centre?
2) What are the objectives of the R&D centre?
3) What are their major ongoing and envisaged projects for 2005 – 6 and 2006 – 7?
4) What amount of R&D expenditure each of the R&D centres has been incurring during the last three financial years?
5) The number of professional researchers that the R&D centre employs and their professional qualifications
6) Major infrastructural facilities provided in each R&D centre
7) Technologies developed and commercialised
8) Technologies patented
9) Research publications brought out by the R&D centre.
10) Major difficulties faced by the concerned R&D centre

The purpose of asking many of the above questions is self explanatory. For example, information on the centre's primary field of research and the objectives of the R&D centre (question 7 in the above list).

Information on the ongoing projects and projects envisaged for the next year (question 10), information on the amount of R&D expenditure and the R&D centres (question 12) have been incurring is likely to indicate the importance of research activities within the organisation concerned and also the importance of the R&D centre in India relative to those belonging to the same organisation but situated in other countries. Information on the number of professional researchers that the R&D centre employs and their professional qualifications (question 13) indicates how much employment for scientists and other technical professionals the centre is generating. Major infrastructural facilities provided in each R&D centre (question 15). Technologies developed, commercialised and technologies already patented (question 17).

Finally, information on the major difficulties faced by the concerned R&D centre (question 20) provide us with some direction about the domestic and international policy changes that might be required for more effective capacity building for Indian downstream industry. The present status of R&D activities might provide an idea about the existing policy framework.

## 3. Contribution of foreign R&D centres in domestic capacity building in India

Contribution of the foreign R&D centres in domestic capacity building in India is difficult to measure, primarily because such contributions can be made in several ways and each of the ways can be measured in different units. We have identified through our desk research that among many other ways of contribution, employee training programs, research in support of the manufacturing unit in the host country (in this case India), contract research with organisations in the host country (in this case India) and collaborative research with Universities, research institutes, and corporate organisations in the host country (in this case India) are the important ways of making contribution to the capacity building in the

downstream industry in the host country. The questions included in the questionnaire to this end were the following:

1) Whether the objective of the R&D centre is to (a) perform research on a contract basis for organisations in India, or (b) perform research on a contract basis for organisations worldwide, or (c) provide research support to R&D of the parent organisation, or (d) provide research support to manufacturing unit of the parent organisation in India.
2) Information on the linkages / affiliations with organisations in India and abroad. Such organisations could include (a) the government, (b) Private organisations, (c) Non-governmental organisations, (d) Research laboratories, (e) universities etc.
3) Information on the training program or courses that the R&D centre has sponsored, in India and abroad, for its employees.
4) Information on the services offered by the R&D centre. Such services could include (a) training, (b) consulting, (c) certification, (d) contract research, (e) collaborative research etc.

**Formation of the questionnaire**

The questionnaire developed and used for collection of data is given in the Appendix of this Chapter. The questionnaire was formed by CITT and finalised after incorporation of the suggestions made by DSIR and senior faculty members of IIFT.

**Step- III Data Collection**

The **desk research** provided the basic information required to proceed with the study and enlightened us about the need of the study at this point in time. On the basis of the desk research 119 Foreign R&D centres were identified for the **survey**. The exact number of R&D centres contacted for the study and the number of centres on which the information as per the designed questionnaire is available for each sector are given in table (1.1) below. The response of the survey was hardly encouraging. Therefore the information that we received from

the responses was supplemented by the information available on the web in order to make a useful study. Profile thus prepared for foreign R&D centres based on the data collected through the field survey and the other sources of information were sent to them for their comments and modifications if any.

**Table 1.1**

| Sectors | Number of centres contacted | Number of centres for which information is available |
|---|---|---|
| **Agriculture** | **12** | **8** |
| **Automobile** | **12** | **4** |
| **Biotechnology & Pharmaceuticals** | **46** | **16** |
| **Chemical** | **17** | **3** |
| **Computer Software & Hardware** | **24** | **4** |
| **Others** | **8** | **2** |
| **Total** | **119** | **37** |

**Step- IV Compilation and analysis of data**

The analysis is done as per the identified research questions. Chapter III of this Report provides the detailed analysis.

**Step-V Findings and recommendations**

The findings and recommendations are done as per the analysis. Chapter IV of this Report gives the findings and recommendations.

### 1.5 Questionnaire:

**Note: In case the space provided for any answer is not enough for the answer, please use separate sheet(s).**

1. a. Name of the **Organisation** in India:_____

b. Name of the foreign **Organisation**:_____

c. Name of the **R&D Centre**:_____

d. Address of the **R&D Centre**:_____

e. (i) **Contact Person's** / **respondent's** name and designation:_____

(ii) Communication Address:_____

(ii) Telephone Number:_____

(iii) Fax:_____

(iv) E-mail:_____

2. a. Year of Establishment of the R&D Centre:_____

b. Category of organisation the R&D Centre is established as: (tick mark the appropriate alternative)

(i) 100% subsidiary of a foreign company ☐
(ii) Joint venture ☐
(iii) Foreigner or NRI owned ☐
(iv) Non-Governmental Organisation ☐
(v) Laboratory ☐
(vi) Any other (please specify) ☐

3. a. In case your R&D Centre is a joint venture, please provide the following information:

| Names of Indian joint venture partners | Stake holdings |
|---|---|
| [1] | |
| [2] | |
| [3] | |

b. If your R&D Centre is a 100% subsidiary please provide the name / locations of the parent organisation including complete address:_____

4. a. Are there any other R&D centres of the Parent company(s)?

Yes / No

b. If 'Yes', please provide the following information about them.[ Please add extra sheet(s) if the space provided is not enough.]

Name:_____

Address:_____

Contact Person (name and Designation):_____

_____

Telephone number:_____

5. Recognition / certification of the R&D Centre:

Recognized by:_____

Since year:_____

6. a. Major reasons as to why India was chosen for establishing R&D Centre: (Please tick the appropriate alternative in order of importance.) [1 = most important]

| Reason | Ranking according to importance |
|---|---|
| Political and social stability | |
| Availability of skilled manpower at economical rates | |
| Proximity to Indian market | |
| To avail the existing Indian S&T infrastructure | |
| Conducive policy of the Indian Government to the establishment of R&D centres | |
| Any international policy change | |
| Any other reason | |

(i) Please briefly specify the policy (if any) adopted by Government of India that has been conducive to the establishment of the R&D Centre:_____

_____

_____

(ii) Please briefly specify the international policy change (if any) that has been conducive to the establishment of the R&D Centre:_____

_____

_____

(iii) Please briefly specify if there have been reason(s) other than those specified in Question 6.a. for the establishment of the R&D Centre in India:_____

_____

_____

7. Primary field of R&D Operations undertaken by the R&D Centre (for example, agriculture, pharmaceutical… etc):_____

_____

8. a. Objectives of the R&D Centre [Please rank in order of importance, for example, put 1 for 'the most important objective]:

| Objectives | Rank |
|---|---|
| To perform research on a contract basis for organisations in India | |
| To perform research on a contract basis for organisations world wide | |
| To provide research support to the R&D of the parent organisation | |
| To provide research support to the manufacturing unit of the parent organisation | |
| Any other objective | |

b. Please specify if your R&D Centre has any objective other than the four objectives mentioned in question 8 a. :_____

_____

_____

_____

9. Major product(s) / System(s) / Processes(s) / software programmes undertaken by your R&D Centre which best describe the primary objective of the R&D Centre:__

_____

_____

_____

_____

_____

10. Major on-going projects and projects envisaged for 2005-6 and 2006-7:

[Please add extra sheet(s) and mention if there are more than five projects.]

(i)_____

_____

(ii)_____

_____

(iii)_____

_____

(iv)_____

_____

(v)_____

_____

11. Linkages / Affiliations with organisations in India and abroad: (Please specify briefly about the applicable alternative)

| Organisations/ Institutions | Nature of linkages | |
|---|---|---|
| | India | Abroad |
| Government | | |
| Private Organisation | | |
| Non-Governmental Organisation | | |
| R&D Laboratory | | |
| University | | |
| Any other | | |

12. Expenditure of the R&D Centre during the last three years:

2002-2003 _____

2003-2004 _____

2004-2005 _____

13. Professionals employed by your organisation:

| Qualification Levels ( Scientists and Engineers) | Year | | | | |
|---|---|---|---|---|---|
| | 2005 | 2004 | 2003 | 2002 | 2001 |
| Doctorate level | | | | | |
| Masters degree | | | | | |
| Bachelors | | | | | |
| Technicians | | | | | |
| Others | | | | | |

14. Training Programs / courses that the R&D centre has sponsored for the employees in India and abroad:[Please add extra sheet(s) if the space provided is not enough.]

| Training programme(s) | Number of participants | Qualification level of the participation prior to the training programme / course |
|---|---|---|
| | | |

15. Please provide a list of the major infrastructural facilities of the R&D Centre in India:[Please add extra sheet(s) if the space provided is not enough.]

_____
_____
_____
_____

16. Services offered by the R&D Centre: [Please add extra sheet(s) if the space provided is not enough.]

| Services | Customer(s) |
|---|---|
| Training | 1.<br>2.<br>3.<br>4.<br>5. |
| Consulting | 1.<br>2.<br>3.<br>4.<br>5. |
| Certification | 1.<br>2.<br>3.<br>4.<br>5. |
| Contract Research | 1.<br>2.<br>3.<br>4.<br>5. |

| | |
|---|---|
| Collaborative Research | 1.<br>2.<br>3.<br>4.<br>5. |
| Any other | 1.<br>2.<br>3.<br>4.<br>5. |

17. a. Information on technologies developed, commercialised etc: [Please add extra sheet(s) if the space provided is not enough.]List of Major technologies developed / innovations made:

| Year | Technology developed / innovations made<br>(brief description is sufficient) |
|---|---|
| | |

b. List of technologies Transferred and commercialized in India and abroad:

| Year | Technology | Licensed to |
|---|---|---|
| | | |

c. Patents filed and granted:

| Patent number | year | Title | Filed / granted | Country |
|---|---|---|---|---|
| | | | | |

18. Does your organisation bring out any publications?

Yes/ No

If yes, Please provide a list of your publications in the last 3 years. [Please add extra sheet if the space provided is not enough.]

| Publication | Year |
|---|---|
| | |

19. Know-how fees and royalties received:

| Year | Receipts | Category (Royalty / Fee etc.) |
|---|---|---|
| 2001-2002 | | |
| 2002-2003 | | |
| 2003-2004 | | |

20. Major difficulties faced by you in India:

_____

_____

21. Suggestions / comments on steps that you think government of India should take for attracting more investments in R&D from other companies / countries.

_____

_____