

PROJECT COMPLETION REPORT

ON

DEVELOPMENT OF DATABASE OF EQUIPMENT SUPPORTED UNDER EXTRAMURAL
R&D PROJECTS SANCTIONED DURING 2008-09 TO 2010-11 PERIOD (PHASE II)

(Project Reference F.No.DST/NSTMIS/05/174/2014-15)

A STUDY

CONDUCTED BY

**THE ENERGY AND RESOURCES INSTITUTE (TERI)
DARBARI SETH BLOCK
IHC COMPLEX, LODHI ROAD
NEW DELHI – 110 003**

SPONSORED BY

**DEPARTMENT OF SCIENCE AND TECHNOLOGY
NATIONAL SCIENCE AND TECHNOLOGY MANAGEMENT
INFORMATION SYSTEM
TECHNOLOGY BHAVAN, NEW MEHRAULI ROAD
NEW DELHI - 110 016**

April 2017

TERI. 2017.

Development of Database of Equipment Supported under Extramural R&D Projects
Sanctioned During 2008-09 to 2010-11 Period

New Delhi: The Energy and Resources Institute. 35pp.

[Project Report No. 2014LC01]

For more information

Knowledge Management Division

TERI

Darbari Seth Block

IHC Complex, Lodhi Road

New Delhi – 110 003

India

Tel. 2468 2100 or 2468 2111

E-mail tpsankar@teri.res.in

Fax 2468 2144 or 2468 2145

Web www.teriin.org

India +91 • Delhi (0) 11

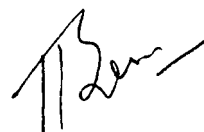
Mobile: 09810793533

ACKNOWLEDGEMENTS

The project team is grateful to the National Science and Technology Management Information System (NSTMIS) Division of the Department of Science and Technology (DST), Government of India for providing an opportunity to undertake this study on 'Development of Database of Equipment funded under Extramural R&D Projects'. It gratefully acknowledges the guidance, inputs and cooperation provided by the Local Project Advisory Committee Members, viz. Dr Parveen Arora, Head (CHORD-NSTMIS), Department of Science and Technology, Government of India, Mrs Namita Gupta, Scientist-F, Department of Science and Technology, Government of India, Dr Suneet Tuli, Dean [R&D], Indian Institute of Technology, Delhi, Dr Suresh Chand, Chief Scientist, National Physical Laboratory, New Delhi, Dr Sandeep Chatterjee, Registrar, Indian Institute of Technology Delhi, Dr Chandrima Shaha, Director, National Institute of Immunology, New Delhi, Dr Annapoorni Subramanian, Professor, Department of Physics and Astrophysics, University of Delhi, and Dr Garima Shukla, Additional Professor, Department of Neurology, All India Institute of Medical Sciences, New Delhi, from time to time in the execution of this project.

That TERI was able to successfully complete this project has been possible only due to the whole-hearted support and cooperation extended by the project investigators/heads of institutions/nodal officers of various project implementing agencies, universities and higher educational institutions, who forwarded the requisite data of equipments for the database. The project team duly acknowledges their support.

Finally, a word of thanks also goes to the project team members for their indulgence, commitment and hard work of surveying, collecting, compiling and authenticating data from a plethora of agencies located across the country, and to other TERI research and administrative professionals who contributed towards the timely completion of the project.



T P Sankar
(Project Investigator)

New Delhi
April 2017

(i)
CONTENTS

S No	Item	Page(s)
	Acknowledgements	i
	Table of Contents	
1.0	Executive summary	1
2.0	Objectives	5
3.0	Methodology	5
4.0	Designing and development of database	10
5.0	Database promotion, resource sharing and networking	15
	5.1 Stakeholders' workshop	15
6.0	Analytical report on the funding pattern of equipment	17
6.1	<i>Funding agency-wise analysis of projects and equipments</i>	18
6.2	<i>Coverage of implementing institutions</i>	20
6.3	<i>Beneficiary institutions</i>	21
6.4	<i>Gender representation among PIs</i>	21
6.5	<i>Cost range-wise analysis of overall purchase of equipments</i>	23
6.6	<i>Funding pattern of equipments</i>	24
6.7	<i>Acquisition pattern of import vs indigenous equipments</i>	25
6.8	<i>Resource sharing of equipments</i>	26
6.9	<i>Region-wise distribution of equipments</i>	27
	6.9.1 <i>City-wise distribution</i>	27
	6.9.2 <i>State-wise distribution</i>	29
7.0	Recommendations	31
8.0	References	35

(ii)

List of Tables

Table 1	Year-wise break-up of projects ...6
Table 2	Distribution of projects by states ...6
Table 3	Evaluation of survey responses ...10
Table 4	Agencies that provided funds for the acquisition of scientific equipments ...18
Table 5	Funding support by central and S&T departments/agencies ...19
Table 6	Ranking of agencies according to coverage of institutions ...20
Table 7	Distribution of equipments and grant funding by top 10 institutions ...22
Table 8	Gender Representation Among PIs ...23
Table 9	Acquisition pattern of equipments – imported vs indigenous ...25
Table 10	Distribution of equipments funding by type of cities ...26
Table 11	Distribution of equipments with a total grant funding of Rs 3000 and above received by select cities ...28
Table 12	State-wise grant funding by top six states ..29
Table 13	Equipment Funding received by the three North-Eastern states ..29
Table 14	Ranking of states by equipments grant funding during 2008-09 to 2010-11 ...30

(iii)

List of Figures

Figure 1	Dispersal of projects by states ...7
Figure 2	Sample filled in Survey Questionnaire ...9
Figure 3	Database of Scientific Equipments ...11
Figure 4	Details in the database with respect to EMR project ...12
Figure 5	Details with respect to equipment purchased under EMR project ...13
Figure 6	Classification of equipments under different categories ...14
Figure 7	Inaugural Session: Stakeholders' Workshop ...16
Figure 8	Ranking of funding agencies according to grants allocation for equipment ...20
Figure 9	Cost range-wise grants allocation ...23
Figure 10	Year-wise equipment funding support ...23
Figure 11	Acquisition pattern of import vs indigenous pattern of equipments ...25
Figure 12	Current status and sharing of equipments purchased under projects ...26
Figure 13	City-wise distribution of grant funding of equipments ...28

List of Annexures

Annexure I	Survey questionnaire
Annexure II	Database search tips
Annexure III	Report on stakeholders' workshop
Annexure IV	List of equipments each costing Rs 50 lakh and above
Annexure V	Distribution of funding for equipments by cities

1.0 EXECUTIVE SUMMARY

The progress of science and the competitive position of a nation's science base depend upon the availability and access of advanced research infrastructure. Scientific equipments forms an important component of research infrastructure and enables scientists to carry out development of research. In a wider perspective, it is critical to recognize that scientific equipments and research infrastructure are intimately associated with policy frameworks that facilitate and enable procurement, maintenance and disposal of scientific equipments, and management systems for providing information on accessibility and sharing of trained manpower.

The National Science and Technology Management Information System, a division of the Department of Science and Technology, Government of India, has initiated a nation-wide study for development of database of equipment funded under R&D projects and other S&T research infrastructure schemes of the Central Government during the period 2008-09 to 2010-11.

The task of surveying and data collection exercise was carried out and with the cooperation of over 793 project investigators and heads of institutions. The study has resulted in the creation of a web-based database presenting details of 431 extramural research projects and other S&T infrastructure schemes such as Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions (FIST) having 890 items of specialized; multi-disciplinary and multi-user equipments each costing Rs 10 lakh and above from 179 academic institutions and R&D organisations located across the country.

The study has also analyzed the data received from project investigators and prepared a report covering the funding pattern of equipment, city- and state-wise distribution, and gender representation, among other. A summary of which is given below for quick reference. Recommendations and suggestions that emerged from the study are given at the end of the report.

Findings and recommendations are based on responses to the questionnaire received from project investigators, universities and higher educational institutions representing 431 projects sanctioned during the period 2008-09 to 2010-11. It is, therefore, presumed that the information furnished by nodal officers was authentic and accurate in all respects.

Findings at a Glance

- **Coverage of study:** The survey covered 1564 projects each costing Rs 50 lakh and above spread over 570 institutions across the country. It found that of the 1197 responses received, 431 projects had equipments each costing Rs 10 lakh and above and 766 projects with either no equipments or having equipment each costing less than Rs 10 lakh.
- **Equipment grant funding by scientific agencies.** During the period 2008-09 to 2010-11, the total grant for obtaining 890 items of equipments under 431 projects were Rs 54,564 lakh.
 - Department of Science and Technology (DST) Rs 24518 lakh;
 - Ministry of Communication and Information Technology (MOCIT) Rs 12573 lakh;
 - Department of Biotechnology (DBT) Rs 9512 lakh;
 - Ministry of New and Renewable Energy (MNRE) Rs 2468 lakh; and
 - Department of Scientific and Industrial Research (DSIR) Rs 2160 lakhare the five largest contributors and they together accounted for about 94% of the total equipment funding during the period.
- **Recipient Institutions.** Maximum funding support for obtaining equipments was sanctioned to
 - Indian Institute of Technology Bombay (Rs 6700 lakh); followed by
 - Indian Institute of Technology Madras (Rs 6353 lakh);
 - Indian Institute of Science Bangalore (Rs 5065 lakh);
 - Indian Institute of Technology Delhi (2999 lakh);
 - Eco Recycling Limited (Rs 2110 lakh);
 - National Centre for Cell Science (Rs 1842 Lakh);
 - Inter-University Accelerator Centre (Rs 1436 lakh);
 - Calcutta University (Rs 1137 lakh);
 - Centre for Biochemical Magnetic Resonance (Rs 1059 lakh); and
 - Indian Institute of Technology Kanpur (Rs 962 lakh).

These ten institutions together received Rs 29664 lakh accounting for 54% of total funding.

- **Cost range of equipment.** The maximum number of R&D equipment obtained was in the cost range of Rs 10 to 25 lakh (428 items at a total cost of Rs 6784 lakh) constituting 12% of the total cost of equipment; Rs 25 to 50 lakh (225 items at Rs 8156 lakh) constituting 15% of total cost; Rs 50 to Rs 75 Lakh (71 items at Rs 4336 lakh) 8%; Rs 75 lakh to Rs 1 Crore (44 items at Rs 3841 lakh) 7%; and Rs 1 crore and above (122 items at Rs 31446 lakh) constituting 58% of total cost of equipment, indicating a greater support to high value equipment.
- **Gender representation among PIs.** The study of gender-wise allocation of projects has revealed that there were 75 female and 328 male PIs (403) representing 431 projects having equipments each costing Rs 10 lakh and above; the percentage of female representation of these projects has been 19 compared to that of 81 of male PIs.
- **Purchase of equipment.** The study also revealed that majority of the equipments was imported (94% at a total cost of Rs 51345 lakh) as against indigenously manufactured equipment (6% at a total cost of 3219 lakh).
- **Sharing of Equipment.** An analysis of the data received from PIs revealed that of the 890 items of equipments installed and operational at various institutions across the country, 624 items (70%) are already shared indoors or PIs willing to share with outside researchers/agencies. The 266 items (30%) of equipments purchased or indigenously made are used only for internal research purposes and/or configured to be used as per the requirement of the project or internal training purposes.
- **City-wise Distribution.** The city-wise analysis has revealed that equipments funding was dispersed among the 261 institutions located in 80 cities and towns in the country. Among these locations, 66 institutions based in seven metropolitan cities, viz. Bangalore, New Delhi, Chennai, Hyderabad, Mumbai, Kolkata, and Pune received about 71% of the total funding; and the rest in other 73 cities and towns gained about 29% of the total grant support.
- **State-wise Distribution.** About 80% of the equipment funding was received by the institutions located in six states, Maharashtra (Rs 14192 lakh), Tamil Nadu (Rs 8645 lakh), New Delhi (Rs 7365 lakh), Karnataka (Rs 6448 lakh) West Bengal, (Rs 4028 lakh) and Kerala (Rs 2989 lakh). The share of three north-eastern states, viz. Assam, Manipur, and Meghalaya accounted for only 2% of the total funding.

Study at a Glance	
Period under study	2008-09 to 2010-11
Total number of projects	1564
Funding agencies	14
Number of Institutions	573
Number of States/UTs	30
Outcome of Data Collection Exercise	
Number of project-based responses	1197
Number of projects having equipments <u>each costing Rs 10 lakh and above</u>	431
Number of projects having equipments <u>each costing less than Rs 10 lakh or no equipments</u>	766
PI-based responses (Total Number of PIs)	403 [75 female and 328 male PIs]
Total Grant for equipments	Rs 54,564 lakh
Funding agencies	14
Number of Institutions	179
Number of cities associated	79
Number of states associated	23

Terms to read hereinafter	Denotes
PROJECTS	Extramural sponsored research and other S&T infrastructure schemes
PIs	Project Investigators
EQUIPMENTS	Scientific equipments each costing Rs 10 Lakh and above
FUNDING AGENCIES	Ministries and Departments of Government of India
INSTITUTIONS	Project Implementing Institutions, universities, and higher education institutions
PERIOD OF STUDY	2008-09 to 2010-11

2.0 OBJECTIVES

- Conduct a study for development of a database of scientific equipments, valued over Rs 10 lakh, supported under extramural research projects and other S&T infrastructure schemes, each costing Rs 50 lakh and above approved for funding by Central Government agencies and departments during the period 2008-09 to 2010-11;
- Develop a searchable database; provide access to; enable sharing and using science equipment among scientific community, institutions and research personnel

3.0 METHODOLOGY

At the project start-up, the team developed an initial plan with potential approaches for data collection, timeline, and action steps as below:

3.1 *Identification of projects*

- (i) The study started off with a creation of a catalogue of projects in accordance with the study objectives. It identified a total of 1564 projects funded under extramural sponsored research and other S&T infrastructure schemes such as Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions, each costing Rs 50 lakh and above.

The year-wise break-up of projects funded by the central government ministries and departments and the state-wise break-up of projects located across 30 Indian states/UTs are given in Table 1, Table 2 and Map 1, respectively.

Table 1: Year-wise break-up of projects

Year of funding	No. of projects
2008-09	431
2009-10	432
2010-11	701
Total	1564

Table 2: Distribution of projects by states

State/UTs	Projects	State/UTs	Projects	State/UTs	Projects
Delhi	245	Orissa	34	Manipur	9
Tamil Nadu	187	Haryana	32	Madhya Pradesh	9
Maharashtra	169	Gujarat	29	Puducherry	9
Karnataka	167	Uttarakhand	25	Goa	7
Andhra Pradesh	134	Rajasthan	24	Bihar	6
West Bengal	132	Jharkhand	14	Andaman & Nicobar	4
Uttar Pradesh	107	Jammu & Kashmir	12	Arunachal Pradesh	3
Kerala	74	Chandigarh	11	Nagaland	4
Punjab	51	Himachal Pradesh	10	Tripura	3
Assam	42	Meghalaya	10	Sikkim	1

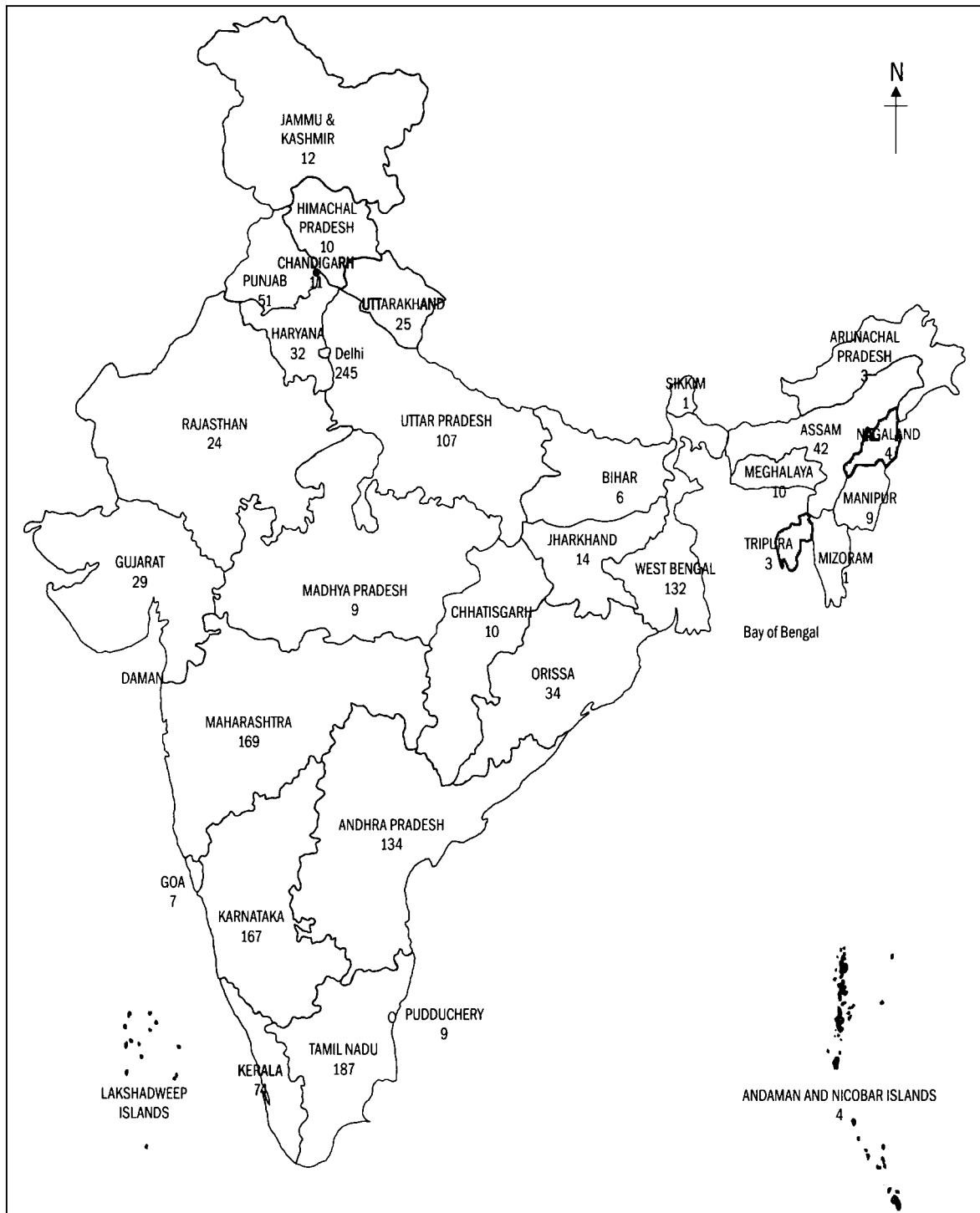


Figure 1: Dispersal of projects by states

The numbers indicate projects each costing Rs 50 Lakh and above

3.2 *Survey Form*

A survey form was designed keeping in view the objective of the project and in consultation with the Local Project Advisory Committee constituted for the project (*Annexure I*). The form contained two portions: viz. (i) project related information, and (ii) equipment related questions such as name of equipment purchased under the project, cost of each equipment, date of purchase of equipment, source of purchase (imported/indigenous); equipment make & model, major specifications, equipment capability, resource sharing, performance of equipment, etc.

3.3 *Coverage of project implementing institutions for data collection*

The target group for equipment data collection was principal investigators, heads of departments of universities and higher education institutions who have undertaken the projects during the period 2008-09 to 2010-11.

The data collection was carried out in two phases as under:

Phase I - Preparatory survey: The survey questionnaires with respect to 1564 projects were forwarded to the PIs and heads of departments of research institutions, universities and higher education institutions via email and post.

Phase II - Data collection phase: In this phase, survey was conducted through field visits and in-depth interactions and interviews were held with PIs/nodal officers/heads of institutions.

These institutions consisted of universities, engineering colleges, medical colleges and hospitals, national research laboratories, scientific and industrial research organizations.

Phase III - Stakeholders' workshop: In order to provide an opportunity to project investigators and scientists to share experiences related to scientific equipments; promote the Equipments Database and facilitate a culture of sharing scientific equipment; and evolve a standardized interoperable database of scientific equipment, a stakeholders' workshop was organized during the project period.

3.4 Outcome of Data Collection Exercise

The survey received 1197 responses from 1564 projects. (A sample survey questions along with data received from a respondent is given below)



DATABASE OF EQUIPMENT SUPPORTED UNDER EXTRAMURAL R&D PROJECTS SANCTIONED DURING 2008-09 TO 2010-11		Knowledge Partners  TERI, Darbari Seth Block, IHC Complex, Indira Road, New Delhi	 Government of India Department of Science & Technology National Science and Technology Management Information System
I. PROJECT DETAILS			
Project title		Development of Glycogen synthase kinase - 3B inhibitors for neurogenesis in neurodegenerative disorders. DBT-R&D. 2010-11	
Funding Agency - Scheme & Sanction year			
Name with complete address of Project Investigator / Head of the Institution		Dr M. Ramanathan, Principal, P.S.G. College of Pharmacy, Peelamedu, Coimbatore - 641004. Tamil Nadu	
Project cost (Rs in lakhs)		66.11	
II. PLEASE FILL IN DETAILS OF EQUIPMENT PURCHASED UNDER THIS PROJECT [each costing Rs 10 Lakhs and above ONLY]			
Name of equipment [Please use separate form for each equipment]		Multimode Reader with plate washer and Spectrophotometer with accessories.	
Cost of the Equipment [Rs/US Dollars/Euros]		18,40,594/- Rs	
Date of purchase of equipment		02.12.2011	
Equipment Imported/Indigenous		Imported	
Equipment Make/Model [e.g. FEI Philips XL 30]		ThermoFisher / Multiscan GO	
Major Specifications [e.g. SE detector, GSED detector]		High Quality Monochromator, Detects wide wavelength range of 200-1000nm, Xenon flash lamp	
Write a line about equipment capability [e.g. 3D imaging of biological specimens]		Qualitative and Quantitative Spectrophotometric Evaluation of biological samples.	
Present location of the equipment [Dept/Lab/Site where it is installed/ operational]		Molecular Biology Lab, Department of Pharmacology, P.S.G. College of Pharmacy.	
A. Performance of equipment (Specify whether the equipment is functional as on date. If Not, please indicate the reason by tick marking the boxes below:			
<input type="checkbox"/> Equipment not available for use due to non-availability of spare parts <input type="checkbox"/> Equipment outdated/unserviceable/identified as obsolete hence condemned <input type="checkbox"/> Consequent to the project completion, equipment not operated due to lack of qualified manpower <input type="checkbox"/> Any other reason (please specify)			
B. Whether the equipment is shared presently <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No			
If not shared presently, would you like to share it with outside researchers/organizations in future? <input type="checkbox"/> Yes / <input type="checkbox"/> No			
If No, please tick mark the reason:			
<input type="checkbox"/> Lack of dedicated instrument specific technical person to supervise the operation for external usage <input type="checkbox"/> Apprehension over the safety of sophisticated/costly equipment <input type="checkbox"/> Because the equipment is purchased exclusively for internal usage <input type="checkbox"/> The instrument requires consumables for analysis/sample preparation, hence incurs additional costs <input type="checkbox"/> Any other reason (PI specify)			
C. Please indicate whether a log book/database of users is maintained to track usage of equipment			
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> [If yes, indicate equipment usage rating in terms of percentage:			
Internal 60%; External 10%; Free time 30%]			
		Signature (PI/Authorized signatory) _____ Date 23/3/13	

Figure 2: Sample filled in Survey Questionnaire

As can be seen from the Table 3 below, during the course of Phase 2 (2008-09 to 2010-11), from 1564 survey questionnaires, a total of 1197 responses were received. The study found that of the 1197 responses, 431 projects carried 890 items of equipment each costing Rs 10 lakhs and above; and no equipment or equipment worth less than Rs 10 lakh under the remaining 766 projects.

Table 3: Evaluation of survey responses

Item	Phase 1	Phase 2	Total
Time Period	2003-04 to 2007-08	2008-09 to 2010-11	
EMR + FIST (each costing Rs 50 Lakh and above)	1064 (EMR)	1564 (EMR + FIST)	2628
Responses Received	939	1197	2136
EMR / FIST projects with equipment	394 (545 with no equipment or equipment each costing < Rs 10 Lakh)	431 (766 with no equipment or equipment each costing < Rs 10 Lakh)	825 (1311 with no equipment or equipment each costing < Rs 10 Lakh)
Total number of equipment each costing Rs 10 L and above	816	890	1706
816 items of equipment purchased under 394 EMR projects at a total cost of Rs 52275 L		890 items of equipment purchased under 431 EMR & FIST at a total cost of Rs 54564 L	

3.5 Processing and Analysis of data

The details of 890 equipment items were keyed in a specially designed template using MySQL-enabled database as per the requirement of the study. Using this structure, data analysis were performed based on specific criteria such as year-wise break-up, funding agency-wise break-up, institution-wise break-up, city- and state-wise break-up, equipment cost-wise break-up, gender-wise outcome, and so on.

3.6 Limitations of the study

Despite all efforts to achieve cent per cent data collection, the response rate was 77 per cent. While attempts are being made in collecting the remaining 23%, a few could not be received due to the following reasons:

- PIs were transferred/no longer associated with the organization/retired/expired;
- Project confidential/projects not approved/projects abandoned

Therefore, the strength of data collection and subsequent analysis are purely based on the 1197 project-based responses.

4.0 DESIGNING AND DEVELOPMENT OF DATABASE

A web-accessible framework using the LAMP platform was designed and developed with a query-based retrieval methodology based on the meta data fields (Figure 3). The acronym LAMP stands for Linux, Apache, MySQL, and PHP. Linux is a computer operating system assembled under the model of free and open source software development and distribution; Apache a free open source software which runs over 50% of the world's web servers; while MySQL is a powerful database management system used for organizing and retrieving data on a virtual platform; PHP is an open source web scripting language that is widely used to build dynamic webpages.

The screenshot displays the 'Database of Equipment' website. The header features the Government of India logo and the text 'Department of Science & Technology', 'National Science and Technology Management Information System - NSTMIS', and 'Government of India'. Navigation links include 'HOME | ABOUT THE DATABASE | HOW TO SEARCH | FEEDBACK | LOGIN'. The main title 'Database of Equipment' is followed by the subtitle 'Database of Equipment supported under Extramural R&D projects and Research Infrastructure programmes'. A search section on the left includes a 'SEARCH FOR' box with an 'Enter Text' input field, radio buttons for 'Extramural R&D projects', 'Research Infrastructure programmes', and 'All Projects' (selected), a 'Any Field' dropdown, a 'Browse by category of equipment' dropdown, 'From year' and 'To year' dropdowns, and a 'Select State' dropdown with options: 'Andaman and Nicobar Islands', 'Andhra Pradesh', and 'Arunachal Pradesh'. A note states '* Press Ctrl button to select multiple entries'. At the bottom of the search section are 'Search', 'Reset', and 'Advanced Search' buttons. The right side of the page shows a grid of nine images depicting various scientific equipment and researchers. A URL box at the bottom right contains the text 'http://equipment-nstmis-dst.org/'.

Figure 3: Database of Scientific Equipments


4.1 Organization of the database

The database contains details of projects having equipments each costing Rs 10 lakh and above located across the country. The details of both projects and equipments are organized and can be accessed through a variety of search options. For example, the 'Search For' box allows users to look for details of a specific equipment, institution, project title, funding agency and/or any free text search.

As for the structure of the database, each record has been organized under three groups as given in the following section:


4.1.1 Details of Projects with respect to extramural research projects

This section in the database comprises title of the project, funding agency and scheme, year of sanction, project cost, name and affiliation of project investigator, as shown in Figure 4 below.


 Department of Science & Technology National Science and Technology Management Information System - NSTMIS Government of India		HOME ABOUT THE DATABASE HOW TO SEARCH FEEDBACK LOGIN	
		Number of equipment(s) : 10	
Project Title	Low energy ion collisions on molecular solids: Chemical reactions phase transformation and unique properties		
Funding agency & scheme	DST-SERC		
Year of Funding	2010-11		
Project Cost (Rs. in lakhs)	444.50		
Name of investigator	T. Pradeep (M)		
Designation	Professor		
Department	Department of Chemistry		
Organisation name	Indian Institute of Technology Madras (IIT Madras)		
Address	IIT Madras Chennai		
City	Chennai		
State	Tamil Nadu		
Pin code	600036		
Phone number	044-22575929		
Email	pradeep@iitm.ac.in		

4.1.2 Details of Equipments

Each project related group is linked to particulars of equipments purchased under the respective project. These include title of equipment, cost and date of purchase of equipment, source of purchase [imported/indigenous], current status, make and model of equipment, major specifications, capability of equipment, present location, resource sharing, classification of equipment, *performance* of equipment, and location of equipment. To elucidate on this, the Figure 5 below gives details of equipments purchased with respect to the EMR project above (Figure 4).



Department of Science & Technology
National Science and Technology Management Information System - NSTMIS
Government of India



HOME | ABOUT THE DATABASE | HOW TO SEARCH | FEEDBACK | LOGIN

Number of Equipment(s) under this Project : 10

Ion Scattering Spectrometer

Equipment Cost (Rs. in lakhs)	400
Date of purchase of Equipment	24 Jan 2011
Equipment (Imported/Indigenous)	Imported
Current status of equipment	Installed and Functional
Make / Model	Extrel CMS
Major Specifications	Ultra-low energy ion scattering, MS, coupled with TPD
Capability	Capable of surface analysis at a very low temperature down to 10K
Present location	HSB 148, Department of Chemistry, IIT Madras, Chennai, Tamil Nadu
Resource Sharing	Shared within the organisation
Whether a Log Book/Database of Users is maintained?	Yes
Usage of equipment (%)	Internal : 100

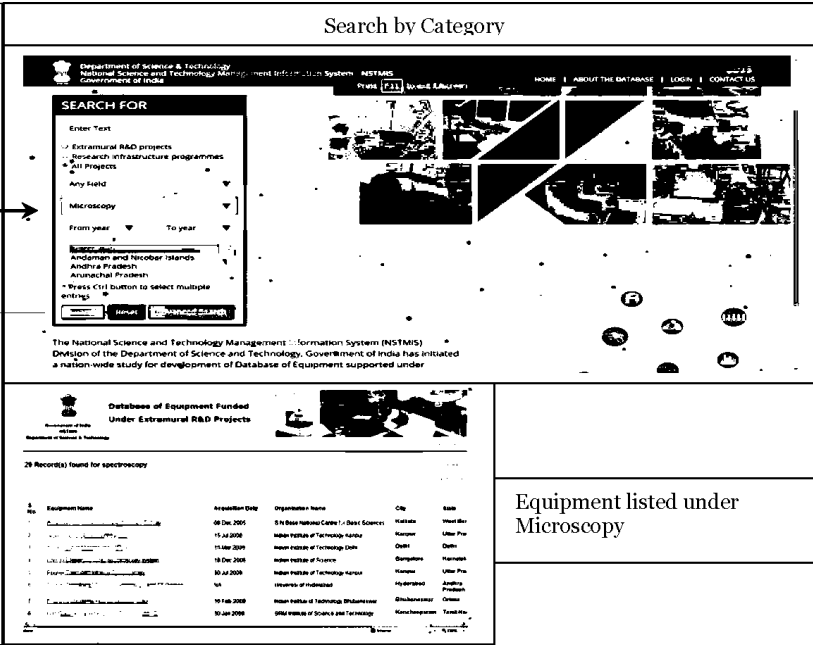
Figure 5: Details in the database with respect to equipment purchased under EMR project

4.1.3 Classification of Equipments


A classification scheme has been devised to make the equipment data retrieval as specific as possible. Under the scheme, each item of equipment in the database has been classified into 18 categories of equipment as shown in Figure 6:

Figure 6: Classification of equipments under different categories

1. Analytical Instruments
2. Chromatography
3. Dimensional Instruments
4. Filtration and Water Purification
5. Imaging equipment
6. Laboratory automation
7. Laboratory equipment
8. Laboratory safety
9. Laboratory Spectrophotometer
10. Laboratory supplies
11. Microscopy
12. Product and Material Testing
13. Recorders and Loggers
14. Sample Preparation and Liquid Handling
15. Separations
16. Spectroscopy
17. Test and Measurement Equipment
18. Other



The screenshot shows the NSTMIS website interface. At the top, there's a header with the Department of Science & Technology logo and navigation links. Below the header, there's a 'Search by Category' section with a search form. The form has a dropdown menu for 'Any field' and a 'Microscopy' category selected. Below the search form, there's a table titled 'Database of Equipment Funded Under Extramural R&D Projects' showing 28 records found for 'spectroscopy'. The table has columns for S. No., Equipment Name, Acquisition Date, Organization Name, City, and State. The first record is for 'Optical Polarizing Microscope'.



Department of Science & Technology
National Science and Technology Management Information System - NSTMIS
Government of India

[HOME](#) | [ABOUT THE DATABASE](#) | [LOGIN](#) | [CONTACT US](#)

Number of Equipment(s) under this Project : 1

Optical Polarizing Microscope

Equipment Cost (Rs. In lakhs)	13.59
Date of purchase of Equipment	07 Mar 2012
Equipment (Imported/Indigenous)	Imported
Current status of equipment	Installed and Functional
Make / Model	Carl Zeiss, Axio Scope Al Pol. Microscope Magnification 10x, 20x, 40x and 50x
Major Specifications	
Capability	This microscope fitted with mettler hostage can monitor the different phases of LC material / polymer.
Present location	Polymer Laboratory of Advance Material Section PSD, Institute of Advanced Study I Science & Technology (IASST), Guwahati, Assam
Resource Sharing	Shared outside the organisation
Whether a Log Book/Database of Users is maintained ?	Yes
Usage of equipment (%)	Internal : 40 External : 10 Free time : 50

A drop-down list of categories has been given to facilitate access to equipments classified under specific category as listed in the Figure. The search page displays a list of equipment under the category ‘Spectroscopy’ along with date of acquisition, institution name and location. Each link presents particulars of equipment as shown in Figure 6.

4.1.4 *Search Mechanisms*

The database makes searchable over 890 items of equipments and can be accessed through a wide range of search options including simple search terms as well as complex search combinations using boolean operators (AND, OR, NOT) in various permutations and combinations. For example, the ‘Search For’ box allows users to look for details of a specific equipment, institution, project title, funding agency, location, free text or keywords. ‘Browse by category” box limits search by selecting the category of equipment. Other search facilities include (i) selecting range of year of purchase of equipment; (ii) Selecting state where a specific organization is located.

To further refine search, an ‘Advanced Search’ interface has been devised to enable filter function by using the connectors — AND and OR. When AND is used, for example, “Indian Institute of Technology” AND “Analytical instruments” would only return records that contain both these terms. And, when OR is used, for example, “Indian Institute of Technology” OR “Analytical instruments” would return records that contain either of these terms.

Other features include provision to highlight search terms in the display record and **Search** button to begin search, and a **Reset** button to clear the search page. Queries conducted in the search button may be case insensitive, i.e., a word entered in lower case will match words entered in upper case, lower case, or mixed case.

In order to best facilitate users to search database effectively, a search tips document has been prepared and given in *Annexure II*

5.0 **DATABASE PROMOTION, RESOURCE SHARING AND NETWORKING**

5.1 *Statkeholders’ Workshop*

A stakeholders’ workshop was organized on 30 August 2016 at India Habitat Centre, Lodhi Road, New Delhi, with a view to provide a platform to project investigators and scientists to share views and provide inputs leading to policy actions for strengthening the

database. The workshop was inaugurated by Prof. Ashutosh Sharma, Secretary, Department of Science and Technology, Government of India. Dr Parveen Arora, Head (CHORD-NSTMIS), Department of Science and Technology, Government of India gave the opening remarks. The objectives of the workshop were to

- Provide an opportunity to project investigators and scientists to share experiences related to scientific equipments;
- Promote the Equipments Database and facilitate a culture of sharing scientific equipments thereby promoting scientific collaboration among institutions;
- Evolve a standardized interoperable database of scientific equipments



Figure 7: Inaugural Session: Stakeholders' Workshop

Dr Parveen Arora, Head (CHORD-NSTMIS), Department of Science and Technology, Government of India; Dr Ajay Mathur, Director-General, TERI; Prof. Ashutosh Sharma, Secretary, Department of Science and Technology, Government of India; Mr Prabir Sengupta, Distinguished Fellow and Director, TERI.

A large number of participants from government institutions engaged in R&D, academia, project investigators among others took part in the workshop. The workshop programme and the deliberations are given in Annexure III.

**ANALYTICAL REPORT ON THE
FUNDING PATTERN OF EQUIPMENT**

6.0 FUNDING PATTERN OF EQUIPMENTS

6.1 Funding Agency-wise Analysis of Projects and Equipments

Government of India supports and invests in scientific research through various projects and programmes. One of the key components budgeted for funding is for the acquisition of multi-user research equipments and support of research facilities at established institutions. Table 4 below lists the 14 major funding agencies through which Government of India provided funds allocation for the acquisition of scientific equipments under extramural sponsored research and other S&T infrastructure schemes during the period 2008-09 to 2010-11.

Table 4: Agencies that provided funds for the acquisition of scientific equipments

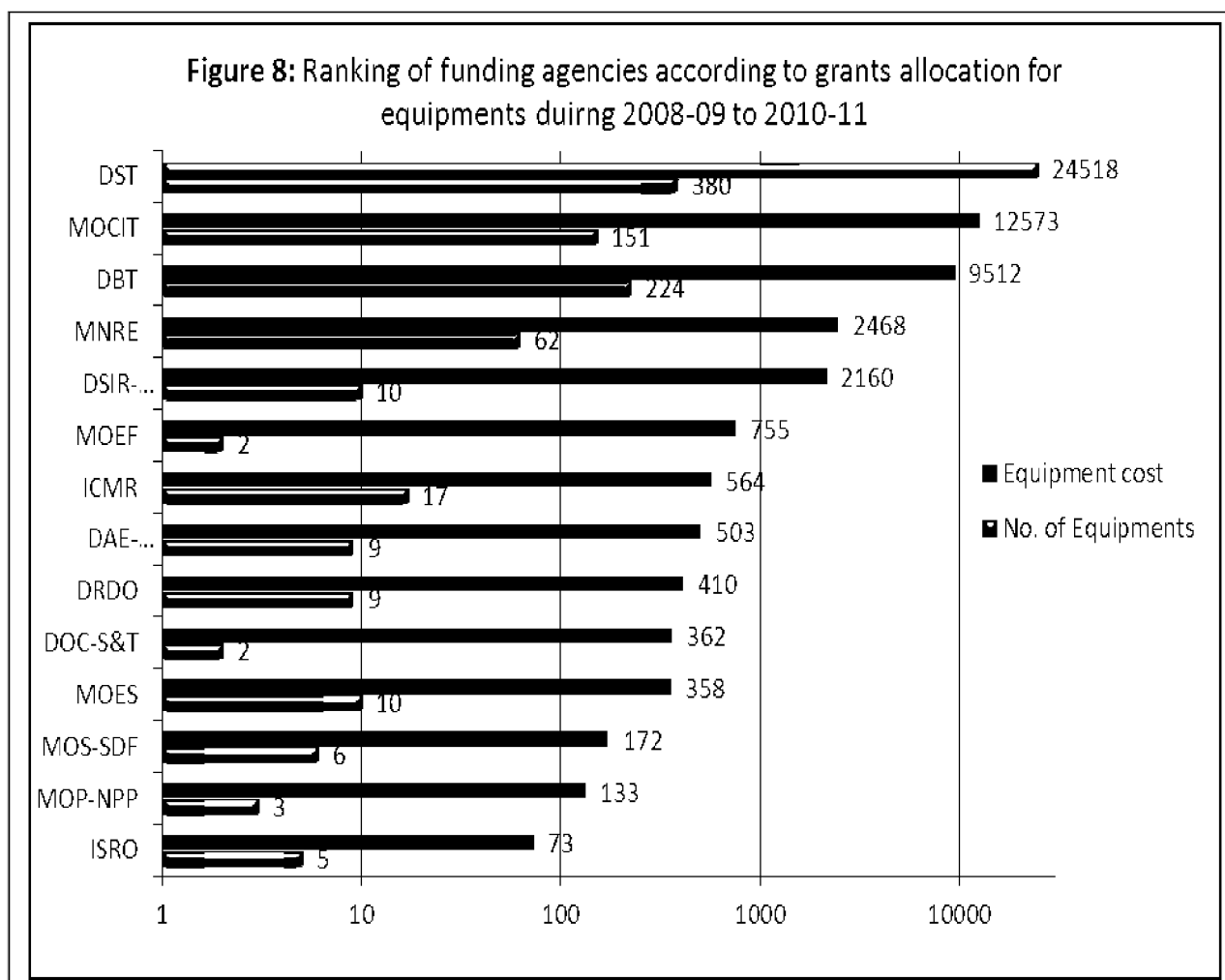
Sl No.	Abbreviation	Name of Funding Agency
1	DAE	Department of Atomic Energy
2	DBT	Department of Biotechnology
3	DOC	Department of Coal
4	DRDO	Defence Research and Development Organisation
5	DSIR	Department of Scientific and Industrial Research
6	DST	Department of Science and Technology
7	ICMR	Indian Council of Medical Research
8	ISRO	Indian Space Research Organisation
9	MNRE	Ministry of New and Renewable Energy
10	MOCIT	Ministry of Communications & Information Technology
11	MOEF	Ministry of Environment and Forests
12	MOES	Ministry of Earth Sciences
13	MOP	Ministry of Power
14	MOS	Ministry of Steel

The Table 5 below shows agency-wise funding for obtaining equipments under the projects. As can be seen, during the period 2008-09 to 2010-11, the total funding support for obtaining 890 items of equipments by the 14 Central and S&T Departments/Agencies were Rs 54564 lakh.

Table 5: Funding support by Central and S&T Departments/Agencies for obtaining equipments during 2008-09 to 2010-11

Funding Agency	No. of Projects (each costing Rs 50 lakh and above)	Equipments (each costing Rs 10 lakh and above)	Equipment cost (Rs in lakh)	% of total equipment funding	Average cost per equipment (Rs in lakh)
DST	173	380	24518	44.94	64.52
MOCIT	39	151	12573	23.04	83.27
DBT	148	224	9512	17.43	42.46
MNRE	21	62	2468	4.52	39.81
DSIR	4	10	2160	3.96	216.04
MOEF	2	2	755	1.38	377.65
ICMR	11	17	564	1.03	33.18
DAE	8	9	503	0.92	55.94
DRDO	9	9	410	0.75	45.51
DOC	2	2	362	0.66	181.00
MOES	4	10	358	0.66	35.83
MOS	3	6	172	0.32	28.74
MOP	4	3	133	0.24	44.29
ISRO	3	5	73	0.13	14.64
TOTAL	431	890	54564	100.00	61.30

It may be noted that the Department of Science and Technology was the largest contributor with Rs 24518 lakh (45%), followed by the Ministry of Communication and Information Technology Rs 12573 lakh (23%), Department of Biotechnology Rs 9512 lakh (17%), Ministry of New and Renewable Energy Rs 2468 lakh (5%), and Department of Scientific and Industrial Research Rs 2160 lakh (4%) and they together accounted for 94% of the total equipment funding.



It is also note-worthy to mention that the average cost of an equipment was the highest for MOEF (Rs 378 lakh), followed by DSIR (Rs 216 lakh), DOC (181 lakh), and MOCIT (Rs 83 lakh) and DST (Rs 65 lakh). MOS and ISRO provided the lowest amounts (Rs 29 lakh and Rs 15 lakh respectively) per equipment.

Majority of the equipments funded under projects are classified under *Earth Sciences, Chemical Sciences, Medical Sciences, Engineering and Technology*. This indicates a special prominence on R&D in these fields.

6.2 Coverage of Implementing Institutions

During the period 2008-09 to 2010-11, the 14 agencies reached out to 261 institutions in terms of allocating funds for acquisition of equipments each costing Rs 10 lakh and above under the EMR and FIST programmes. There were considerable variation in the coverage of institutions among the agencies during the period. The DST provided support to as many as 97 institutions, DBT, MOCIT, and ICMR 80, 22, and 10 institutions respectively. The coverage of institutions was low (less than 5 institutions) in the case of DSIR, MOP, MOS, ISRO, DOC, MOEF and MOES.

Table 6: Ranking of agencies according to coverage of institutions during 2008-09 to 2010-11

Funding agency	Number of Institutions	Number of PI s	No. of Projects	No. of Equipments	Equipment cost
DST	97	159	173	380	24518
MOCIT	22	36	39	151	12573
DBT	80	137	148	224	9512
MNRE	18	21	21	62	2468
DSIR	4	4	4	10	2160
MOEF	2	2	2	2	755
ICMR	10	11	11	17	564
DAE	6	8	8	9	503
DRDO	7	9	9	9	410
DOC	2	2	2	2	362
MOES	2	4	4	10	358
MOS	4	3	3	6	172
MOP	4	4	4	3	133
ISRO	3	3	3	5	73
TOTAL	261	403	431	890	54564

Table 6 also shows that during the period under study, a total of 403 PIs were given funding support for obtaining equipments each costing Rs 10 lakh and above under projects. Among the agencies, the outreach to scientists was the highest in the case of DST, which provided support to 159 PIs, followed by DBT (137 PIs), MOCIT (36 PIs) MNRE (21) ICMR (11 PIs) and so on.

6.3 Beneficiary Institutions

As shown in Table 7 below, the 10 institutions together received 297 items of equipment at a total cost of Rs 29664 lakh accounting for 54% of total funding. Indian Institute of Technology Bombay got the highest funding support (Rs 6700 lakh) followed by Indian Institute of Technology Madras (Rs 6353 lakh), Indian Institute of Science Bangalore (Rs 5065 lakh), Indian Institute of Technology Delhi (Rs 2999 lakh), and so on.

Table 7: Distribution of Equipments and Grant funding by top 10 Institutions

S.No.	Institution	No of equipments	Grant funding (Rs in lakh)
1	Indian Institute of Technology Bombay	78	6700
2	Indian Institute of Technology Madras	53	6353
3	Indian Institute of Science	54	5065
4	Indian Institute of Technology Delhi	59	2999
5	Eco Recycling Limited	7	2110
6	National Centre for Cell Science	13	1842
7	Inter-University Accelerator Centre	8	1436
8	Calcutta University	16	1137
9	Centre for Biochemical Magnetic Resonance	1	1059
10	Indian Institute of Technology Kanpur	8	962
	TOTAL	297	29664

6.4 Gender Representation Among PIs

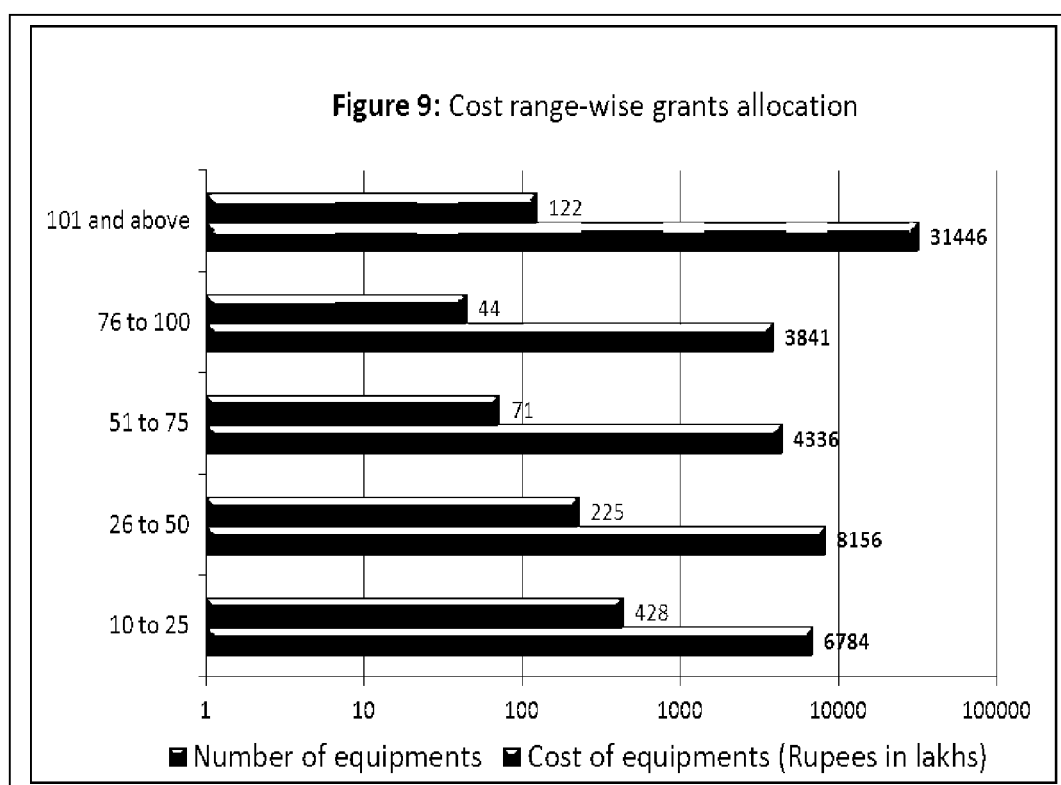
Majority of the projects had male representation, finds the study. It is seen from the Table 8 that the total number of projects having equipments each costing Rs 10 lakh and above approved during the period 2008-09 to 2010-11, according to the survey responses, was 431. The study revealed that there were 75 female and 328 male PIs (403) representing the 431 projects; the percentage of female representation of these projects has been 19 compared to that of 81 of male PIs.

Table 8: Gender representation of projects each costing Rs 50 lakh and above and having equipment each costing Rs 10 lakh and above

Gender of PIs	PI-based representation	Project-based representation	Number of Equipments	Funding support (Rs. In lakh)
Female	75	87	143	8729
Male	328	344	747	45835
Total	403	431	890	54564

6.5 Cost range-wise analysis of overall purchase of equipments

The amount sanctioned to procure equipments and cost-wise number of equipments is analyzed for the period 2008-09 to 2010-11. Funding support to obtain these equipments varied extensively, ie. from Rs 10 lakh to more than a crore of rupees. Consequently, the funds allocated to all these equipments obtained were grouped into five categories according to the total cost of the equipment, viz. Rs 10-25 lakh; Rs 26-50 lakh; Rs 51 to 75 lakh; Rs 76 lakh to 1 crore; and Rs 1 crore and above as shown in the Figure below. Details of high valued equipments costing Rs 50 lakh and above along with Funding agency, Acquisition type, Institution and State are furnished in *Annexure IV*.

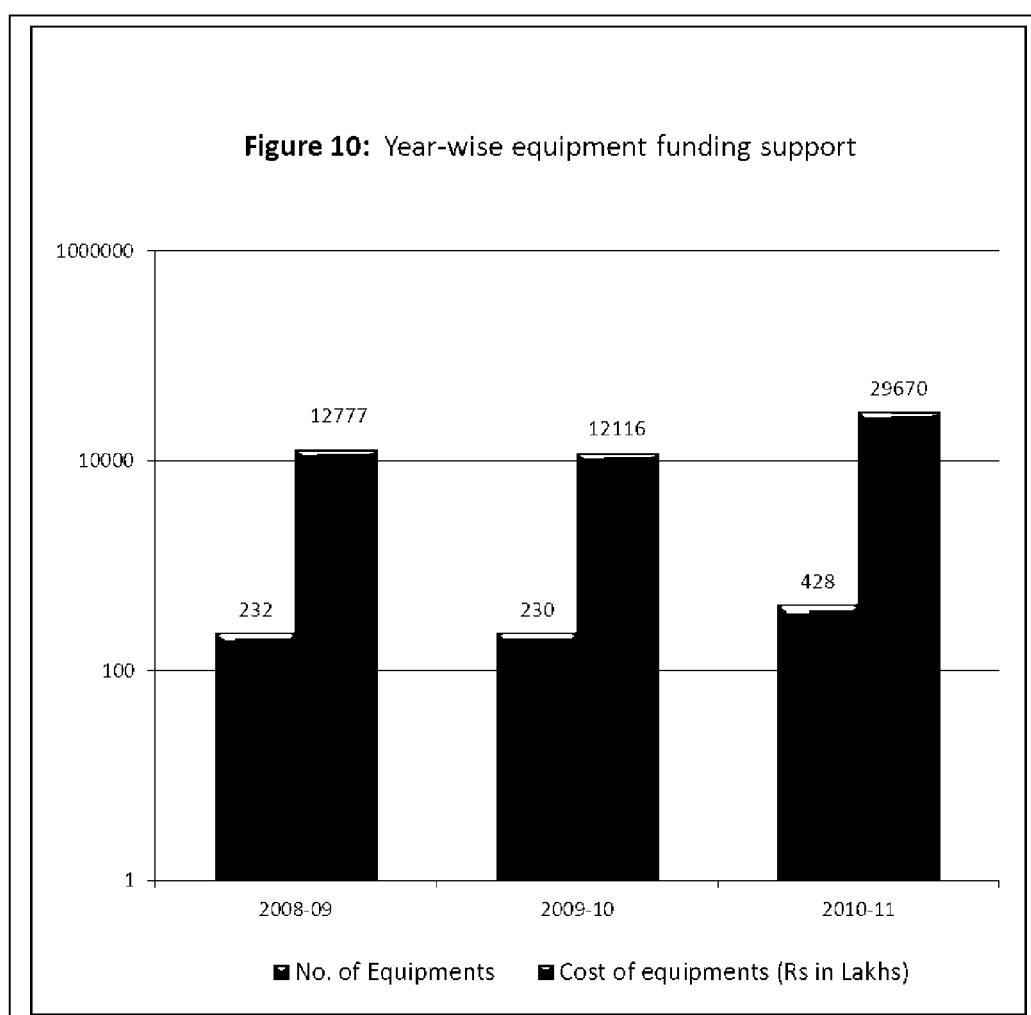


As is seen in the Figure, the maximum number of R&D equipments obtained (428 at a total cost of Rs 6784 lakh) was in the cost range of Rs 10 to 25 lakh constituting 12% of the total grant for equipment; 225 equipments items at a cost of Rs 8156 lakh were in the cost range of Rs 26 to 50 (15%); 71 items at Rs 4336 lakh in the range of 51 to Rs 75 lakh (8 %); 44 items at Rs 3841 lakh in the range of Rs 76 to Rs 1 crore (7%); 122 items at Rs 31446 lakh in the range of cost range of above Rs 1 crore constituting 58%.

The number of equipments decreased with increase in the sanctioned cost range of Rs 10 lakh to Rs 1 crore. The figure also indicates the allocation of maximum grant for acquisition of high-cost equipment was in this cost range of Rs 1 crore and above.

6.6 Funding pattern of equipments

The total approved cost for equipments varied for 2008-09 (Rs 12777 lakh); 2009-10 (Rs 12116 lakh); and 2010-11 (Rs 29670 lakh)



There has been an increasing trend in both the number of equipments and approved cost with substantial increase in funding between the period 2008-09, 2009-10 and for the period 2010-11. However, the period 2009-10 witnessed a small decrease in both the number of equipments (230 nos.) and total approved cost of equipment (Rs. 12116 lakh) indicated a drop in support both in terms of equipment and funding.

6.7 Acquisition pattern of import vs indigenous equipments

More money spent on imported items of equipments compared to indigenous. According to the survey responses, the amount spent on acquisition from indigenous and foreign sources during the period 2008-09 to 2010-11 is given in Table 9. It is revealed from the study that majority of the equipments were imported 806 (91%) at a cost of Rs 51345 lakh as against indigenously manufactured equipment 84 (9%) at the cost of Rs 3219 lakh.

Table 9: Acquisition pattern of equipments – import vs indigenous

Year of funding	Imported		Indigenous	
	Cost of equipment (Rs in lakh)	Number of equipments	Cost of equipment (Rs in lakh)	Number of equipments
2008-09	12243	215	534	17
2009-10	11467	211	649	19
2010-11	27634	380	2036	48
Total	51345	806	3219	84

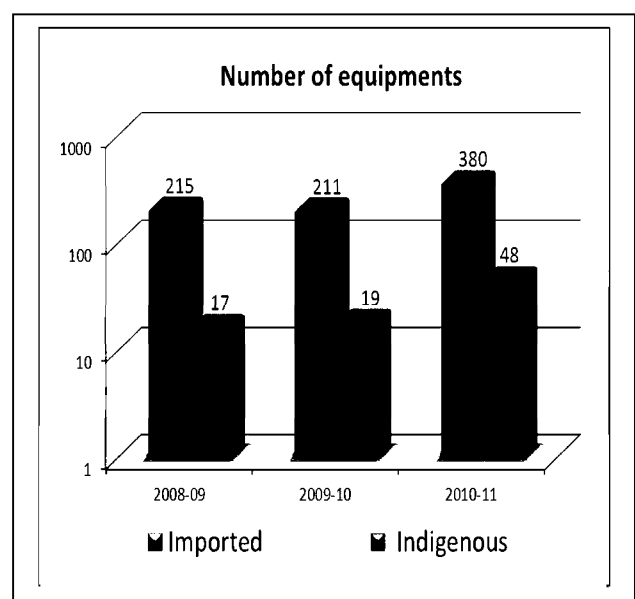
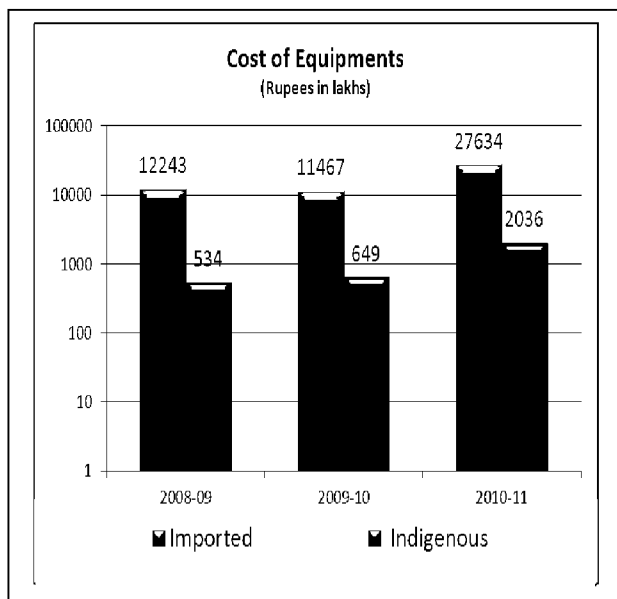
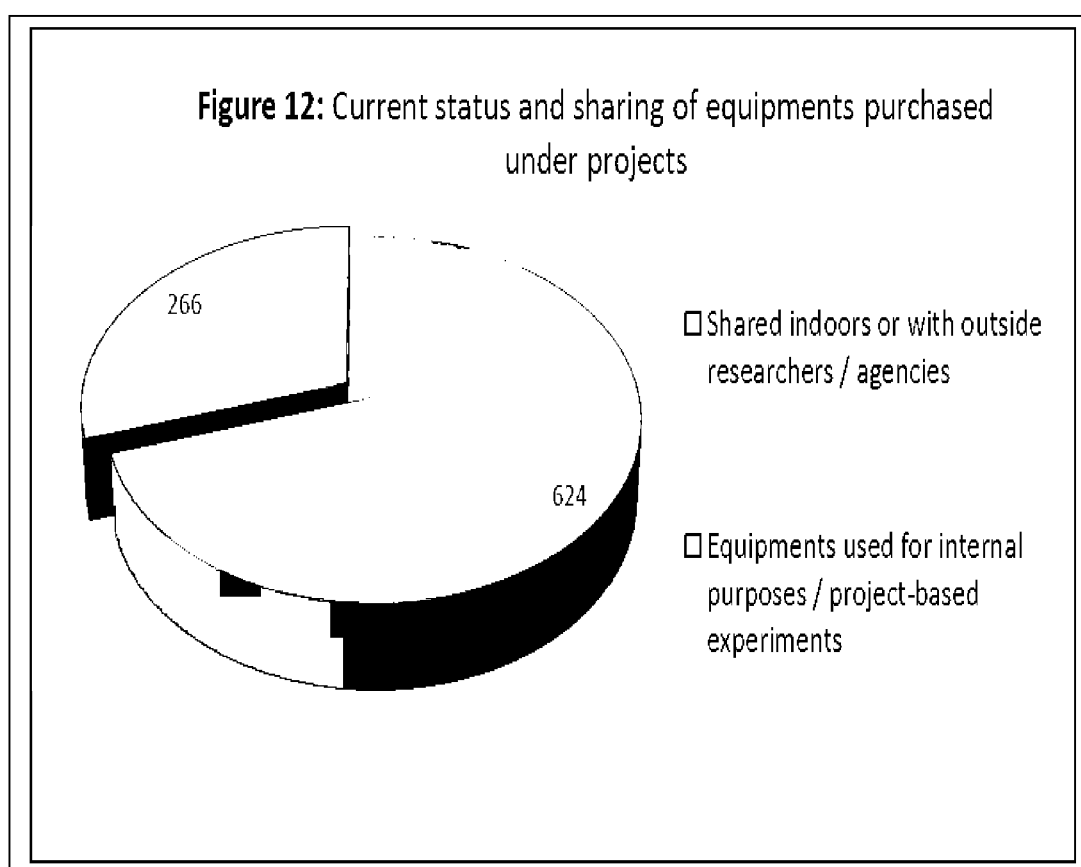


Figure 11: Acquisition pattern of import vs indigenous pattern of equipments

6.8 Resource Sharing of equipments

Sharing of equipments purchased under sponsored projects promotes the cost-effective and efficient use of public resources and facilitates a culture of sharing and presenting improved resource efficiencies. A question concerning 'willingness to share sponsored equipment' was raised through the survey form. An analysis of the data received from PIs revealed that of the 890 items of equipment installed at various institutions across the country, 624 items are already shared indoors or with outside researchers/agencies (Figure 5). Most of the respondents in this category pointed out that willingness to share equipment is mainly for a meaningful scientific collaboration with institutions for worthwhile and measurable outcomes or to get back the running costs for the time used.



The 266 pieces of equipments purchased or indigenously made are used only for internal research purposes and/or configured to be used as per the requirement of the project. There are also issues with many items of sophisticated equipments to do with training or resetting to the original user configuration; lack of dedicated instrument specific technical person to supervise the operation for external usage (iii) apprehension over the safety of sophisticated/costly equipment (iv) requirement of consumables for analysis/sample preparation, hence incurs additional costs.

6.9 Region-wise Distribution of Equipments

6.9.1 City-wise distribution

Funding support for obtaining equipment is provided essentially to recognized academic/ research institutions. Given that most of these institutions are located in state capitals and metropolitan cities, it is useful to analyse the city-wise distribution of equipment under EMR projects.

Based on the analysis of the data received, during the period 2008-09 to 2010-11, the funding for equipments was dispersed among the institutions located in 80 cities/towns in the country [Annexure V]. Among these locations, 66 institutions based in seven metropolitan cities, viz., Bangalore, Delhi, Chennai, Hyderabad, Mumbai, Kolkata and Pune, received about 71% of the total funding of Rs 54564 lakh, and the rest in other 73 cities and towns gained about 29% of the total grant support (Table 10).

Table 10: Distribution of equipments funding by type of cities during 2008-09 to 2010-11

Type of cities	Number of cities	Approved cost (Rs in lakh)	Percentage of allocation
Metropolitan	7	38766	71
Cities/Towns	73	15798	29
Total	80	54564	100

6.9.1.1 Distribution of equipments

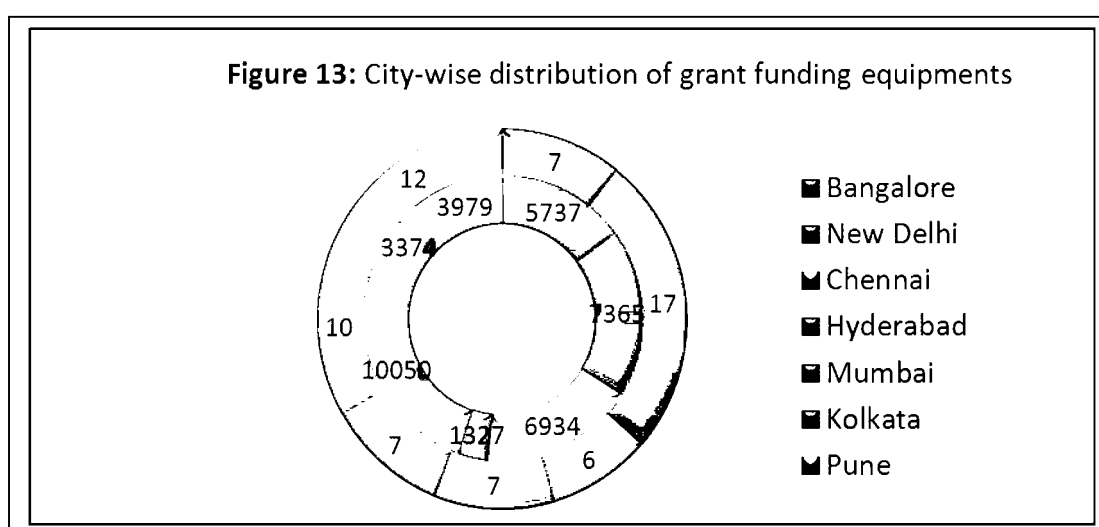
The analysis covered those cities which received Rs 3000 lakh and above as grant amount for obtaining equipments. There are 7 such cities coming under this category. As can be seen from Table 11, 7 institutions located in Mumbai received the highest support of funding (Rs 10050 lakh) which accounted for 18% of the total funding approved during 2008-09 to 2010-11.

This city was followed by New Delhi (17 Institutions; Rs 7365 lakh; 13%), Chennai (6 institutions. Rs 6934 lakh; 13%); Bangalore (7 Institutions; Rs 5737 lakh; 11%); Pune (12 institutions; Rs 3979 lakh; 7%); Kolkata (10 Institutions; Rs 3374 lakh; 6%); and Hyderabad (7 Institutions; Rs 1327 lakh; 2%). 66 institutions in these 7 cities received 542 items of equipments at a total cost of Rs 38766 lakh.

Table 11: Distribution of equipments with a total grant funding of Rs 3000 and above received by select cities

City	Number of Institutions	Number of equipments	Equipment cost (Rs in lakh)	% of total grant funding
Mumbai	7	102	10050	18
New Delhi	17	149	7365	13
Chennai	6	68	6934	13
Bangalore	7	66	5737	11
Pune	12	57	3979	7
Kolkata	10	57	3374	6
Hyderabad	7	43	1327	2
Total	66	542	38766	71

These cities together received about 71% of total grant funding from the central government agencies during 2008-09 to 2010-11. Distribution of funding for equipment by all the 80 cities during 2008-2010 is given in *Annexure IV*.



6.9.2 *State-wise Distribution*

The state-wise grant funding for equipment by the central government agencies is shown in Table 12. The table shows the ranking of states in terms of range of grant funded to each state. About 80% (Rs 43,666 lakh) of total funding of Rs 54564 lakh was approved to the institutions located in six states. Maharashtra topped the list with a grant funding of Rs 14192 lakh, followed by Tamil Nadu (Rs 8645 lakh), Delhi (Rs 7365 lakh) Karnataka (Rs 6448 lakh), West Bengal (Rs 4028 lakh), and Kerala (Rs 2989 lakh). These states together accounted for about 80% of total number of equipments (633) during 2008-09 to 2010-11.

Table 12: State-wise grant funding by top six states

State	Number of Equipments	Grant Funding (Rs in lakh)	Percentage of funding
Maharashtra	167	14192	26.0
Tamil Nadu	108	8645	15.8
Delhi	149	7365	13.5
Karnataka	81	6448	11.8
West Bengal	77	4028	7.4
Kerala	51	2989	5.5
TOTAL	633	43666	80.0

Institutions located in the remaining 18 states/UTs, had received about Rs 10,897 Lakh of grant funding for a total of 257 items of equipments. The states receiving a grant funding less than Rs 500 lakh are Puducherry, Himachal Pradesh, Goa, Haryana, Manipur, Chandigarh, Meghalaya, Jammu and Kashmir, and Jharkhand. These 10 states together had 36 items of equipment and accounted for only 2% (Rs 1000.44 lakh) of total grant funding.

6.9.2.1 *Equipment funding for North-Eastern Region*

During the period, the three states in the north-eastern region, viz. Assam, Manipur, and Meghalaya accounted for only 2.4% (Rs 1289 lakh) of the total grant funding.

Table 13: Equipment Funding received by the three North-Eastern States

State	Number of Equipment	Grant Funding (Rs in lakh)	Percentage of Funding
Assam	32	1139	2.1
Manipur	4	103	0.2
Meghalaya	1	47	0.1
Total	37	1289.0	2.4

6.9.2.2 Dispersal of funding for equipment among states

The extent to which the equipment funding was dispersed among the states can be assessed by using the indicator, *state funding dispersal ratio*. As shown in Table 7.12 below, six states, viz. Maharashtra, Tamil Nadu, Delhi, Karnataka, West Bengal and Kerala accounted 80% of the total funding of Rs 54564 lakh.

Table 14: Ranking of states by equipments grant funding during 2008-09 to 2010-11

State	Number of Equipments	Grant Funding (Rs in lakh)	Percentage of funding
Maharashtra	167	14192	26.01
Tamil Nadu	108	8645	15.84
Delhi	149	7365	13.50
Karnataka	81	6448	11.82
West Bengal	77	4028	7.38
Kerala	51	2989	5.48
Uttar Pradesh	23	2569	4.71
Andhra Pradesh	49	1571	2.88
Gujarat	29	1368	2.51
Punjab	26	1215	2.23
Assam	32	1139	2.09
Rajasthan	25	778	1.43
Uttarakhand	21	655	1.20
Orissa	16	601	1.10
Pondicherry	9	227	0.42
Himachal Pradesh	5	211	0.39
Goa	3	171	0.31
Haryana	6	119	0.22
Manipur	4	103	0.19
Chandigarh	5	78	0.14
Meghalaya	1	47	0.09
Jammu and Kashmir	2	31	0.06
Jharkhand	1	16	0.03
Grand Total	890	54564	100

7.0 RECOMMENDATIONS

The “Development of Database of Equipment Funded under Extramural R&D Projects” is an important and useful project for both the government and the scientific research fraternity. The database depicts the progress and research trends in various sectors of scientific research and development. Following inferences were derived while conducting the survey:

1. Institutionalization of central hub facility of equipments;
2. Optimal utilization of scientific resources through resource sharing;
3. Appropriate maintenance of scientific resources;
4. Avoiding duplication effort to procure the same equipment by the same organization/department;
5. Challenges experienced by the PI, while procuring or importing certain equipments;
6. Enhancing collaborative research in cross-disciplinary areas;
7. Providing appropriate capacity building for technically handling equipments;
8. Exchange of technical experts to handle certain sensitive equipments;
9. Identifying local vendors or indigenous manufacturers for maintenance, supplying spare parts
10. Outcomes of research
11. Remuneration to technical staff
12. Release of funds/instalments

Recommendation 1: Centralized repository/Central lab facilities

Major equipments purchased from various projects are generally of large significance and hence their proper utilization is very crucial. Most efficient utilization of these equipment can be made by:

- i) making them as a part of central lab facilities covering multidisciplinary areas of research by the host Institute;
- ii) developing ways to share the facilities with other institutes/individual researchers and students to enhance research and training;

Recommendation 2: Optimum usage of equipment/resource sharing

During the survey, it was strongly felt that equipment purchased against projects and programmes should be optimally used for research purpose. After the completion of the project, if the equipment is lying unused then it should be allowed to be used by other

research organizations or researchers against a nominal fee, so that the maintenance of the equipment can be carried out.

PIs and Heads of Departments should announce/publicise, through the database, information on auctioning, donating, transferring of old/obsolete equipment thereby facilitating optimum utilization of equipment.

Recommendation 3: Maintenance of scientific resources

During the survey, it was realized that there is a need for appropriate maintenance of these scientific equipment. AMC should be renewed to increase the life span of the equipment. Periodic upgradation of the equipment would be required, wherever it is possible. Separate funds should be allocated or the respective institution should spend from their own corpus.

Upgrading equipment

As technology becomes obsolete due to rapid technological advances, additional financial support is required for upgrading the equipment to maintain its technical standard. Upgrading the equipment may be required even after completion of project.

Maintenance of equipment

There should be a special grant programme for renewal of annual maintenance costs for equipment, especially spare parts and accessories. Many a time, equipments remain unutilized because of lack of maintenance or inadequate maintenance which can even lead to accidents and health problems.

Recommendation 4: Avoiding duplication of purchase of same equipment by the same organization

Recommendation 5: Exploring the right vendor offering right cost for the equipment

Recommendation 6: Enhance collaborative research in cross-disciplinary areas

The database will facilitate a culture of sharing scientific equipments thereby promoting scientific collaboration among institutions

Recommendation 7: Manpower training

Government needs to additionally invest in training of laboratory manpower for operating the specialized / state-of-the-art equipment. This will be useful in optimal utilization of

the equipment; as also retention of trained professionals for the full term of the project thereby preventing delay in the timely completion of the project;

There should be provision for organizing capacity building programmes at different levels such as from Technical Assistant to Lab Attendant level;

After completion of a project, the trained technical expert should be absorbed in the same organisation or to be shifted to other organization/centre. Because in many cases, after the completion of project, the technical experts are no longer available and as a result the equipment is lying idle in the organization.

Recommendation 8: *Exchange of technical experts to handle certain sensitive equipment* If there is a paucity of technical experts to handle sensitive equipment, then there could be an exchange programme between institutions can be devised.

Recommendation 9: *To identify to local vendors or indigenous manufacturers for maintenance, supplying spare parts*

Obtaining imported equipments, in many cases, was time consuming due to fluctuations in foreign exchange rate and at times lack of stock of the required equipment parts. There are quite a number of other constraints when it comes to purchase of equipments.

One possible solution could be to encourage indigenous manufacture of equipment by the Government. For this, a conducive policy framework and guidelines needs to be in place.

Recommendation 10: *Outcomes of Research*

Scientific agencies of central government support scientific and technological research in the form of extramural or sponsored R&D projects. Measurement of outcome of these projects is necessary to assess value for money invested in these projects. While we may have many yardsticks for such measurement, we have found following could be used as standard for all projects:

- Research papers published and presented
- PhDs produced
- New principle/theory developed
- Instruments /products developed

Recommendation 11: Remuneration to technical staff

Staff in the technical category is not willing to work with the current salary structure fixed for JRF or SRF by the Government. The salary given is very low as compared to what is offered in the corporate or public sector undertakings. Government may look into the present salary structure for JRF or SRF for consideration.

Recommendation 12: Release of funds/instalments

Enormous delay in releasing funds/instalments by the funding agency obstruct processing of equipment purchase. This leads to delay in timely project completion. The government may look into the current system and consider incorporating specific payment schedule in the project contract.

=== * ===

8.0 REFERENCES

1. Directories of Extramural Research and Development Projects 2008-09, 2009-10 and 2010-11
2. FIST programme 2008, 2009 and 2010. Department of Science and Technology, Government of India