Chapter 1

Background

1.0 Introduction

The share of 'Services' is increasing at a very rapid rate in the national Gross Domestic Product all over the developed world as well as in some developing countries including India. In India, the share of services now accounts for more than 50% of the combined share of agriculture and manufacturing sectors to the GDP. The services sector will continue to play an increasingly significant role in India's economic development. While India's share in global merchandise trade is around 0.8 per cent, the share of Indian services exports is slightly higher at 1.3 per cent of the total world trade in services.

However the services offered by countries, differ according to their patterns of national competitive advantage. For example, Swiss firms are strong in banking, logistical services, training etc. whereas Singaporean firms are strong in ship repair, port and terminal services.

India has enviable R&D infrastructure and technological capabilities in some sectors, supported by highly trained and qualified manpower, well equipped R&D laboratories and systems including a chain of 27 research laboratories under the Indian Council of Medical Research (ICMR). These laboratories are known to be equipped with internationally comparable facilities and the experts in certain areas are capable of providing R&D services as well as carrying out R&D activities. Thus India is in the position to offer its R&D services to the world for mutual benefits.

1.1 Objectives of the study

The study "Exportable R&D services in ICMR System" was undertaken with the following in view:

1. To examine the types of R&D services available from the ICMR system, laboratory-wise in different sectors and identify the exportable R&D services.
2. To study the availability of major facilities and equipments with ICMR laboratories for conducting R&D work.
3. To come out with the suggestions and recommendations to promote the export of R&D services from the ICMR system.

1.2 Scope of the study

1.2.1 This study is limited to the ICMR's 21 Permanent Institutes and 6 Regional Medical Research Centers all over the India. The lists of institutes/centers are as follows:

ICMR's Permanent Institutes:

1. National JALMA Institute for Leprosy & Other Mycobacterial Diseases (NJILMD), **AGRA**
2. National Institute of Occupational Health (NIOH), **AHMEDABAD**
3. Tuberculosis Research Centre (TRC), **CHENNAI**
4. National Institute of Epidemiology (NIE) ,**CHENNAI**
5. National Institute of Malaria Research (NIMR), **DELHI**
6. Institute of Pathology (IOP), **DELHI**
7. National Institute of Medical Statistics (NIMS) **,DELHI**
8. National Institute of Nutrition (NIN), **HYDERABAD**
9. National Centre for Laboratory Animal Science (NCLAS)**,HYDERABAD**
10. Food and Drug Toxicology Research Centre (FDTRC), **HYDERABAD**
11. National Institute of Cholera and Enteric Diseases (NICED), **KOLKATA**
12. Centre for Research in Medical Entomology (CRME), **MADURAI**
13. National Institute for Research in Reproductive Health (NIRRH), **MUMBAI**
14. Institute of Immunohaemotology (IIH), **MUMBAI**

15. Enterovirus Research Centre (ERC), **MUMBAI**
16. Genetic Research Centre, **MUMBAI**
17. Institute of Cytology and Preventive Oncology (ICPO) **,NOIDA**
18. Rajendra Memorial Research Institute of Medical Sciences (RMRIMS), **PATNA**
19. Vector Control Research Centre (VCRC) **,PONDICHERRY**
20. National Institute of Virology (NIV), **PUNE**
21. National AIDS Research Institute (NARI), **PUNE**

ICMR's Regional Medical Research Centers:

1. Regional Medical Research Centre, Bhubaneswar
2. Regional Medical Research Centre, Dibrugarh
3. Regional Medical Research Centre, Port Blair
4. Regional Medical Research Centre,Jabalpur
5. Desert Medicine Research Centre ,Jodhpur
6. Regional Medical Research Centre, Belgaum

1.2.2 Based on the data available, analysis and findings of the study, recommendations have been made. Limited data could be obtained or has been made available by the ICMR's Permanent Institutes and Regional Medical Research Centers as most of them have been hesitant in supplying information or responding to a well designed questionnaire. Nevertheless, the study does indicate a trend. It is hoped that the report would be useful to ICMR policy makers, scientific community and all others concerned with the subject.

1.3 Methodology

To collect relevant information regarding the potential that exists in the ICMR system, which includes a network of 27 ICMR laboratories (includes 21 permanent institutes and 6 Regional Medical Research Centers) spread all over India, a well- designed questionnaire was drawn and that was sent to all the laboratories of ICMR. The data supplied by the laboratories was analyzed and visits to some select laboratories were made to discuss, collect further information, and for clarifications.

Based on the data and information collected, a draft report was prepared and discussed with ICMR and DSIR and their observations and suggestions were incorporated.

1.4 Services under GATS

Services are divided into following 12 sectors in the WTO General Agreement on Trade in Services (GATS):

1. Business services
2. Construction and engineering services
3. Environmental services
4. Health services
5. Energy services
6. Communication services
7. Educational services
8. Financial services
9. Transport services
10. Distribution services
11. Tourism services
12. Movement of natural persons

R&D Services enlisted in GATS constitute a part of business services which are defined as those that provide intermediary impacts throughout the value chain. They

include activities such as computing, consultancy services, research and development services, marketing and advertising (including market research), management consulting, rental leasing services without operator, technical testing and analysis and maintenance and repair of equipment services etc.

R&D services are further sub-divided into:

1. R&D services in Natural sciences
2. R&D services in Social sciences and Humanities
3. Interdisciplinary R&D services

1.5 Mode of supply of services under GATS

For providing the services by a member country to another member country following are the four modes:

1) Cross-border supply - refers to a situation where the service flows from the territory of one Member country into the territory of another Member country. For example, an architect can send his architectural plan through electronic means; a teacher can send teaching material to students in any other country; a doctor sitting in Germany can advise his patient in India through electronic means. In all these cases, trade in services takes place and this is equivalent to cross-border movement of goods.

2) Consumption abroad – refers to a situation where consumer of services moves into the territory of another Member country to obtain the service. For example, a tourist uses hotel or restaurant services abroad; a ship or aircraft undergoing repair or maintenance services abroad.

3) Commercial presence – implies that service suppliers of a Member country establish a territorial presence (a legal presence) in another Member country with a view to providing their services. In this case, the service supplier establishes a legal presence in the form of a joint venture / subsidiary / representative / branch office in the host country and starts supplying services.

4) Movement of natural persons – (this only refers to export of manpower) covers situations in which a service is delivered through persons of a Members country temporarily entering the territory of another Member country. (e.g. doctors, engineers, individual consultants, accountants, etc.)

GATS cover only temporary movement and not citizenship, residence or employment on a permanent basis in the foreign country. It is not uncommon to see combination of two or more or sometimes all of them in order to provide the required service.

1.6 Commitments for R&D services under GATS

Presently, only some countries have committed for a few sectors of R&D Services. India is a signatory to only the R&D services in natural sciences. Our commitment in this sector covers heat, light, electromagnetism, astronomy, engineering and technology including applied science and technology for casting, metal, machinery, electricity, communication, vessels, aircraft, civil engineering, construction, information etc. It excludes atomic energy related matters.

Several other countries have made commitments of varying nature. For example: Australia, Brazil, EU, Indonesia, Japan, Korea, Kuwait, Thailand and the US have not made any commitments in cross-border category and many of them have not undertaken commitments in this sector due to the reason of technical infeasibility. Only a few countries, such as Argentina, Canada, Norway and United Arab Emirates have undertaken commitments to fully liberalize trade through this mode.

In the Consumption abroad category Antigua & Barbuda, Bulgaria, EU, Gambia, Hungary, Iceland, Jamaica, Liechtenstein, Mexico, Pakistan, Slovenia, Swaziland, Switzerland, Trinidad & Tobago, United Emirates and Venezuela have no limitations on market access or national treatment in R&D services in natural sciences.

In the Commercial presence category, which involves the establishments of R&D labs, institutions, centre of excellence etc., Bulgaria, Dominican Rep., Gambia,

Hungary, Kuwait, Liechtenstein, Nicaragua, Pakistan, Qatar, Slovenia, Swaziland, Switzerland, Trinidad & Tobago and United Arab Emirates and Venezuela have not mentioned any limitations on market access or national treatment in R&D services in natural sciences.

Antigua & Barbuda, Swaziland and Trinidad & Tobago have also not put any limitations on market access or national treatment in R&D services in natural sciences.

1.7 Role of innovation in growth

Innovative activity and capabilities are essential for economic growth and development. Given the large gap between the developed and developing countries in terms of technological advancement, the latter continue to rely heavily on technology transfer from the former in their development process. Sustainable economic development requires active, continuous technological effort by enterprises, and government policies to help firms attract technologies.

Technological innovation, put in a simple form, takes place in the following four stages; (1) acquisition of basic production capabilities to absorb and use existing technology, (2) absorption of technology, (3) adaptation of technology and (4) frontier innovation stage, when firms design, develop and test entirely new products and processes. Research and development (R&D) is one source of innovation. Empirical studies suggest a direct relationship between R&D and growth. The long-term impacts on economic growth of public R&D and business R&D have been found to be strong and significant. Business R&D undertaken in other countries also plays an important role. Moreover, increased domestic business R&D accentuates the positive impact of both public and foreign business R&D. In other words, business R&D (either domestic or foreign funded) has both a direct impact on a country's economic growth and an indirect one through improved absorption of the results of public R&D and R&D performed in other countries. Enterprises are the principal agents of innovation today, but they do not innovate and learn in isolation. They rely on

intricate (formal and informal) links with other firms and with public research institutions, universities and other knowledge creating bodies like standards and metrology institutes. In undertaking innovation, they react to government policies on trade, competition, investment and innovation. They seek human resources for innovation from the education and training system, and they draw upon the financial system for funding innovative efforts.

1.7.1 Global R&D Services Scenario

There is an increasing pressure on shortening international market penetration times for new products, on shortening R&D times, and on decreasing the market life times for new products. Innovations are beginning to have multiple geographical and organizational sources of technology with increasingly differentiated and innovation specific patterns of diffusion. R&D in high-technology industries such as biotechnology, microelectronics, pharmaceuticals, information technology and new materials has become highly science based. The costs of doing R&D are also increasing phenomenally. The high technology goods have doubled their share of world merchandise in the last twenty years while at the same time dropping the share of primary products by half.

There has been a progressive weakening of the strategic position of corporate central laboratories within large firms. The firms around the world are becoming very selective with internal developments focused on critical products and processes. They complement their internal efforts with external technology acquisition on a global basis.

Creation of seamless laboratories around the world is also being helped by the evolution of global information networks. Indeed, these networks are allowing the real-time management and operation of laboratories in any part of the world. Thus, companies are gaining a competitive advantage by using the global knowledge resource and working with a global time clock. The trend is also being fuelled by the shortage of R&D personnel in some emerging high technology areas in industrialized

countries. The companies have to bridge that demand-supply gap in skills by external outsourcing. Obtaining access to high-quality scientists, engineers and designers is on the top of the agenda of many major companies now.

The world investment Report 2005 from UNCTAD estimates global R&D spending at US $ 677 billion in year 2002. Major countries spending on R&D in absolute terms are USA (40% of world spending on R&D), Japan (20%), Germany (7%), France (5%) and UK (4%). Developing countries such as China, Korea, Taiwan, India and Mexico have also witnessed increasing R&D spending during the period 1991-2002. However, when considered the R&D expenditure as a share of GDP, Israel tops the list with a share of 4.72%, followed by Finland (3.46%), Japan (3.12%), Iceland (3.09%), South Korea (2.91%), Germany (2.52%) and China (1.23%).

1.7.2 R&D Services Scenario in India

India has a well-established legal framework with the enactment / amendments to the Patents Act, Designs Act, Trade Marks Act, and Geographical Indications of Goods (Registration and Protection) Act. Besides, India has institutional framework with an estimated 3000 R&D institutions, including national laboratories and industrial R&D units.

According to Government of India, a total Rs 216.4 billion were spent on various R&D activities in India in the year 2004-05. Central government accounted for over 60% of total R&D expenditure followed by private sector (20%), state governments (nearly 10%), public sector (5%) and higher education sector (4%).

At firm level, R&D expenditure was estimated to be Rs 45.0 billion. R&D intensity (Ratio of R&D expenditure to sales turnover) of business firms was estimated to be around 0.5% in year 2002-03 which is lower than the global standards. As compared to this, R&D intensity of business firms is estimated to be 1.5% for Canada, 1.8% for EU-15, 2.6% for USA, 3.1% for Japan, 2.7% for Korea and 0.9% for China.

Sectoral break-up of R&D intensity of business firms gives a different scenario with some sectors having greater intensity than others. It may be noted that R&D expenses as a percentage of sales was higher in the pharmaceuticals sector (5.31%), followed by automobiles (1.17%), electronics (0.85% and auto-components (0.78%). To promote R&D activities and to encourage indigenously developed R&D, government has come up with various incentive plans.

1.8 India- An Emerging Destination of Global R&D

India has been receiving global R&D investments since many decades. However, in the initial years, R&D investments by transnational corporations were limited to adaptation or product development suitable for Indian market. Subsequently FDI became the window for R&D activities of transnational corporations.

A study by UNCTAD has marked USA and UK as top most destinations for R&D internationalization. Amongst developing countries, China has been placed as the top most destination, followed by India. A survey conducted by INSEAD and Booz Allen Hamilton has identified low cost skill base, availability of skilled workers, and markets as major determinants of R&D base in favour of India. The survey has identified that China is scoring more as compared to India in terms of proximity to markets; and USA, Germany, UK and France are scoring more in terms of availability of technological clusters / institutional network. It is thus important to leverage and strengthen the capabilities of India to emerge as prime destination for R&D.

1.9 Strengthening R&D Capabilities in India

Various measures such as tapping of global Knowledge base, strengthening of innovation system, strengthening of education system, strengthening the IPR regime, increasing government funding in R&D, increasing the involvement of private sector firms in R&D, strengthening the incentive regime for R&D, and strengthening of

international S&T cooperation are required for India to emerge as a R&D hub for the world.

1.10 Marketing Strategies & Business Potential

While formulating strategies at the macro level, relative competitiveness and relative wealth position of the country is to be kept in mind. Though, India is strong on relative competitiveness, it is low on relative wealth position. In order to realize our potential in world economy, a world-scale domestic market and world-class competitors are necessary to be developed simultaneously. Therefore, the imperative for Indian R&D organizations would be to achieve world-class competitiveness and provide world-class services to the domestic market. A service organization can become successful in global market place only if it has established itself in the domestic market.

R&D services unlike most 'pure' services, is a tangible dominant service, where there is a definite tangible component in the overall product package. The results/products/processes have to be shown to the customers and have to conform to definite specifications, as is the case with pure products. The services are to be provided usually by a scientific body or institution(s) who may have a number of subordinate or associated laboratories and research centers; where the services are developed. In our country, a huge untapped domestic market exists, but there is a need to develop short term and long term business strategies for R&D services from India.

In the years to come, when services are going to be an important determinant of a country's position in the global market place, our R&D organizations need to prepare themselves and capture as much share as they can and need to develop a comprehensive concept about the services they can offer and also how they can utilize the R&D-Marketing interface to become successful in the market place.

1.11 Contribution of ICMR towards detection and control of various diseases

For achieving the above objective it is necessary to advertise the contributions made by Indian laboratories towards combating various diseases and the expertise available so that Indian and Foreign drug companies get attracted and have confidence in collaborating with Indian laboratories for development work in drug research. There are many laboratories under the CSIR system as well as laboratories in private sector of industry working on drug development. However ICMR is the premier autonomous organization of the Ministry of Health & Family Welfare, Government of India under the aegis of which a network of 21 permanent institutes and 6 regional research medical centres equipped with modern equipment and facilities work on the national health priorities.

Some of the notable developments of ICMR laboratories are: Development of Cyclosporine(an immunosuppressive drug), Thrombinase (an antithrombolytic drug), and an Anti-diabetic drug, Cancerous lesion visualizing device, Bio-control agents for mosquitoes, microbial pupicide, Insect repellent, Diagnostic for Japanese Encephalitis, Cholera, Kits for Fertility assessment, Pregnancy detection, Iron deficiency, Biochemical makers for Osteoporosis and Reproductive tract infections and Hemoglobin estimation etc.