CHORD (NSTMIS) DIVISION
DEPARTMENT OF SCIENCE & TECHNOLOGY
MINISTRY OF SCIENCE & TECHNOLOGY
GOVERNMENT OF INDIA
NEW DELHI-110016 (INDIA)

Impact Evaluation Report:

Funds for Improvement of Science & Technology Infrastructure (FIST) Scheme

January 2021

"Building a strong S&T infrastructure that is accessible to academia, start-ups, industry and R&D labs is a priority of the government. To address the problems of ease of access, maintenance, redundancy and duplication of expensive equipment in our Scientific Institutions, the desirability of establishing professionally managed, large regional centres in PPP mode housing high value scientific equipment should be examined".

Hon'ble Prime Minister of India Shri Narendra Modi- at 104th Indian Science Congress on 3rd January, 2017.

प्रो. आशुतोष शर्मा
Prof. Ashutosh Sharma

सचिव
भारत सरकार
विज्ञान एवं प्रौद्योगिकी मंत्रालय
विज्ञान एवं प्रौद्योगिकी विभाग
Secretary
Government of India
Ministry of Science and Technology
Department of Science and Technology

18th January, 2020

MESSAGE

The scientific institutions are critical cradle of innovation and knowledge creation and the development of scientific infrastructure is crucial for advancement of a nation with ease of access and greater emphasis for their optimal utilization.

Considering the importance of S&T infrastructure in the universities and related academic institutions, the Government of India, in the year 2000 announced a major new initiative called "Fund for Improvement of S&T (FIST)" to strengthen S&T infrastructure with adequate funding and associated flexibility.

To take further policy imperatives and in order to get insight into the success of FIST scheme, it was equally important to evaluate the impact generated by the scheme for the purpose it was announced. With this view, the study was commissioned in a network mode to evaluate the impact generated by the project funded during the 2000-2011. The present study effectively covers the impact generated up to the year 2016

I hope that the present study will not only provide the information on the direct and indirect impact generated across the country in strengthening S&T infrastructure but also will suggest policy imperatives for further refinement of the scheme.

The Department acknowledges the collective efforts made by the professional teams. The Department also acknowledges the cooperation of the FIST grantee institutions, and other stakeholders who made successful completion of the study possible. The insight brought out will certainly pave the way to make our institution globally recognized.

(Ashutosh Sharma)

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PREFACE

The nation is at a cross road with the new economic policy for achieving Atmanirbhar Bharat. Strengthening country's S&T infrastructure has become more important at this juncture to make our S&T and innovation capabilities at par with the best in the world.

Launched in 2000, FIST has become one of the most important S&T infrastructure development programme supporting excellence as well as handholding aspiring institutions, departments and faculties across the country. As the programme spread across the country, over different S&T disciplines and institutes, several issues regarding outcome and efficient management of the programme at different levels were being comprehended. An evaluation study has been initiated in 2008 for addressing some of such issues. Eight years letter, it was thought appropriate to look back for a comprehensive understanding of the achievements, limitations and way forward for the programme.

The present Impact Evaluation Study and the Report on FIST programme is the result of the above concern and follow up initiatives. The Study has been conducted in a Network mode, where five zones (East and North East; South, North, Central and West) being coordinated by the Central Coordinating Unit (CCU), were studied by regional units with a common questionnaire. The CCU was also responsible for collating and processing the data collected by the regional units, and also developing a uniform format for the regional as well as the National Report. Nevertheless, the study report has been immensely shaped by the critical inputs and efforts of regional PIs with distinct focus namely, bibliometric analysis by Southern region, success stories by North region, survey analysis and tabulation by Central and West regions and finalization of the National Report including executive summary and recommendations by East and North East region. The conduct of the impact study and the report have also been immensely benefited from the constant support, cooperation and valuable guidance of the scientists form DST-FIST programme and members of Project Steering Committee. The evaluation study Report, therefore, is comprised of five regional Reports and the present National Report.

I am sure the report throws important insights about the outcome, and effectiveness of the FIST programme that would lead to further refinements during its future course.

(Dr. Parveen Arora)

ACKNOWLEDGMENT

It is difficult to find words to express thanks and gratitude for encouragement and support extended from various sources at different phases of implementing this project since its inception. First and foremost, I would like to express my sincere gratitude to the Department of Science and Technology (DST), Govt. of India, for imposing faith to carry out this study.

We acknowledge with thanks to Dr. Parveen Arora, Head, Centre for Human Organisation and Resource Development (CHORD) Division and Dr. A. N. Rai, Scientist-G, CHORD division for their constant overwhelming support and able guidance from the very beginning of this study and their understanding helps a lot to overcome all the critical constraints and practical difficulties faced while its execution.

We also acknowledge the contributions of the Project Steering Committee, in the implementation of the project, at its various stages for their overall guidance and direction in achieving the objectives of the study, especially the Chairman Dr. W. Selvamurthy, Former Chief Controller R&D, DRDO, Govt. of India, and the expert members, namely Prof. Suneet Tuli, Ex- Dean, Research, IIT Delhi, Prof. Harikesh Bahadur Singh, Institute of Agricultural Sciences, BHU, Varanasi. Prof. Utpal Bora, DBBIIT, Guwahati, and Dr. Meenakshi Sood, JUIT, Solan for their overall direction and guidance.

Our special thanks go to FIST division officials, DST, for rendering support in providing necessary inputs about FIST recipient universities/institutions/colleges without which this study could not have been possible. Our special thanks to Dr. A. Mukhopadhyay (Ex Advisor, Former Head, DST FIST), Mr. S. S. Kohli (Head, R&D Infrastructure Division), Mr. S. S. Rao, Dr. Pratishtha Pandey, and Dr. Arindam Bhattacharyya for their full cooperation and valuable insights provided time to time.

We also acknowledge all the Coordinators and Co-coordinators' contributions without which this study could not have been possible.

We also sincerely acknowledge all the FIST recipient universities/ institutions/ departments/ colleges and other stakeholders for providing their generous support for the completion of this study.

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RECOMMENDATIONS AND POLICY IMPERATIVES

Efficacy of the FIST Programme

1. The FIST support has demonstrated a very positive impact on the working environment, academic and research output of recipient departments and institutions across the country in the S&T sector and strongly calls for the FIST scheme's continuity.

2. Due to this program, less endowed regions and institutions have benefited immensely, which has created expectations for support to more institutions from remote and lesser endowed areas. A policy initiative to address these issues by the Department is earnestly required.

3. The number of privately-owned higher education institutions has grown rapidly over the last decade but hasa negligible presence in the FIST grant list. This aspect requires to be looked into.

4. The scope of the Level-0 grant should focus on the uplift of Postgraduate research and training infrastructure rather than teaching.

Deriving the best out of the programme

5. The hiring of trained technical staff to operate the equipment purchased under the FIST grant has been a severe problem in many cases. The department should seek clear information on such requirements and include the cost incurred in hiring a trained operator in the total grant.

6. Provision for annual maintenance (AMC) of major equipment during its expected lifetime and provision for import duty and other overhead expenses, especially in the case of imported equipment, were felt necessary.

7. Permission may be granted for external usage of these facilities for MSMEs and other private users to facilitate revenue generation, which may be used to maintain and upkeep the facilities.

8. Create/Maintain an online centralized MIS on FIST grants and its associated activities in DST for effective management of the programme and in imparting timely requisite policy thrust towards strengthening, providing better access and optimum utilization of S&T infrastructure in the country.

Administrative Issues

9. The Coordinators should be provided more financial autonomy with proper responsibility to ensure the project's speedy and smooth implementation. A guideline should be evolved by DST consulting some financial experts.

10. Project Co-ordinator's change due to superannuation, promotion, rotation or migration, etc., or any other change should immediately be informed to DST-FIST Division for further action and updating on the website.

11. Reduction in the time lag between sanctioned and purchase of equipment is required. The reason forthe delay in procurement of equipment should be investigated separately, and remedial measures should be taken wherever possible. A detailed guideline for the procurement process should be prepared with an objective to achieve transparent and speedy procurement and installation of equipment.

EXECUTIVE SUMMARY

The present study evaluated 1359 FIST grants amounting to Rs.96194.8 lakhs, provided to 1170 departments from 380 institutions across the country for grants during 2000-2011. Since the project grant is given for 5 years, the study effectively covers the impact up to the year 2016.

Structure of the Report

The report is structured in nine main chapters, the ninth chapter being on summary and conclusion. The first chapter introduces the study's orientation with a brief reference to other programmes that address the S&T infrastructure for S&T research and education. It also draws attention to the S&T infrastructure-related concerns in different countries and schemes and programmes thereof. The discussion highlights the high rate of obsolescence, management, maintenance, and sharing for optimum utilization of the expensive equipment to derive the best possible outcome.

Methodological Note

The methodological guideline for the study has been drawn from the review of selective literature to narrow down to empirically examinable issues. Among other aspects, the distinction between Direct and Indirect impacts turned out to be an important methodological emphasis. Based on the methodological guideline, detailed planning was done for the kind of data and information that was to be collected in line with the objectives of the study. The study has been executed through five regional units (East and North East, South, North, Central and West) coordinated through a Central unit. The study has been designed to focus on the characteristics of the grantees and corresponding impacts, direct and indirect.

Grants and Grantees

Grantees have been seen in four different tiers, namely, States, Institutions, Departments, and Principal Investigators (PIs). The overall picture that emerges is a policy push towards building up capacity and capability in the lesser endowed regions and institutes. There are states with very few S&T institutes along with states that have in hundreds. Among the grantees, there are more than hundred years old institutes along with others that are less than 10 years old. The recent decades have witnessed private initiatives towards establishing S&T Institutions. The FIST grant over the years included such private institutes as well. However, Public institutions in India received a significant

share of the FIST grant. About 47.5% of the funds were provided to Central Government Institutions and 43.3% to State Government Institutions. Only 8.3% (information missing for 0.9%) went to private institutions and constituent colleges. Correlations indicate older institutes are also being benefitted through the scheme.

Most of the projects granted to the institutions in different states are in the Level-I category, i.e., 55% of the total support was given to the Level-I category, followed by the Level-II category (40%) and Level-0 category (5%).

The majority of the institutions that received FIST grants are endowed in terms of the facilities and infrastructures like a library, internet facility for faculty, computerized admission, computational facilities, and placement cells. However, the presence of IPR cells and incubation centres in the institutions is much less.

Most of the PIs are male. Female representation as PIs is lowest in Uttarakhand and West Bengal. Working PIs constitute around 50%. The rest either superannuated or left the position for alternative opportunities.

Impact of the FIST Grants and Associated Issues

The study has distinguished between direct and indirect impact of the FIST grant; direct impact being the projected impact; like new equipment and how it would strengthen the education and research infrastructure; indirect impact, on the other hand, is derived impacts that cannot be directly attributed to the FIST grant but has perceivable contributions to the academic achievements of the grantee departments. Again, direct impacts are reasonably easily identifiable and attributable to the actions (in this case, the mandates of the grants). On the other hand, indirect impacts are the results of many other associated actions. Therefore, anyone attribute cannot be singled out.

Direct Impact of the FIST Grants

The direct impacts of the FIST grant are tangible changes in the grantee institutions' infrastructure and occurring at the same time and space.

All levels (Level-0, Level -I, Level -II) accounted for a total amount of grant sanctioned during 2000 – 2011 was Rs.961.95 crores, of which Southern states had a share of 42.95% followed by E&NE states 18.33% and Central region states 14.15%. North and West have 13.51% and 11.06%, respectively. Out of 18.33% share of E&NE, West Bengal has a share of 9.87%; along with Odisha

and Assam, it is 13.71%. Similarly, out of 42.95%, Tamil Nadu and Karnataka get a share of 31.24% among the southern states. More striking is the central region, where out of a share of 14.15%, UP takes away 12.84%. For the North Region, out of total share of 13.51%, Punjab and Delhi together share 7%. In the West Region, Maharashtra has a share of 6.33% out of a regional share of 11.06%.

Seen in terms of each state's share in GDP and population, the flow of the FIST grant indicates that push has been given to the institutions from less endowed states like Jharkhand, Himachal Pradesh, Goa, and North-Eastern states, as these states' share in the total number of FIST projects and grant amount received closely match their respective shares in GDP and population. At the same time, states like Tamil Nadu, West Bengal, Karnataka, and Maharashtra, having a higher share of S&T institutes and institutes of national repute in science education and research, received major support.

Out of total expenditure, 87% of FIST grant was spent on procurement of equipment, 5% on computer, networking & internet, 3.2% on equipment repair, 2.5% on a renovation, 1.2% on books, and 1% on other miscellaneous works.

Evaluatingthe equipment's utilization and current functional statusshowed that more than 70% of the equipment procured during the last 5 years under FIST assistance are functional. Also, high-cost equipment (>50 lakhs) isin better working condition than the low-cost equipment, as the share of high-cost equipment under annual maintenance contracts (AMC) was much higher than the low-cost ones.

Indirect Impacts

There are overwhelming evidence and responses suggesting highly significant positive changes post FIST. There have been changes in the workplace, capacity building, manpower strength, research output, and associated collaborations.Post FIST grant, there has been a considerable improvement in the volume of research. Paper publication in high impact factor journals and citations of the papers increased significantly, so has been faculties receiving national and international awards. However, the patenting and commercialization of technology have not accelerated much. More than 42% of grantees reported a significant change in motivation for innovation.

Though post FIST, universities did not gain much in terms of manpower. However, there has been a significant rise in student intake capacity at the graduate and postgraduate courses and research (MPhil. and Ph.D.). Also, there has been a considerable increase in the students' pass percentage, including competitive examinations.

Post FIST grant, there has been a considerable improvement in the volume of research. There is a sort of unanimity that paper publication and quality of publication after the FIST grant improved. Paper publication in high impact factor journals and citations of the papers increased significantly, so has been faculties receiving national and international awards. However, patents and commercialization of technology have not accelerated much. There is an improvement, post FIST, in research publications and collaboration. More than 42% of grantees reported a significant change in motivation for innovation. Though universities did not gain much in terms of manpower post FIST, there has been a considerable rise in student intake capacity. Student intakes in graduate and post-graduate courses and research (M.Phil. and Ph.D.) have shown a significant increase, and the pass percentage of the students' post FIST has also increased substantially.

While the general perception on the impact of FIST is a significant improvement in research outcome; simplification of the procurement process, and increase in internal capacity of equipment maintenance; There are issues like administrative support from the institutions, delay in the release of funds, and inadequate trained technical manpower, etc., that require more attention. There are grey areas like financial support for AMC and more financial autonomy to Principal Investigators. These areas need to be addressed for improvement in the impact of the FIST program.

A bibliometric study provides full support to the above observation. The study shows that, as expected, until 2003 (3 years after the introduction of FIST), only two papers acknowledged FIST, and the number went up to 7289 by 2020. It is indicative of the fact that FIST was an effective catalyser in S&T research in the country.

Attributes of the Impacts

The **Direct** and **Indirect Impacts** have been further elaborated in terms of certain selective attributes at the state, institution, and Principal Investigator (PIs) levels.

Evaluating **Direct Impact**- The correlation coefficients indicate some sort of hypothesis that some grantee departments are not equipped enough (sort of motivational or leadership issues) for deriving the best out of the grants. Also, it appeared that equipment is in better upkeep condition and better utilized in younger institutions. Also, it has been seen that PIs in senior positions help improvement in the working environment.

Evaluating **Indirect Impact**- On the academic achievements of the faculty of the grantee departments, it has been seen that a higher share in number of FIST project and FIST funds and also

with a higher % of working status of the equipment result inhigher academic achievements. At the institution level, facilities available show a negative correlation with academic achievements. It suggests that academic leadership is important for deriving benefits from the S&T infrastructure. This is somewhat reflected at the PI level, where it is seen that the middle-level leadership of associate professors are highly positively correlated with academic achievements.

Lack of funds for AMC turned out as a significant issue. This issue did come up in many occasions during visits and discussions with the PIs and the faculty of various institutes. Inadequate space and lack of technical manpower (both faculty and technical staff) are the other woes.

Success Stories

Ten stories, two from each region, corroborate some of the observations made above. The leadership of the PIs in particular and initiatives of the faculties, in general, has been the main stay of the successful implementation of the projects. It is leadership again that motivated wider utilization of the equipment by students and researchers. And such endeavours are reflected in research output, recognitions, and collaborations. Furthermore, most of the success stories indicate that administrative support within the Institutions has been crucial both for implementing the project and extending the utilization of the same within and beyond the department and institution.

KEY FACTS AND FINDINGS

Overall, there is a tremendous appreciation of the FIST programme among the grantee institutions across India. There is a consensus among the respondents that FIST has helped strengthen the institutions and opened up opportunities for faculties and students of the recipient departments. The DST-FIST has played the twin role of supporting advanced research and education in established and renowned institutions on the one hand, and handholding other institutions to promote higher education and research.

Background of FIST

- The total amount sanctioned under FIST during the year 2000-2011 was Rs.124533 lakhs.
- FIST has provided 1623 grants during the year2000-2011
- Funding is given at Level-0, Level-I, and Level-II. Level-I and II were started in the year 2000, and Level-0 was started in the year2009.
- The upper limit for assistance to Level-0 grant was Rs.50 lakhs, and it was revised to 100 lakhs in the year 2010. This grant is not specific to any subject area and is usually provided to colleges.
- The upper limit for Level-I grant was Rs.100 lakhs, and it was revised to 300 lakhs in the year2006.
- The upper limit for Level-II grant was Rs.200 lakhs and was revised to 1000 lakhs in 2006.
- Level-I and Level-II grants are area-specific and cover Engineering and Technology, Chemical, Physical, Mathematical, Earth and Life Sciences.

Contd.

KEY FACTS AND FINDINGS

Impact on Working Environment and Academics

- More than 42% of grantees reported a significant change in motivation for innovation.
- Research Publication & Collaboration was the most important contributor to improve departments' working environment (32.5%).
- The pass percentages of the students with better divisions and grades increased and increased the success rate in competitive exams, with more students qualifying national level tests.
- Although there are not much significant improvements in the faculty positions of the grantee departments, there are significant positive changes in student intakes in higher degree courses.
- Pass percentage in Graduate and PG program with A grade or First division increasedby4%.
- The success rate in a national test like NET, GATE, and SLET increased in the range of6.7 to 18%.
- Each department organized 11.2 more capacity building and knowledge sharing activities after FIST assistance.
- The success stories suggested the important role of PIs and faculty members in successfully implementing and utilizing FIST grants. Administrative supports also turned out to be an important factor for the same.
- There are, however, issues related to AMC and support of technical manpower. In many cases, projects suffered because of fund provisions in this count.

Contd.

KEY FACTS AND FINDINGS

Impact on Research Output

- Publication rate of the articles increased by 81% per department post FIST grant.
- There are significant positive changes in research publication with higher citations in higher impact factor journals.
- Improvement of impact factor was reported by 93% of respondents.
- Improvement in citation index was reported by 92% of respondents.
- Along with the increase in quality and volume of research, there has also been an increase in Fellowship, national and international collaboration and award, recognitions for the faculties.
- These activities were highest in private institutions, followed by central and state-governed institutions.
- Improvement in extramural and intramural grants was reported by 74% and 66% of respondents, respectively.
- Positive trend was observed in the commercialization of technology (27%), product and process development (41%).

Satisfaction Level and Way Forward

- More than 96% of grantees were satisfied with the utilization of infrastructure. About 9% of respondents were not happy with the procurement process.
- Grantees satisfied with fund utilization and administrative support were 94.7% and 91.4%, respectively.

Positive Points

- Improvement in research outcome, working environment, and infrastructure
- Simplification of the procurement process and smooth funding.
- Centralization increase in internal capacity of equipment maintenance.

Constraints

- Lack of funds for AMC and import overheads
- Lack of trained manpower
- Poor administrative support within the Institutions and delayed funding.

ACRONYMS

List of Acronyms	
AAA	Academic & Administrative Assurance
AAS	Atomic Absorption Spectroscopy
AICTE	All India Council for Technical Education
AIIMS	All India Institute of Medical Science.
AMC	Annual Maintenance Contracts
AP	Andhra Pradesh
BHU	Banaras Hindu University
CAT	Common Aptitude Test
CCU	Central Coordinating Unit
CHORD	Centre for Human and Organisational Resource Development
CSTS	Centre for Science and Technology Studies
DAAD	DeutscherAkademischerAustauschdienst
DBT	Department of Biotechnology
DST	Department of Science & Technology
E&NE	East & North East
ERA	European Research Area
FIST	Fund for Improvement of S&T Infrastructure
GATE	The Graduate Aptitude Test in Engineering
GDP	Gross Domestic Product
GIS	Geographic Information System
HOD	Head of the Department
HP	Himachal Pradesh

HR	Human Resources
ICAR	Indian Council of Agricultural Research
IIT	Indian Institute of Technology
IPR	Intellectual Property Right
ISO	International Organization for Standardization
KNIDS	Centre for Knowledge Ideas and Development Studies
MET	Mumbai Educational Trust
MIS	Management Information System
MRI	Magnetic Resonance Imaging
MSME	Micro, Small and Medium Enterprises
NAAC	National Assessment and Accreditation Council
NABL	National Accreditation Board for Testing and Calibration Laboratories
NE	North East
NER	North Eastern Region
NET	National Eligibility Test
NETS	Neurosurgery Education and Training School
NSTMIS	National S&T Management Information System
PG	Post-graduate
PI	Principle Investigator
PM	Prime Minister
PPP	Private Public Partnership
RI	Research Infrastructures
SAHAJ	Scientific Infrastructure Access for Harnessing Academia Universal Research joint Collaboration
SAIF	Sophisticated Analytical Instrument Facilities

SATHI	Sophisticated Analytical &Technical Help Institute
SCI	Science Citation Index
SET	State Eligibility Test
SGDP	State Gross Domestic Product
SGPGIMS	Sanjay Gandhi Postgraduate Institute of Medical Sciences
SPR	Science Policy Resolution
SPSS	Statistical Package for Social Sciences
SRIMAN	Scientific Research Infrastructure for Maintenance and Networks
SRISTI	Shared Research Infrastructure for Science, Technology and Innovation
STI	Science Technology and Innovation
STIP	Science, Technology and Innovation Policy
STP	Science and Technology Policy
TPS	Technology Policy Statement
UG	Under Graduate
UP	Uttar Pradesh
USA	United States of America
UT	Union Territory
UV	Ultra Violet
VSM	Value stream mapping
XRD	X-Ray Diffraction

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Chapter 1: Introduction

Abstract

Complementarity between S&T and economic policies is well recognized and evident in the European initiatives intertwining S&T policies with economic policies. In India, however, S&T education and Research have been disconnected from the production system, a fact that had received recognition in the Science Policy Resolution of 1958 and subsequent policies for strengthening self-reliance and promoting innovations in the Indian production system. DST-FIST bears the imprint of these policy emphases. FIST is a major initiative for augmenting S&T education and research infrastructure in India. This chapter traces the genesis of the programme and relates it to the global concerns on S&T infrastructure and associated policies. It also refers to other infrastructure-related programmes and initiatives in India and possible synergy among them. The chapter is divided into the following sections:

1. S&T policies and genesis of DST-FIST
2. Other programme on S&T Infrastructure
3. Impending Issues on S&T Infrastructure
4. Need for the Present Study
5. Chapter Plan of the Report

1: S&T Policies and Genesis of DST-FIST

"History suggests that the countries that have managed to grow rapidly have done so by doing many things right, not just one or two things. With respect to such policies, it appears that potential pay-offs may be very high, but only if science and technology are perceived as complements to effective economic policies, not as substitutes." Rosenberg (1990).

Historically, developed economies of Europe successfully intertwined the economic policies with the S&T policies. These countries have enjoyed the time-tested tradition of private initiatives in S&T research through University-industry collaborations. The result has been a robust S&T research system with enviable S&T infrastructure and some European countries emerging as knowledge and technology hub and innovation superpower. Unlike Europe, science education and research in pre-independence India remained disconnected from the production system or economic priorities. The first-ever government policy, in this regard, has been enunciated in the Science Policy Resolution (SPR), 1958. This policy emphasized on building suitable infrastructure for science education and the practice of science. The 1960s, therefore, witnessed the establishment of several institutions of

national importance for science education and R&D. The SPR 1958, however, had the underlying assumption that the knowledge pool thus created would be carried to the production system and enrich the economy in its endeavour to become self-reliant in high technology areas.

With the gradual realization that technology rules the roost, and science education and R&D do not smoothly flow to technology and to the production system, a policy with a special focus on technology generation priorities has been the felt need. The Technology Policy Statement (TPS) 1983, therefore, emphasizedthe strengthening of indigenous technology base addressing the vulnerability of technology dependence and also developing capabilities in the emerging areas like information technology, electronics, and biotechnology. That was the time when globalization, coupled with economic liberalization, was becoming the new world economic order. The year 1991 saw a major shift in Indian economic policies through the liberalization of the Indian economy. This made the policy of technology self-reliance (as the guiding principle of TPS 1983) dormant. Nevertheless, these three policies spearheaded the initiatives for building valuable infrastructure for S&T education and research. Globalization, as a direct fall out of the revolutionary changes in technology with its consequent ramifications on social and economic practices, necessitated revamping the practice of S&T education and research and necessary infrastructure. The very first concrete initiative in this regard has been launched in the year 2000 as DST-FIST [1](Fund for Improvement of S&T infrastructure) with a budget of Rs.75 crores to complement and match the aspiration of the country for a significant presence in the global market place where the winning rule is fostering technological advantage. The programme envisaged facilitating and strengthening R&D infrastructures in universities and institutions of higher education. The FIST programme began with selected areas of research and also with institutes/universities of recognized expertise. Over the period of execution, priority areas, institutes/universities, and fund size expanded substantially. The investment under the FIST programme has crossed Rs.2000 crores over the last two decades. The total fund increased substantially over the years. A review of the programme was taken up in the year 2008 in the form of an impact study for the grants received during 2002-2005 and 2002-2007[2]. The study highlighted the substantial impact and gains of the initiative, thereby substantiating the FIST programme's enhanced activities. Another thrust for such initiative came from the Science and Technology Policy (STP) 2003 that outlined the roadmap involving all stakeholders for building an STI ecosystem that would help mobilization of human and physical resources for both investments in

[1]See www.fist-dst.orgfor details of the programme

[2]The study was based on 213 responses out of total 459 recipients of the grants during 2000-05 and 2002-07.

R&D and as well as strengthening education and research infrastructure in the universities and institutes. It set a target of achieving 2% GDP for R&D. The FIST programme, therefore, got a fillip and expanded both in numbers of projects funded and also the volume of funding. In the following we present the chronological development of the programme over time. Also,the actual execution of the programme in terms of a number of projects, the fund invested, over the states, and levels of funding. Table 1.1 presents the chronological development of the programme. It is to be noted that when the scheme was formally launched in the year 2000, funding used to be divided at two levels (Level -I and Level -II) with financial limits of Rs.100 lakhs and Rs.200 lakhs respectively for both govt. and private organizations. In the year 2006, the limit was extended to Rs.300 lakhs (Level -I) and Rs.1000 lakhs (Level -II), with a caveat of 50:50 modes for private organizations. In the year 2009, a new Level (Level-0) was introduced with Rs.50 lakhs' financial limit exclusively for PG colleges, not for any specific department of the college. Subsequently,the limit was extended to Rs.100 lakhs in 2010 and again to Rs.150 lakhs in 2017. Named Level-3, a new level was introduced in 2018 exclusively for such 'Departments those who have already been supported for two cycles at Level -II and have obtained at least one Very Good and/or Excellent in each/ both of these cycles of support'. In the year 2019, further notification was made reiterating, 'Support (@100%) would be provided for pure Govt. organizations only for high-quality research; teaching activities would be discouraged. For Private self-financed as well as Govt. aided organizations, the sanctioned grant would be provided on 50:50 mode (i.e., 50% by Govt. and 50% by the Private/ Govt. aided organization) only for high-quality research'. Then there were special FIST packages for states and regions from where there were not many applications for funding. These states and regions were identified as Bihar, J&K, and North-East states. 'Three Special Package programs: one for the states in the North-East Region (2008), Jammu & Kashmir (J&K) state (2009) and Bihar (2012) were initiated for augmentation of the teaching and research facilities at the S&T departments of the Colleges and Universities. While the NER Special Package is developed for a total estimated cost of Rs.70 crores for five years and J&K and Bihar state are about Rs.60 crores and Rs.76 crores respectively for 5 years duration'.

Table 1.2 presents the year-wise extent of FIST grants to institutes, departments and the amount sanctioned. It also shows the spread of the programme across the country. It is apparent that Tamil Nadu, Karnataka, Maharashtra, and West Bengal have the most active institutions using the FIST grant advantage. Table 1.3 presents the progress of FIST under different levels over the years. Figures 1.3a and 1.3b present the trend in FIST funding (number of projects and size of the fund). It

is evident that there is a dip in the number of projects supported under FIST. It never touched again the high of 2000 (221) and 2002 (231) after a sharp decline in numbers in 2005 (81) and 2006 (96). Table 1.4 shows thesubject areas covered under the FIST programme. About 57% of the grant went to Engineering and Technology and Life Sciences, followed by Chemical and Physical sciences (17% and 13% respectively). Earth sciences' share was about 7%.

Table 1.1: Chronological Development of FIST 2000 - 2019

Year	Chronological Development	Purpose
1999	Scheme was conceptualized	To facilitate support towards augmenting higher education and research largely at the Departments of Universities and other academic sectors (including PG Colleges) by augmenting basic infrastructural facilities for teaching as well as for conducting research in basic or applied S&T areas. Support (@100%) was extended to both Govt. and Private organizations for both PG teaching and advanced research.
2000	FIST was formally launched at 2 levels with financial limits: Level-I: up to Rs.100.0 lakhs Level-II: up to Rs.200.0 lakhs	
2000-2005		
2006	Upper limits at both the levels were revised: Level-I: up to Rs.300.0 lakhs Level -II: up to Rs.1000.0 lakhs	Support (@100%) was provided to only Govt. and Govt. aided organizations for both PG teaching and advanced research infrastructure. For Private self-financed organizations, the sanctioned grant was provided on 50:50 modes (i.e. 50% by Govt.and 50% by the Private organization) for only research purpose.
2009	FIST support revised to3 levels with financial limits: Level-0: up to Rs.50.0 lakhs Level -I: up to Rs.300.0 lakhs Level -II: up to Rs.1000.0 lakhs	Introduction of Level '0' support exclusively for PG Colleges. The unit of support was College as a whole rather than individual Departments of the College.
2010	FIST support quantum was revised with financial limits: Level-0: up to Rs.100.0 lakhs Level -I: up to Rs.300.0 lakhs Level -II: up to Rs.1000.0 lakhs	Upper limit of support for the PG Colleges at Level '0' was revised to Rs.100.0 lakhs from Rs.50.0 lakhs.
2017	FIST support quantum was revised with financial limits: Level-0: up to Rs.150.0 lakhs Level -I: up to Rs.300.0 lakhs Level -II: up to Rs.1000.0 lakhs	Upper limit of support for the PG Colleges at Level '0' was revised to Rs.150.0 lakhs from Rs.100.0 lakhs.

2018	FIST support revised to 4 levels with financial limits: Level-0: up to Rs.150.0 lakhs Level -I: up to Rs.300.0 lakhs Level -II: up to Rs.1000.0 lakhs Level-III: up to Rs.2000.0 lakhs	Introduction of Level '3' support exclusively for such Departments those which have already been supported for 2 cycles at Level -II and have obtained at least one Very Good and/or Excellent in each/both of these cycles of support.
2019	FIST support levels with financial limits: Level-0: up to Rs.150.0 lakhs Level -I: up to Rs.300.0 lakhs Level -II: up to Rs.1000.0 lakhs Level-III: up to Rs.2000.0 lakhs	Support (@100%) would be provided for pure Govt. organizations only for high quality research; teaching activities would be discouraged. For Private self-financed as well as Govt. aided organizations the sanctioned grant would be provided on 50:50 mode (i.e. 50% by Govt. and 50% by the Private/ Govt. aided organization) only for high quality research.

*Source: DST-FIST

Table 1.2: State-wise expansion of the FIST across the country* (2000 – 2011)

State/UT	Amount (Rs. in lakhs)	Project (no.)	Department (no.)	Institution (no.)
Arunachal	110.00	1	2	2
Assam	3375.50	53	48	9
Jharkhand	1335.00	18	14	3
Manipur	583.00	10	7	1
Meghalaya	614.50	11	2	1
Mizoram	193.00	3	3	1
Nagaland	103.00	3	3	1
Odisha	2300.00	38	35	13
Sikkim	20.00	1	1	1
Tripura	122.50	5	5	1
West Bengal	15926.50	187	146	34
E&NE	**24683.00**	**330**	**266**	**67**
A & N	84.00	1	1	1
AP	1940.00	36	34	7
Karnataka	15223.30	127	110	28
Kerala	5017.65	112	112	55
Puducherry	976.50	12	13	3
Telangana	4356.00	56	47	12
Tamil Nadu	18262.52	259	233	71
South	**45859.97**	**603**	**550**	**177**
Delhi	9679.50	71	57	11
Haryana	1152.00	27	24	7
HP	945.00	18	19	4

State/UT	Amount (Rs. in lakhs)	Project (no.)	Department (no.)	Institution (no.)
J&K	1334.50	24	23	5
Punjab	4503.50	75	66	18
Uttarakhand	3749.50	49	43	10
North	**21364.00**	**264**	**232**	**55**
Bihar	112.00	4	4	3
Chhattisgarh	354.00	10	10	5
MP	1106.00	28	28	15
UP	13864.05	119	100	31
Central	**15436.00**	**161**	**142**	**54**
Goa	804.50	15	13	2
Gujarat	2354.50	41	41	13
Maharashtra	10630.50	147	76	61
Rajasthan	3400.00	62	52	20
West	**17189.50**	**265**	**182**	**96**
Total	**124532.52**	**1623**	**1372**	**449**

*The States have been arranged in regions – the way it has been divided for the convenience of the study

Source: DST-FIST division

Table 1.3: Year-wise expansion of the FIST under different levels over the years (2000-2011)

Year of Sanction	Number of Grants				Amount (Rs. in lakhs)
	Level - 0	Level - I	Level - II	Total	
2000	0	123	98	221	11292.15
2002	0	143	88	231	10063.75
2003	0	140	43	183	7344.50
2004	0	80	31	111	4245.00
2005	0	51	30	81	4688.50
2006	0	74	22	96	11262.00
2007	0	90	50	140	20812.75

Year of Sanction	Number of Grants				Amount (Rs. in lakhs)
	Level - 0	Level - I	Level - II	Total	
2008	0	118	40	158	14268.00
2009	13	45	31	89	8763.42
2010	30	81	38	149	14293.65
2011	45	74	45	164	15265.30
Total	88	1019	516	1623	122299.02

Note: Level-0 started in the year 2009; Source: DST-FIST division

Fig. 1.3a: Expansion of FIST projects over the years 2000-11 (trend using polynomial)

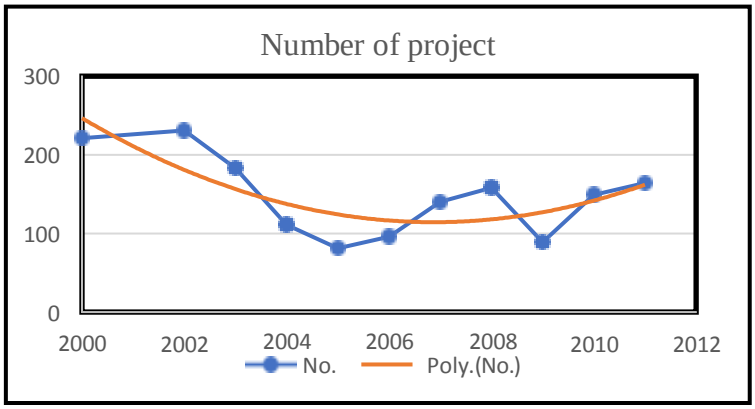
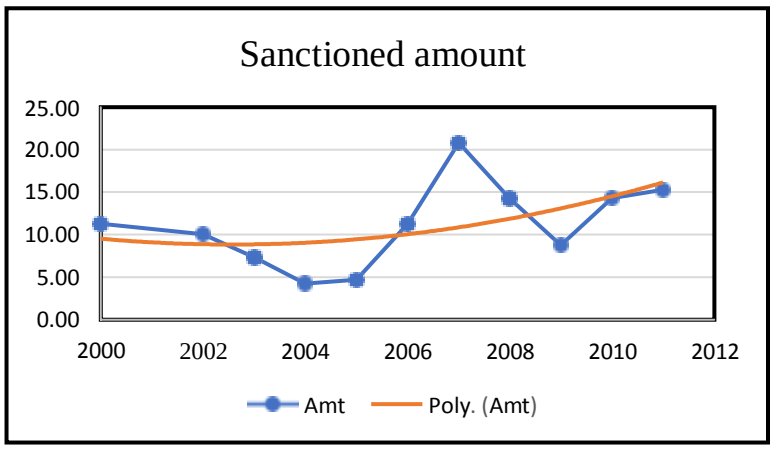


Fig. 1.3b: Size of the FIST grants over the years* 2000-11(trend using polynomial)



*Amount is not inflation adjusted

Table 1.4: Discipline-wise expansion of the FIST (2000 – 2001)

Subject Area	Number of Grants				Amount (Rs. in lakhs) (%)	
	*Level - 0	Level - I	Level - II	Total		
Eng.& Technology	-	175	169	344	39409.00	(31.65)
Life Sciences	-	387	144	531	31069.00	(24.95)
Chemical Sciences	-	167	84	251	21004.00	(16.87)
Physical Sciences	-	130	60	190	16331.00	(13.11)
Earth Sciences	-	89	40	129	9148.00	(7.35)
Mathematical Sciences.	-	71	19	90	2060.00	(1.65)
General (Level-0)	88	0	0	88	5512.00	(4.43)
Total	88	1019	516	1623	124533.00	(100.00)

*Not subject-specific, Started in 2009

2: Other Programmes on S&T Infrastructure

There was another thrust on technological innovations in the subsequent policy known as Science, Technology, and Innovation Policy (STIP), 2013. The decade of 2010 has been declared as the decade of innovation, as recognition of the fact that in the globalized world, to remain competitive in the global market, the imperative is the creation of science-led technological advantage. An important action point has been building an innovation ecosystem with the active participation of the private sector in the directed R&D programmes.

Apart from FIST, DST also has initiated programmes like SAIF and SATHI to augment sophisticated instruments and equipment for a higher level of R&D. Under Sophisticated Analytical Instrument Facilities (SAIF), eighteen such facilities created at different institutes of excellence across the country. The programme is executed through the web portal Shared Research Infrastructure for Science, Technology and Innovation (SRISTI), and annually it provides services to nearly 15,000 users. On the other hand, the Sophisticated Analytical &Technical Help Institute (SATHI) are located in IIT Delhi, IIT Kharagpur and BHU Varanasi for providing professionally managed services with efficiency, accessibility, and transparency of highest order under one roof to service the demands of industry, start-up, and academia.[3]

SRIMAN[4] (draft policy, yet to be announced) provides a guiding framework for developing a regional ecosystem for the following:

[3]For details see https://dst.gov.in
[4]For details see https://dst.gov.in

- Procurement and maintenance of equipment and infrastructure for research
- Providing access to and sharing of scientific equipment and infrastructure
- Disposal of scientific equipment and infrastructure
- Capacity Building of operators and technicians for efficient operations
- Monitoring of usage of expensive scientific research infrastructure
- Infrastructure Management for efficient operations

Like DST, other S&T departments like the Department of Biotechnology (DBT) also initiated infrastructure-related programs known as Scientific Infrastructure Access for Harnessing Academic University Research Joint Collaboration (SAHAJ). Under this programme, each DBT Autonomous Institute and DBT are supported. Infrastructure programme will make available its high-end equipment and infrastructure to Research Institutes, Universities, colleges, and start-ups/entrepreneurs[5].

3: Impending Issues on S&T Infrastructure

While these initiatives have taken wings, the high rate of obsolescence and continuous sophistication of instruments and equipment for scientific research has the imperative that strengthening of R&D infrastructure is a continuous process. In the Draft, the SRIMAN policy statement of DST is envisaged, 'development of research infrastructure is costly. Hence, it becomes important for a developing country like India to carefully plan for it and develop mechanisms for its efficient use. Research Infrastructure (RI) has taken centre stage among developing and developed countries with a growing focus on enhancing social and economic value and promoting development based on science and technology. Therefore, the development of scientific infrastructure is critical for the advancement of nation with ease of access and greater emphasis for optimal utilization.'[6] These programmes echo the spirit that has been expressed in the Prime Minister's address in the Science Congress (104th Indian Science Congress on 3rd January 2017). The PM said, "Building a strong S&T infrastructure that is accessible to academia, start-ups, industry and R&D labs is a priority of thegovernment. To address the problems of ease of access, maintenance, redundancy, and duplication of expensive equipment in our Scientific Institutions. The desirability of establishing professionally managed, large regional centres in PPP mode housing high-value scientific equipment should be examined". The PM went a step further to highlight the issue of maintenance, redundancy, and duplication of

[5]For detail see dbtindia.gov.in
[6]For detail see htpps://dst.gov.in

expensive equipment. Programmes like DBT's SAHAJ and DST's SRISTI portal for SAIF and SATHI have been evolved based on the concepts for optimum utilization and management for sharing sophisticated equipment among scientists from different institutions and also for industries, particularly MSMEs and start-ups.

Even the developed economies, that traditionally had very strong research infrastructure, were also facing the need to revamp their research infrastructure to keep their foothold on technological superiority. Founded in 2011, Science Europe, the European association representing the interests of major public research performing and research funding organizations of Europe, observed in its policy document, "Research Infrastructures (RIs) are of utmost importance for Europe's global competitiveness" (Science Europe policy brief 'On Research Infrastructures in EU Framework Programming January 2017). Council of Canadian Academies declares overdrive for strengthening RIs in its policy declaration August 2019 to build the future of Federal Science. "Federal science happens in close to 200 laboratories and other major facilities across Canada, most of which are showing their age," "This report is timely and necessary if Canada is to become a leader in transforming science for society through the next generation of science and technology infrastructure." National Academies of Sciences, Engineering, and Medicine, USA outlines the need for strong RI for University Research and Teaching, Academic-industrial interfaces for technology development Infrastructure (National Research Council. 2003. Materials Science and Technology: Challenges for the Chemical Sciences in the 21st Century. Washington, DC: The National Academies Press.). Recently the UK government has increased budgetary support for research infrastructure to infuse life to its decaying RI. The Horizon 2020 of Science Europe policy brief also focuses on similar issues:

- World-class RIs attract world-class scientists who can address the grand challenges facing society. These grand challenges trigger complex research questions, requiring the production of high-quality data and attracting the best talents to address them.
- Excellent RIs often provide a nucleus for an ecosystem of research organizations, small and medium-sized enterprises (SMEs), and start-ups.

One of the principal assets of Europe is its rich and diverse landscape of regional and national RIs. This RIs need to be better connected so that European researchers can access the ones they need, regardless of their location in Europe. The transnational access mechanism of Horizon 2020, if used effectively, can enrich this connection and strengthen the European Research Area (ERA).

4: Need for the Present Study

For the execution of the policy of strengthening S&T infrastructure and optimum utilization of the same important issues identified in the above-mentioned policy documents are: (a) Identification of the priority areas, (b) Sources and extent of funding, (c) Utilization of the infrastructure created, (d) Operation, maintenance, and management of the facilities. In the developed economies, corporate funding of R&D and infrastructure is not rare in developing countries like India. Nevertheless, these documents recognize the fact that the flow of corporate funding is neither adequate nor easy for RI required for basic and high-end S&T research. Federal funding, therefore, has been considered as a necessity.

After about two decades of a push towards strengthening S&T infrastructure in the institutes of higher education and research, the reasonable look back is to assess its impact and need, if any, for course corrections or/and reinvigorate the programme. The issues mentioned above ((a) Identification of the priority areas, (b) Sources and extent of funding, (c) Utilization of the infrastructure created, (d) Operation, maintenance, and management of the facilities), however, also remain to be understood. The present report is the result of this felt need from the initiator, which is DST, of the programme. The report envisages to understand and identify the direct and indirect impacts of the FIST programme and also to highlight the impediments, if any, in the process of execution of the programme.

5: Chapter Plan of the Report

The Report is structured in the following chapters. Chapter-2 presents a literature review for developing an understanding of the issues in S&T infrastructure and associated initiatives for strengthening the infrastructure. The review would also indicate the methodological issues related to impact analyses of such programmes. Chapter-3 details the execution plan of the study. In Chapter-4, we detail the grantees in terms of the states, Institutions, departments, and the Principal Investigators (PIs). Chapter-5 is about the identification and understanding of the nature and extent of the direct impacts of the FIST programme. Chapter-6 does the same for indirect impacts. In Chapter-7, we try to evaluate both direct and indirect impacts in terms of certain selective attributes of the grantees at various levels/tires. Chapter-8 presents two success stories from each region to highlight the major understanding of the study. A summary, along with key findings and recommendations, is presented in Chapter-9.

Chapter 2: Review of Literature

Abstract

The review highlights the limitation of the econometric study of the return on investment in S&T and the distinction between output and impact. While the former is the direct result of S&T, the latter is the effect of the former on society. The second distinction is gains internal and external to S&T. Most of the available literature focuses on the external. The literature on the former has been pioneered by Pavitt (1991) and Martin (1996). FIST programme is about both internal and external return to S&T. The present study has used this approach defining the distinction in terms of Direct Impact (internal to S&T, or first-order impact) and Indirect Impact (effect or contribution of the direct impact, or second-order impact).

For a very long time, the literature on the impact of S&T used to be focused on economic gains from investment in S&T infrastructure and R&D. The pioneering work by Solow (1957) integrated S&T in the production function; and after estimating the contribution of labour and capital in the GDP, residual was attributed to S&T, which in Solow model was defined very broadly and also included non-S&T factors.[7] It is to be noted that by the end of the 1990's this particular area of research was going out of fashion. NSF's early observation on this issue ("the returns of (science) is so large that it is hardly necessary to justify or evaluate the investment" NSF: 1957) prevailed.

Limitations of the main econometrics studies brought two essential distinctions in understanding S&T and society/economy. First is the distinction between 'impact' and 'output.' More often than not, they are used interchangeably. The output is the direct result of science and technology, say a new product introduced in the market. The impact is the effect that this product would have on society and the economy. The studies on gains from S&T focused mainly on the output aspect, whereas studies on the impact of S&T are rare. (Godin and Dore (2005); Godin (2010)).

The second distinction is between gains as internal and external to S&T. There would both impact and output as internal and external returns to S&T. While the studies referred above dealt mainly with the external return of S&T, the internal return to S&T remained largely under-researched.

[7]Later years, Denison (1962; 1967), and Jorgenson and Grilliches (1958), among others, considerably improved the Solow model. There after research on this field took two different streams: a. impact of R&D on output and productivity growth (among others Coe and Helpman:1995; Grilliches:1980, 1986, 1995; Mansfield:1988; Nadiri: 1980; Verspagen: 1995) and b. impact on rate of return to investment (Bernstien: 1988, 1989; Grilliches: 1980, 1986; Mansfield: 1977, 1980; Odagiri: 1983, 1985; Terleckyj: 1974, 1980; Scherer: 1982,1984; Suzuki: 1993 – to name a select few).

Pioneering work in this regard was initiated in SPRU, Sussex, and CWTS, Leiden. Pavitt (1991) and Martin (1996) developed indicators that measure the gains for S&T. Salter and Martin (2001) later improved upon Pavitt and identified at least six categories of benefits:

- Increasing the stock of useful knowledge
- Training skilled graduate
- Creating new scientific instrumentation and methodologies
- Forming a network and stimulating social interactions
- Increasing the capacity for scientific and technological problem solving
- Creating new firms

The FIST programme is all about strengthening the S&T infrastructure of Universities and academic institutions. The impact assessment, therefore, has to carefully designed developing indicators that would refer to gains, both impact and output, as internal to S&T. About the programme FIST, DST website writes, "Considering the present status of the S&T sector in the universities and related academic institutions who are in dire need for strengthening the existing S&T infrastructure support with adequate funding and associated flexibility, Government of India in the year 2000 announced a major new initiative titled "Fund for Improvement of S&T infrastructure in universities & higher educational institutions (FIST)" to rebuild the Science & Technology infrastructure in the country. "The objective is to generate high calibre manpower and strengthen the repository of national intellectual wealth in Science & Technology (S&T) sector, which if channelized properly, may lead to socio-economic development."

Only a few studies are evaluating the outcome of the intervention in educational and research institutions. Most of the articles talk about the principles, guidelines, and methodology required for impact evaluation in general. Earle Janice (2013) developed a common guideline and report on behalf of the US department of education, with the objective to assess the impact of funding/support given to the education and research institutions. The report describes some indicators like types of research, knowledge generation, education interventions, strategies, and scale-up research that can be useful to assess the impact of funding in such organizations. Similarly, Bamberger Michael (2012) proposed the guideline and framework of different type of impact analysis like quantitative, qualitative, multilevel mixed methods including in-depth interview, focus group discussion, key informants, participant observation, document analysis, internet surveys, group interviews, photography and GIS methods that might be useful for impact evaluation. A report was prepared by the European Science

Foundation (2011) on the evaluation of publicly funded research. The report recommended some guidelines for evaluation of the research, i.e. (a) Every process of an evaluation should be planned carefully from the design of the study to the discussion of the results; (b) Evaluation should have a specific goal and address a real problem. (c) The use of appropriate methodologies and indicators needs to be given special consideration. The Organization for Economic Cooperation and Development (OECD) Paris (2011) prepared the report to evaluate the Research organization. They presented a framework for evaluation of the research organization and suggested that Peer Review articles published, citations of the articles and important ideas generated by the organization, etc., are the significant impact of the research organization.

Therefore, the expected first-order impact of the programme is strengthening the competence internal to the S&T sector. When achieved, the second-order impact on socio-economic development to follow. However, the FIST Questionnaire part A and B did not adequately deal with the Salter-Martin parameters. In the section on 'Methodology,' we suggest ways to incorporate new parameters for measuring internal returns to S&T. Another important issue is to retain the competence gained in the organisation. Nath et al. (2002) argue the case for creating a 'learning organisation.' S&T competence and intellectual wealth generated through R&D activities are human embodied. A 'learning organisation' would have an appropriate mechanism to hone human embodied knowledge as part of organisation knowledge. The impact analysis has to focus on the learning part of the organisational activities.

Reference

1. Adams, J. D, 1990; Fundamental Stocks of Knowledge and Productivity Growth, Journal of Political Economy, Vol. 98(4).
2. Bernstein, J, 1988; Cost of Production, Intra – and Inter industry R&D Spill overs: Canadian Evidence, Canadian Journal of Economics, Vol.21.
3. Bernstein, J, 1989; The Structure of Canadian Inter industry R&D Spillovers and the Rates of Return to R&D, Journal of Industrial Economics, Vol 37. No.3.
4. Coe, D, and Helpman, E, 1995, International R&D Spillovers; European Economic Review.
5. Denison, E. F, 1962, The Sources of Economic Growth in the United States and the Alternatives before us, Committee for Economic Development, New York.
6. Denison, E. F, 1967, why growth rates differ, Washington: Brooking Institute.
7. Grilliches, Z. 1958, Research Cost and Social Returns Hybrid Corn and Related Innovations, Journal of Political Economy, Vol.66 (5).

8. Grilliches, Z. 1980, R&D and Productivity Slowdown, American Economic Review, Vol.70.
9. Grilliches, Z, 1986, Productivity, R&D and Basic Research at the Firm Level in the 1970s, American Economic Review, Vol.76.
10. Grilliches, Z, 1995, R&D and Productivity: Econometric Results and Measurement Issues, In P. Stoneman (ed) Handbook of the Economics of Innovation and Technological Change, Blackwell.
11. Mansfield, E, 1877, Social and Private Rates of Return from Industrial Innovations, Quarterly Journal of Economics, Vol.77.
12. Mansfield, E, 1980, Basic Research and Productivity Increase in Manufacturing, American Economic Review, Vol. 70.
13. Mansfield, E, 1988, Industrial R&D in Japan and the United States: A Comparative Study, American Economic Review, Vol.78.
14. Martin, B, et al., 1996, The Relationship between Publicly Funded Basic Research and Economic Performance, A SPRU Review, University of Sussex.
15. Nadiri, M: 1980; Sectoral Productivity Slowdown, American Economic Review, Vol.70.
16. Nath, p and Mrinalini, N, 2002, Organisation of R&D: An evaluation of Best practices, Palgrave, London.
17. NSF, 1957, Basic Research: A National Resource, Washington
18. Odagiri, H, 1983, R&D Expenditure, Royalty Payment and Sales Growth in Japanese Manufacturing Corporations, Journal of Industrial Economics, Vol.32, no.1.
19. Odagiri, H, 1985, Research Activity, Output Growth, and Productivity Increase in Japanese Manufacturing Corporations, Research Policy, Vol.14.
20. Pavitt, K, 1991, What makes basic research economically useful, Research Policy, Vol.20.
21. Salter, A. J, and Martin, B, 2001, The Economic Benefits of Publicly Funded Basic Research: A critical review, Research Policy, Vol.30.
22. Scherer, F, 1982, Inter-industry technology flows and productivity growth, Review of Economics and Statistics, Vol.64.
23. Scherer, F, 1984, Using Linked Patent and R&D data to Measure Inter industry technology flows, in, Grilliches, Z, ed. R&D, Patents, and Productivity, Chicago University Press.
24. Solow, R, 1957, Technical Change and the Aggregate Production Function, Review of Economics and Statistics, 39, August.
25. Suzuki, K, 1993, R&D Spill overs and Technology Transfer among and within Keiretsu groups: Evidence from Japanese electrical machinery Industry, Journal of Industrial Organisation, Vol.11.

26. Terleckyj, N, 1974, Effects of R&D on Productivity Growth of Industries: An Exploratory Study, Washington DC, National Planning Association
27. Terleckyj, N, 1980, Direct and Indirect effects of Industrial Research and Development on Productivity Growth of Industries, in New Developments in Productivity Measurements Analysis, Kendrick, J and Vaccara, B (Ed). Chicago: University of Chicago Press.
28. Verspagen, B, 1995, R&D and Productivity: A broad Cross-section cross country Look, Journal of Productivity Analysis, Vol.6.
29. Godin, B, 2010, Taking Statistics (More) Seriously: The Measurement of Science, Technology and Innovation and its Future UNESCO Workshop on "New Dimensions of STI Indicators," Paris, 9-10 December 2010. http://www.csiic.ca/PDF/UNESCOconference.pdf. Accessed on 13.02.2020.
30. Godin, B., and C. Doré (2005) Measuring the Impacts of Science: Beyond the Economic Dimension, Montreal: INRS. http://www.csiic.ca/PDF/Godin_Dore_Impacts.pdf. Accessed on 13.02.2020.
31. OECD, 2011; Issue Brief: Research Organization Evaluation. OECD Innovation Policy Platform. http://www.oecd.org/innovation/policyplatform.
32. European Foundation Centre, 2011, Evaluation in Research and Research Funding Organizations: European Practices. A report by the ESF Member Organization Forum on Evaluation of Publicly Funded Research.
33. Bamberger Michael. 2012, Introduction to mixed methods in impact evaluation. Impact Evaluation Notes. No.3. Rockefeller Foundation, August.
34. Earle Janice et al., 2013, Common Guidelines for Education Research and Development. A Report from the Institute of Education Sciences, U.S. Department of Education and the National Science Foundation August.
35. Science Europe, 2017, policy brief 'On Research Infrastructures in EU Framework Programming January.
36. Council of Canadian Academies, 2019, Building the future of federal science, August.
37. National Research Council. 2003. Materials Science and Technology: Challenges for the Chemical Sciences in the 21st Century. Washington, DC: The National Academies Press.

Chapter 3: Objective, Methodology, and Execution of the Study

Abstract

Objective of the study has been the impact internal to S&T and the organisations. Methodologically, impact has been seen in two distinct categories; Direct and Indirect Impact. Direct impacts are reasonably easily identifiable and attributable to the actions (in this case the mandates of the grants), on the other hand indirect impacts are the results of many other associated actions, and therefore, any one attribute cannot be singled out. The study aimed for complete enumeration of all the grants from 2000 to 2011, effectively covering impacts up to 2016, since, five years is the duration of the FIST grant. Information has been collected based on a predesigned questionnaire developed around the principal issues, namely, research activities, recognition, curricula, technology development etc.

The study has been conducted through 5 regional teams (East and North-East, South, North, Central, and West) selected especially for the purpose of the study.

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1. Objectives

Following are the objectives of the proposed study as suggested by the FIST implementing division in the line of the advice of the Expert committee constituted especially for the purpose of the study.

1. To evaluate the impact of DST-FIST program on university departments/centres, colleges and institutes in terms of their academic and research outcome during 2000 to2011.
2. To identify best practices in terms of procedures, processes and managerial practices among recipient organizations.
3. To suggest policy imperatives for strengthening of the scheme.

2. Methodology Adopted for the Study

In the light of the above discussion in the Literature Review, the methodology has to be geared to measure impact internal to S&T and the organisation. The impacts, therefore, are seen in two distinct categories, direct and indirect impacts. The direct impacts of the FIST grant are tangible changes in the infrastructure of the grantee institutions, and occurring at the same time and space. Whereas Indirect impacts are expected but not mandated impacts out of the programme, and are caused by the action that are later in time or farther removed in distance, but are still reasonably foreseeable. Again, direct impacts are reasonably easily identifiable and attributable to the actions (in this case the mandates of the grants), on the other hand indirect impacts are the results of many other associated actions, and therefore, any one attribute cannot be singled out.

Since organisational practices and human resource endowment of the organisation would be unique for each case, a sample survey of the impact of various projects over large number of universities and institutions might not be suitable methodological option. A complete enumeration of all the cases is, therefore, proposed to be undertaken.

The survey would be undertaken on the basis of a pre-designed questionnaire. The available questionnaire from the earlier surveys appears to be inadequate in the light of the literature reviewed above. The available questionnaire is to be supplemented by suitably incorporating categories suggested by Salter and Martin cited above. Accordingly, we are proposing following categories to capture the impact and output internal to S&T and the organisation. The suggested new categories are indicative and would be further refined in consultation with the peers, stakeholders, and other experts.

The Questionnaire designed for the purpose of the study incorporated the following dimensions and issues (Table 3.1) broadly in the line of the understanding derived from the literature review.

Table 3.1: Issues to be focused in the study

Impact on	Issues
Advancement of Knowledge	
Specialties	a. New training programme b. Enrolment of in the new programme c. Number of new journals and articles
Theories	a. Invention of a new theory b. Use of the new theory (citation)
Methodologies	a. Conception of a new methodology b. Use of the methodology (citation)
Facts	a. Discovery of a new fact b. Use of the fact (citation)
Models	a. Construction of a new model b. Use of the model (citation)

Impact on	Issues
Research Activities	
Contribution to research	Number of new publications
Type of research	a. Diversification b. Intensification
Inter sectoral	Number of publications
Interdisciplinary	Number of publications
International	Number of publications
Training of Researchers	
Research competence	Defining a research problem, organizing project, collection of data, analyses of data
Impact on Science (Advances in Knowledge)	**Issues**
Related competence	Writing, computing, management
Technology	
Product and process	a. Achieving and improving a product and process b. Value of sales c. Patents d. Licenses e. Citations
Services	Development of new services
Know how	Number of organisation and individuals trained in
Recognition	
Credibility, visibility, prizes, awards	a. Members in the committees (national and international bodies) b. Members in the decision-making bodies of govt. c. Nomination to represent the country d. Promotion acquired e. Prizes received f. Acquired higher degree/diploma/honours g. New career opportunities

Impact on	Issues
Impact on Curricula	
New courses	a. Number of new courses b. Enrolment
New Training programme	a. Number of new programme b. Enrolment
Pedagogical tools	New pedagogical tolls introduced
New Human Resources	
Added for the project	a. Research fellows, Assistants with qualifications at the time of entry b. Faculty, qualifications at the time of entry
Career opportunities	a. How many lefts with higher experiences/qualifications b. Jobs opted by the personnel left
Learning Organisation	
Project team	a. Composition of the team b. Devolution of project activities c. Intra team and inter team communication
Project output	a. Credit sharing b. Representation in the seminar and conferences (who at what level) c. Training and skill development
Attrition and retention of HR	a. Team members left the team and organisation. How many and where? b. Extent of expertise loss and replenishment c. The system of retaining expertise, if any

Execution of the Study

3. **Target Population and Sample Size:** As suggested by DST Expert Group, the beneficiary's institutions were divided into five zones (East & North East, Western, Northern, Southern and Central). As per the norms of the FIST program, the grants were provided at three levels (0, I&II). The basic information of each institution funded under FIST program during 2000-2011 was

provided by FIST division of DST. Total 1623 projects were funded and completed till 2016. However, after proper evaluation essential basic data was available for 1602 project and these were included in the study for further evaluation.

4. The project assistant (field)/investigator visited each beneficiary institution. Information was collected through personal interview, review of office records and documents, acquiring photographs of the facilities developed under FIST program. The brief summary of number of institutions is presented in Fig.3.1. below. Proportional resource allocation for data collection and other activities is adopted. This was because of the numbers of beneficiaries in each geographic region were unequal.

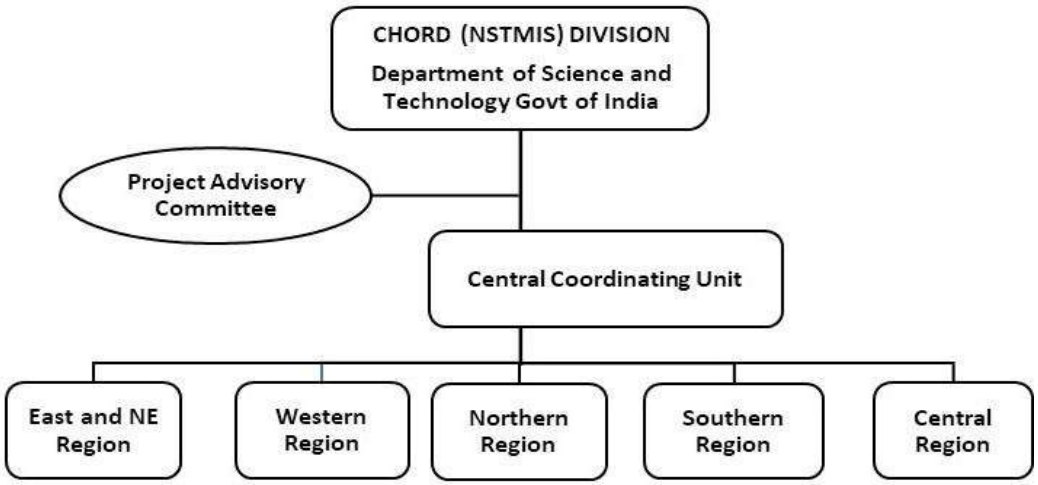


Fig 3.1: The operational structure of the study

The central Coordinating Unit was setup at Department of Biostatistics and Health Informatics, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow. The East and North eastern region was setup at Centre for Knowledge, Ideas and Development Studies (KnIDS), Kolkata. The western region was set up at Department of Statistics, Amaravati University Maharashtra, the northern region at Global Projects & Services Pvt. Ltd., New Delhi; the southern region was setup at JSS Academy of Technical Education, Bengaluru and Central region at Dept. of Biostatistics SGPGIMS Lucknow. The number of states covered by each Regional Coordinator is presented in Table 3.2.

Table 3.2: States/UTs allocated to regions

East and NE	South	North	Central	West
Arunachal				
Assam				
Jharkhand	A & N	Delhi		
Manipur	Andhra Pradesh	Haryana	Bihar	Goa
Meghalaya	Karnataka	Himachal	Chhattisgarh	Gujarat
Mizoram	Kerala	J&K	M P	Maharashtra
Nagaland	Puducherry	Punjab	Uttar Pradesh	Rajasthan
Odisha	Tamil Nadu	Uttarakhand		
Sikkim	Telengana			
Tripura				
West Bengal				

The basic information of each institution funded under FIST program during 2000-2011 was provided by FIST division of DST. Total 1623 projects were funded and completed till 2016. Number of Institutions, departments and grants supported by FIST falling in each region were allocated to respective Regional coordinators as summarised in table 3.3 below. However, after proper evaluation essential basic data was available for 1602 project and these were included in the study for further evaluation.

Table 3.3: Allocation of units to various study regions for evaluation

Region	Institutions	Departments	Unit* Allocated
E&NE	67	266	330
South	177	550	603
North	55	232	264
Central	54	142	161
West	96	182	265
Total	**449**	**1372**	**1623**

***A FIST grant is considered as unit*.**

Source: Constructed from the information provided from DST FIST division.

As per the norms of the FIST program, the grants were provided at three levels (0, I&II) the number of units allocated to each region had a mixed level of grants. Resource for data collection and other activities were allocated proportionately to the number of units and logistics specific to regions. Table 3.4 presents state-wise number of projects for which study could be conducted. All regions together, total 1359 projects were studied for 1170 departments and 380 institutes. With reference to the table 1.2, the survey covered 78.02% of the total amount sanctioned, 85.96% of the projects granted, 85.40% of the grantee departments, and 85.01% of the grantee institutions. Not covered by survey are those, who declined to participate in the study.

Table 3.4: Units studied in states and regions (2000 – 2011)

States/UT	Institution (no.)	Departments (no.)	Projects (no.)	Amount Sanctioned (Rs in Lakhs)
Arunachal	1	1	1	75.7
Assam	7	44	51	3611.7
Jharkhand	2	13	15	1016.9
Manipur	1	7	10	485.5
Meghalaya	1	9	11	587.8
Mizoram	1	3	3	139.5
Nagaland	1	3	3	73.0
Odisha	12	30	34	2011.1
Sikkim	1	1	1	20.0
Tripura	1	5	5	114.3
West Bengal	26	94	120	9497.9
E&NE	**54**	**210**	**254**	**17633.4**
A & N	1	1	1	80.0
Andhra Pradesh	7	33	38	1966.9
Karnataka	27	98	117	13609.6
Kerala	46	103	111	4811.7
Puducherry	2	9	11	886.9
Tamil Nadu	66	222	250	16440.8
Telangana	10	43	53	3522.3

States/UT	Institution (no.)	Departments (no.)	Projects (no.)	Amount Sanctioned (Rs in Lakhs)
South	**159**	**509**	**581**	**41318.2**
Delhi	8	34	38	4197.70
Haryana	4	19	21	910.30
Himachal	6	17	18	906.80
J & K	3	13	15	668.80
Punjab	17	59	68	3792.90
Uttarakhand	12	33	39	2518.30
North	50	175	199	12994.80
Bihar	3	4	4	98.50
Chhattisgarh	4	8	9	316.50
M P	12	24	24	845.30
U P	33	92	115	12354.00
Central	**52**	**128**	**152**	**13614.30**
Goa	2	11	13	798.50
Gujarat	8	25	31	1632.10
Maharashtra	39	78	92	6093.40
Rajasthan	16	34	37	2110.40
West	**65**	**148**	**173**	**10634.40**
Total	**380**	**1170**	**1359**	**96194.80**

*****Source: DST-FIST Impact Evaluation Study

Data Collection Tool: A questionnaire (Appendix A) for data collection has been developed by the Central Coordinating Unit in consultation with national expert group (DST) and all regional PIs. It consists of 9 sections which explore various aspects of impact evaluation of Department/ Centre/ Institute/College. The questionnaire designing (soft and hard) has been taken care by central coordinating unit for homogeneity and provided to each region for data collection.

Field Testing and Pilot Study: Field testing or pilot testing of data collection instruments/tools were done to see feasibility and adoptability of developed tools or instruments. Questionnaire seems relevant during pilot study. No changes incorporated in the final questionnaires.

Training of Investigators: Each associated region recruited their required project staff. The training of investigators has been organized by their associated regions only to carry out the data collection work and simultaneously the testing of questionnaire.

Field Operation and Data Collection: Each Project Assistant (field)/investigator were provided print version (hard copy) of questionnaire. In the field, investigator goes to the allocated units with their paper questionnaire and gather information by personal interaction with the Head of Department or any allocated faculty member of the department, and data entry of each questionnaire is made in excel format provided by Central Coordination Unit. Initially it was thought that the faculty/HOD will respond but due to quantum of response, they took some time to gather the information. So, it was decided to send the information by e-mail and ask for appointment. Our field visits were then initiated to departments with scheduled time and got the information filled. Some of the Key points for survey are:

1. PIs would be the primary respondent for the questionnaire. In the absence of PI, present person in charge of the project or Head of Department/Institution would be contracted and appropriate respondent would be decided in consultation with the above authority.

2. The details of the interviewer, starting and ending time of interview should be should clearly be recorded in cases, where responded are busy and cannot spare time to respond to all questions in one go.

3. In case of any difficulty during the field operation activity, the investigators may contact the corresponding regional coordinator/PI, CCU & DST.

4. Responsibility of Central Coordinating Unit:

    a. Questionnaire development.
    b. Overall monitoring and supervision of project and submission of quarterly progress report.
    c. To evolve the data analysis plan including standardization of report format and tables.
    d. Overall compilation of data and to carry out exploratory analysis for validity and reliability checks.
    e. Data analysis and report writing and submission.

5. Responsibility of Regional PI's:
    a. Recruitment of staff and field investigator
    b. Establish close coordination with central coordinating unit.
    c. Planning and execution of data collection in the respective region according to the methodology approved in the project.
    d. Submitting data to DST and CCU after data cleaning, reliability and validation analysis.
    e. Supervision and monitoring of data collection in respective region.
    f. Preparation of regional reports as perform given by CCU for submission to DST and CCU.

6. Reference period: The FIST grants provided during year 2000-2011 will be included in the study. Since the FIST grant has a life of 5 years, the study, therefore, covers period up to 2016.

7. Method of processing and analysing: Data cleaning and exploratory analysis has been conducted as data collection activity is over. The final set of tables will be evolved in consultation with National Expert Committee and will be produced at the end of data collection. Advanced statistical software and data mining tools i.e. Statistical Package for Social Sciences (SPSS), R programming language has been used for final analysis. Text data analysis is done for open ended questions.

8. Time schedule of activities giving milestones (18months)

Table 3.5: Time frame for the study

Reno.	Time	Activity
1.	6 months	Questionnaires development, Expert group meeting, Staff selection, Purchase of equipment's and development of the project website, Design of the questionnaires in the tablets, Training of the digital questionnaires, Field testing of the digital questionnaires, Modification in the questionnaires, Distribution of work to zonal investigators,

2.	9 months	Data collection by the investigators, Random monitoring of data collection and its quality, by principle investigators/co-investigators and DST members on random basis.
3	3 months	Data analysis, report writing and dissemination.

Limitations

1. Since the study was conducted in 2018-19, there will be a huge chance of recall-lapse. In many cases Respondents were unable to provide accurate information/suggestions regarding respective projects.
2. Most of the respondents are not the original PIs of the project, as some of the grants were old and most of the PIs are retired/superannuated.
3. The questionnaire does not include the response of all stake holders of the DST-FIST grant recipients.

Chapter 4: Characteristics of Grant Recipients

Abstract

This chapter examines the flow of the FIST grants from all four perspectives, namely, States, Institutions, Departments, and PIs. The overall picture emerges as a policy push towards building up capacity and capability in the lesser endowed regions and institutes. There are states with very few S&T institutes, along with states that have hundreds. Among the grantees, some institutes are more than a hundred years old, along with others that are less than 10 years old. In recent decades there are private initiatives towards establishing S&T Institutions. The FIST grant over the years included such institutes, although generally, it had flown to Central and State government established institutes. Correlations indicate that older institutes are also being benefitted through the scheme.

Most of the Grantee departments have necessary facilities like internet, library, and computational facilities.

Most of the PIs are male. Female representation as PIs is lowest in Uttarakhand and West Bengal. Working PIs constitute around 50%.

4.0 Structure of the Chapter

Departments of universities/institutions or colleges are the recipients of the FIST grants. Before we enumerate the impact of the grants, in this chapter, we try to situate the recipients in the S&T ecosystem within which the PIs and/or the departments have to operate. Following are the ways we try to set the attributes of the recipients of the grants.

There are four tiers – PIs, departments, Institutions, and finally, the states. Different attributes at different tires are:

1. States: We can examine the impact in terms of the distribution of grants over different states. If possible can use a proxy like the overall S&T ecosystem in the states. It is not difficult to develop workable proxies.
2. Institutions: Financial and administrative status of the institutions (private, public, autonomous); Academic status (College, university, institute, etc.), size, and age of the institutes.
3. Departments: Academic status; Infrastructure, student strength, faculty strength
4. PIs: Age, Gender, Status of the PIs, attrition, superannuation

4.1: Region and State-wise Distribution of FIST Grants

In table 4.1.1, we present the state and region-wise distribution of grants. It is apparent from the table that there is a wide variation of the grants in terms of numbers and amount. Region-wise variations are as wide as 250 grants for Rs.16440.00 lakhs for Tamil Nadu and one grant of Rs.75.7 lakhs for Arunachal Pradesh. As shown in table 4.1.2, percentage shares of Arunachal in the number of grants and amount are 0.07 and 0.08 respectively, and the same for Tamil Nadu are 18.40 and 17.09 respectively. Region-wise share in the number of FIST projects and FIST Grants are shown in Fig.4.1.1 and Fig.4.1.2. To figure out the criteria behind this gap, we verified table 4.1.2 in terms of states' shares in three factors: State GDP, Population, and the number of S&T institutions. This is shown in table 4.1.3. Table 4.1.4 shows correlations with states' share in population, GDP, and the number of S&T institutions and shares in number and amount of grants. In all the cases, we get correlation coefficients more than 0.70, whereas more than 0.80 for GDP and number of grants; and again, GDP and amount of grants. With the number of S&T institutions, also the coefficients are around 0.80.

Apparently,the population share might not be a good indicator for the normalization of the relative distribution of FIST over different states. However, the three indicators together do suggest distinctive aspects of the flow of grants over the states.

Fig. 4.1.1: Region-wise Share of FIST Projects (Nos.)
(2000 – 2011)

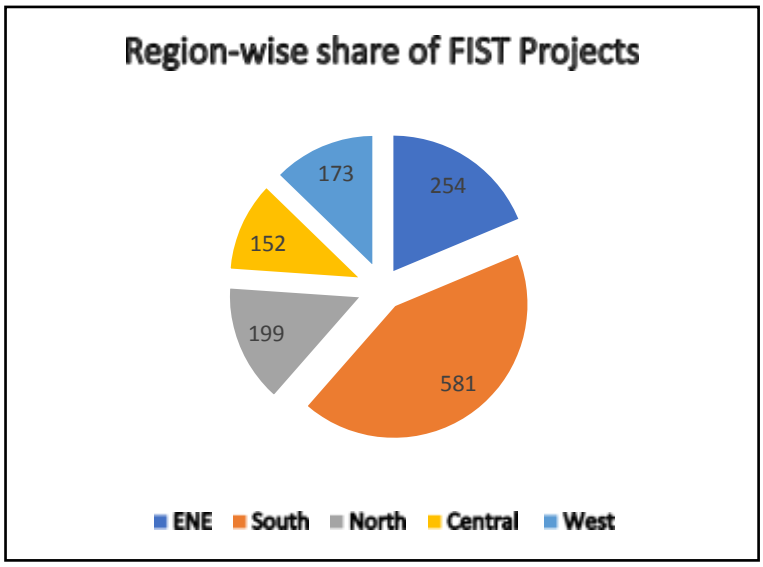
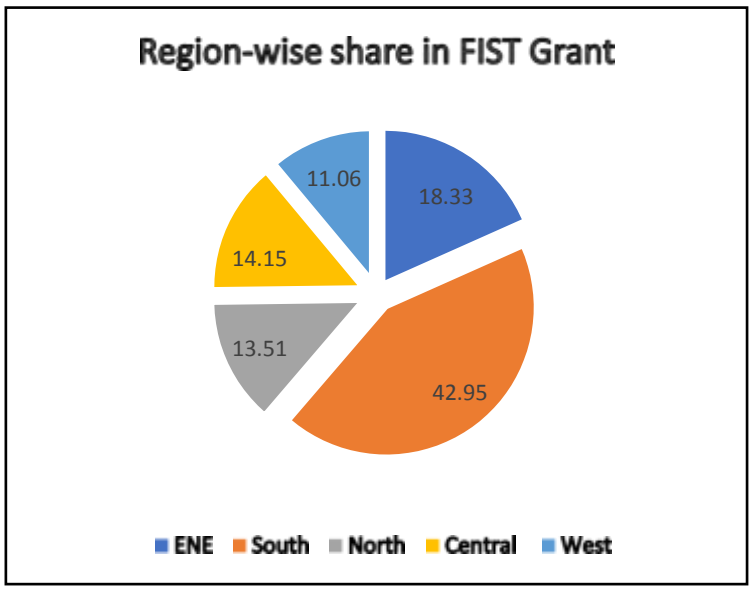


Fig. 4.1.2: Region-wise share of the FIST grants (%)
(2000 – 2011)



4.2: Institutions as Grantee of the FIST

From the state, we narrow down to the institutions that received the grants. We look at the academic credentials and infrastructure that make an institute. The age of the institutions also helps to create an academic tradition, reputation, and infrastructure. Table 4.2.1a shows the departments' age receiving the grant, age of the institutions (would be more than or equal to the age of the department). It is interesting to note that there are no institutions in the less than 10 age group in most of the regions, whereas in the North region it is more than 97%. Again, the Central region has 66% of Institutions established about 50 years ago, and it is 54% for E&NE, 26.67% in the West region, but 2.26% in the North. In Table 4.2.1b, we have tried to see if the age of the institute has any relation with the share in the grant amount. For this purpose, we have taken only the institutes that are in the age group of 50 years or more. The correlation-coefficients indicate interesting insights.

Sl. No.	Correlation Between	Correlation Coefficient	Table Source
1	Age of the Institute and share in FIST Fund	r = 0.51	Table 4.2.1b
2	Age of the Institute and share in FIST Project	r = 0.47	Table 4.2.1b

The strong positive correlations suggest a general preference for long-established institutions.

Unlike other regions, where a majority of the institutes are run by the state governments, the Central region has more autonomous institutions than State and Central govt institutes (Table 4.2.2). In the South, however, % of autonomous institutes (29.45%) are close to that of state-run institutes (39.73%). In E&NE and North and West regions, state govt run institutes constitute more than 50%. Table 4.2.3 suggests that across the regions, most of the institutes are financially dependent on the state governments.

Table 4.2.4 represents the distribution of FIST grants and level by the academic status of institutions. The total assistance of Rs.81915.8 lakhs was sanctioned to all institutions. The State government institutions received a maximum amount of Rs.28012.5 lakh (34.2%) distributed to its 630(46.4%) units. The central govt Institutions 25% of the total grant while autonomous institutions received 30% 0f grants. The private institutions 2.4% of total support, and the constituent colleges received the minimum amount of Rs.948.8 lakhs (1.2%) to total 19(1.4%) units. The investment in L2 grants was the highest, followed by L1 grants. The financial support to L0 grants was lowest irrespective of the academic status of the institution.

Details of grants by level and financial status are given in Table 3.8. The institutions funded by Central Government received the major amount of FIST support (47.5%) of the total support. In this, more emphasis was given to L2 grants. FIST to institutions funded by the state government was about 43% of total investment, and support to L1 grant was more than L2 grants. Maximum support at level -0 was also provided to state institutions. The private institutions received about 8% of total support. The support to private institutions mostly at the L1 level followed by L2 and L0 levels, respectively.

Year-wise distribution of amount sanctioned by the level of grants is presented in Fig 3.7. A declining trend in funding for all levels of grants was observed during the initial 5-year period. In the year 2005, the funding was at the lowest level. After 2005 a rising trend in funding was observed. The maximum funds were provided in the year 2007. Further, a decline was

Table 4.2.6 is on the institutional facilities available to the grantees, namely, Placement Cell, IPR Cell, and Incubation Centre. While most of the institutes (more than 90% at the national level) have Placement Cells, IPR Cells are there only in about 50% of institutes. Institutes in E&NE and West regions at less than 40% are lagging much behind the rest of the regions (more than 50%) in setting upIncubation Centres. However, basic labs like Biology, Chemistry, and Physics – all three are not available in all the grantee institutions, particularly in the E&NE states (table 4.2.5)

4.3: Departments as Grantees

FIST grants are meant for the departments of the S&T Institutes. How equipped are the departments for realizing the best out of the FIST grants? In this section, we enumerate the facilities available in the grantee departments. Table 4.3.1 presents the extent of library and internet facilities available in the departments. The table suggests that more than 80% of departments have a departmental library, and an Internet facility is available to faculty and students alike along with the administration. There are not many regional variations in this regard. Computerization of the admission and exam process and computational facilities (Table 4.3.2) are generally available to most of the departments. However, E&NE states are lagging a little behind other regions in computerized exam systems and computational facilities.

4.4: Principal Investigators (PIs)

PIs are the cornerstone for effective utilization of the FIST grant, for deriving the best and optimum benefits for the department and the institutions. It is the dynamic leadership of the PIs that steers the best possible utilization of the grants. Some of the success stories in this regard will support this view. For the present purpose, we look at the Gender and present working status of the PIs.

Table 4.4.1 shows that Uttarakhand (at only 5.13%) and West Bengal (at 9.17%) have the lowest representation of the Female PIs. These two states are followed by UP (13.04%), Karnataka (13.68%), Maharashtra (16.30%), Himachal (17. 65%), and Tamil Nadu (19.20%). It is interesting to note that Maharashtra, Karnataka, and Tamil Nadu have a large number of S&T institutions, and later two states are also recipients of the highest number of FIST grants. Table 4.4.2 shows the working status of the PIs. While the attrition rate is low at around 4%, superannuation is as high as over 50% at the national level, except at the E&NE region, where it is about 39%. Working PIs constitute 49% in the E&NE states, but as low as 25% in Central and 30% in South regions.

Tables for Chapter 4: Characteristics of Grant Recipients

(Refers to FIST Grants for 2000 – 2011)

Section 4.1: FIST in the States

Table 4.1.1: State-wise number of grantees and grant amount

States/UT	Institution (no.)	Departments (no.)	Projects (no.)	Amount Sanctioned (Rs in Lakhs)
Arunachal	1	1	1	75.70
Assam	7	44	51	3611.70
Jharkhand	2	13	15	1016.90
Manipur	1	7	10	485.50
Meghalaya	1	9	11	587.80
Mizoram	1	3	3	139.50
Nagaland	1	3	3	73.00
Odisha	12	30	34	2011.10
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West Bengal	26	94	120	9497.90
E&NE	**55**	**210**	**254**	**17633.40**
A & N	1	1	1	80.00
Andhra	7	33	38	1966.90
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Puducherry	2	9	11	886.90
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Telangana	10	43	53	3522.30

States/UT	Institution (no.)	Departments (no.)	Projects (no.)	Amount Sanctioned (Rs in Lakhs)
South	**159**	**509**	**581**	**41318.20**
Delhi	8	34	38	4197.70
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Himachal	6	17	18	906.80
J&K	3	13	15	668.80
Punjab	17	59	68	3792.90
Uttarakhand	12	33	39	2518.30
North	**50**	**175**	**199**	**12994.80**
Bihar	3	4	4	98.50
Chhattisgarh	4	8	9	316.50
MP	12	24	24	845.30
UP	33	92	115	12354.00
Central	**52**	**128**	**152**	**13614.30**
Goa	2	11	13	798.50
Gujarat	8	25	31	1632.10
Maharashtra	39	78	92	6093.40
Rajasthan	16	34	37	2110.40
West	**65**	**148**	**173**	**10634.40**
National – Over All	**380**	**1170**	**1359**	**96194.80**

*Source: DST FIST survey

Table 4.1.2: The percentage share of the states in FIST grants

States/UT	Institution%	Departments%	Projects%	Amount Sanctioned%
Arunachal	0.26	0.09	0.07	0.08
Assam	1.84	3.76	3.75	3.75
Jharkhand	0.53	1.11	1.10	1.06
Manipur	0.26	0.60	0.74	0.50
Meghalaya	0.26	0.77	0.81	0.61
Mizoram	0.26	0.26	0.22	0.15
Nagaland	0.26	0.26	0.22	0.08
Odisha	3.16	2.56	2.50	2.09
Sikkim	0.26	0.09	0.07	0.02
Tripura	0.26	0.43	0.37	0.12
West Bengal	6.84	8.03	8.83	9.87
A & N	0.26	0.09	0.07	0.08
Andhra	1.84	2.82	2.80	2.04
Karnataka	7.11	8.38	8.61	14.15
Kerala	12.11	8.80	8.17	5.00
Puducherry	0.53	0.77	0.81	0.92
Tamil Nadu	17.37	18.97	18.40	17.09
Telangana	2.63	3.68	3.90	3.66
Delhi	2.11	2.91	2.80	4.36
Haryana	1.05	1.62	1.55	0.95
Himachal	1.58	1.45	1.32	0.94
J & K	0.79	1.11	1.10	0.70
Punjab	4.47	5.04	5.00	3.94
Uttarakhand	3.16	2.82	2.87	2.62
Bihar	0.79	0.34	0.29	0.10
Chhattisgarh	1.05	0.68	0.66	0.33

States/UT	Institution%	Departments%	Projects%	Amount Sanctioned%
MP	3.16	2.05	1.77	0.88
U P	8.68	7.86	8.46	12.84
Goa	0.53	0.94	0.96	0.83
Gujarat	2.11	2.14	2.28	1.70
Maharashtra	10.26	6.67	6.77	6.33
Rajasthan	4.21	2.91	2.72	2.19
Total	100.00	100.00	100.00	100.00

*Source: DST FIST survey

Table 4.1.3: Comparative shares of the states in SGDP and population

States/UT	Population*	% Share	SGDP*	% Share	No. of S&T Inst**	% Share
Arunachal	1383727	0.12	11299	0.16	11	0.12
Assam	31205576	2.58	147342	1.01	69	1.60
Jharkhand	32988134	2.73	163250	0.67	46	1.77
Manipur	2570390	0.21	12993	0.19	13	0.14
Meghalaya	2966889	0.25	20354	0.28	19	0.22
Mizoram	1097206	0.09	7778	0.04	3	0.08
Nagaland	1978502	0.16	12868	0.13	9	0.14
Odisha	41974218	3.47	243363	1.52	104	2.64
Sikkim	610577	0.05	11421	0.16	11	0.12
Tripura	3673917	0.30	20873	0.09	6	0.23
West Bengal	91276115	7.54	542191	5.04	346	5.89
E&NE	**211725251**	**17.49**	**1193732**	**9.28**	**637**	**12.96**
A & N	380581	0.03	4156	0.07	5	0.05
Andhra	84580777	6.99	380629	8.31	570	4.13
Karnataka	61095297	5.05	643033	9.97	684	6.98

States/UT	Population*	% Share	SGDP*	% Share	No. of S&T Inst**	% Share
Kerala	33406061	2.76	387693	2.94	202	4.21
Puducherry	1247953	0.10	17310	0.34	23	0.19
Tamil Nadu	72147030	5.96	791824	9.79	672	8.59
Telangana	35193978	2.91	370113	2.42	166	4.02
South	**288051677**	**23.79**	**2594758**	**33.84**	**2322**	**28.16**
Delhi	16787941	1.39	366628	6.37	437	3.98
Haryana	25351462	2.09	320912	4.33	297	3.48
Himachal	6864602	0.57	77384	1.02	70	0.84
J&K	12541302	1.04	80767	0.70	48	0.88
Punjab	27743338	2.29	280823	1.87	128	3.05
Uttarakhand	10086292	0.83	123710	1.44	99	1.34
North	**99374937**	**8.21**	**1250224**	**15.72**	**1079**	**13.57**
Bihar	104099452	8.60	256851	0.96	66	2.79
Chhattisgarh	25545198	2.11	165977	0.54	37	1.80
MP	72626809	6.00	351683	2.24	154	3.82
UP	199812341	16.51	758205	5.00	343	8.23
Central	**402083800**	**33.21**	**1532716**	**8.74**	**600**	**16.64**
Goa	1458545	0.12	35850	0.45	31	0.39
Gujarat	60439692	4.99	682650	7.97	547	7.41
Maharashtra	112374333	9.28	1357942	20.29	1392	14.74
Rajasthan	68548437	5.66	454564	3.15	216	4.93
West	**242821007**	**20.06**	**2531006**	**31.86**	**2186**	**27.47**
National	**1210569573**	**100.00**	**9213017**	**100.00**	**6862**	**100.00**

* Source: (i) Economic & Statistical Organisation, Punjab (ii) Central Statistical Organisation, New Delhi

** Source: Directory of R&D Institutions 2018, DST, GoI

Table 4.1.4: Correlations among states' shares in population, GDP and S&T institute and share in number and amount of grants

Correlation Between	Share in number ofgrants	Share in amount sanctioned
Share in Population	0.70	0.73
Share in GDP	0.83	0.82
Share in numberof S&T Institute	0.78	0.80

*Source: DST FIST survey

Section 4.2: Institutions as Grantee of the FIST

Table 4.2.1a: Grantee departments in different age groups

State/UT	Age of the Organisation						Total No.
	> = 100	99 - 75	74 - 50	49- 25	24 - 10	< 10	
Arunachal	0.00	0.00	0.00	100.00	0.00	0.00	1
Assam	3.92	0.00	37.25	23.53	35.29	0.00	51
Jharkhand	0.00	13.33	60.00	6.67	20.00	0.00	15
Manipur	0.00	0.00	0.00	100.00	0.00	0.00	10
Meghalaya	0.00	0.00	0.00	81.82	18.18	0.00	11
Mizoram	0.00	0.00	0.00	0.00	100.00	0.00	3
Nagaland	0.00	0.00	0.00	33.33	66.67	0.00	3
Odisha	2.94	0.00	58.82	17.65	20.59	0.00	34
Sikkim	0.00	0.00	0.00	0.00	100.00	0.00	1
Tripura	0.00	0.00	0.00	60.00	40.00	0.00	5
West Bengal	15.00	7.50	48.33	22.50	6.67	0.00	120
E&NE	**8.27**	**4.33**	**41.73**	**27.56**	**18.11**	**0.00**	**254**
A & N	0.00	0.00	0.00	0.00	100.00	0.00	1
Andhra	0.00	2.63	50.00	47.37	0.00	0.00	38
Karnataka	6.84	7.69	40.17	36.75	8.55	0.00	117
Kerala	4.50	13.51	43.24	30.63	8.11	0.00	111

State/UT	Age of the Organisation						Total No.
	> = 100	99 - 75	74 - 50	49- 25	24 - 10	< 10	
Puducherry	0.00	0.00	0.00	72.73	27.27	0.00	11
Tamil Nadu	6.02	8.84	41.37	34.54	9.24	0.00	249
Telangana	9.80	5.88	45.10	35.29	3.92	0.00	51
South	**5.71**	**8.65**	**41.52**	**35.81**	**8.30**	**0.00**	**578**
Delhi	2.94	10.29	33.82	45.59	7.35	0.00	68
Haryana	2.56	0.00	53.85	41.03	2.56	0.00	39
Himachal	0.00	0.00	0.00	0.00	0.00	100.00	13
J& K	0.00	0.00	0.00	0.00	0.00	100.00	31
Punjab	3.16	0.00	0.00	0.00	0.00	96.84	95
Uttarakhand	2.63	0.00	0.00	0.00	0.00	97.37	38
North	**2.26**	**0.00**	**0.00**	**0.00**	**0.00**	**97.74**	**177**
Bihar	0.00	0.00	100.00	0.00	0.00	0.00	4
Chhattisgarh	0.00	0.00	22.22	66.67	11.11	0.00	9
M P	12.50	0.00	41.67	45.83	0.00	0.00	24
Uttar Pradesh	8.93	22.32	39.29	24.11	5.36	0.00	112
Centre	8.72	16.78	40.27	29.53	4.70	0.00	149
Goa	0.00	10.53	28.95	55.26	5.26	0.00	38
Gujarat	0.00	0.00	26.32	36.84	36.84	0.00	19
Maharashtra	0.00	0.00	5.56	77.78	16.67	0.00	18
Rajasthan	0.00	0.00	46.67	26.67	26.67	0.00	15
West	**0.00**	**4.44**	**26.67**	**51.11**	**17.78**	**0.00**	**90**
Total %	**5.46**	**7.16**	**34.98**	**30.55**	**9.08**	**12.77**	**1355**
National	**74**	**97**	**474**	**414**	**123**	**173**	**1355**

*Source: DST FIST survey

Table 4.2.1b: Age of the Grantee department and share in the project and Grant amount

State	Age of the Organisation and Share in the Project and Grant		
	50 and Above	**% of Projects**	**% of Total Amount**
Arunachal	0.00	0.07	0.08
Assam	41.17	3.75	3.75
Jharkhand	73.33	1.10	1.06
Manipur	0.00	0.74	0.50
Meghalaya	0.00	0.81	0.61
Mizoram	0.00	0.22	0.15
Nagaland	0.00	0.22	0.08
Odisha	61.76	2.50	2.09
Sikkim	0.00	0.07	0.02
Tripura	0.00	0.37	0.12
West Bengal	70.83	8.83	9.87
E&NE	**54.33**	**X**	**X**
A & N	0.00	0.07	0.08
Andhra	52.63	2.80	2.04
Karnataka	54.70	8.61	14.15
Kerala	61.25	8.17	5.00
Puducherry	0.00	0.81	0.92
Tamil Nadu	56.23	18.40	17.09
Telangana	60.78	3.90	3.66
South	**55.88**	**X**	**X**
Delhi	47.05	2.80	4.36
Haryana	56.41	1.55	0.95
Himachal	0.00	1.32	0.94
J& K	0.00	1.10	0.70
Punjab	3.16	5.00	3.94
Uttarakhand	2.63	2.87	2.62
North	**2.26**	**X**	**X**
Bihar	100	8.46	12.84
Chhattisgarh	22.22	1.77	0.88

State	Age of the Organisation and Share in the Project and Grant		
	50 and Above	**% of Projects**	**% of Total Amount**
M P	54.17	0.66	0.33
Uttar Pradesh	70.54	0.29	0.10
Centre	**65.77**	**X**	**X**
Goa	39.48	0.96	0.83
Gujarat	26.32	2.28	1.70
Maharashtra	5.56	6.77	6.33
Rajasthan	46.67	2.72	2.19
West	**31.11**	**X**	**X**
Total %	**47.60**	**100.00**	**100.00**

*Source: DST FIST survey

Table 4.2.2: Administrative status of the Grantee organisations

State/UT	Administrative Status of the Institutes						
	Central Govt.	**State Govt.**	**Autonomous**	**Deemed Univ.**	**Constituent College**	**Private**	**Total**
Arunachal	0	0	0	1	0	0	1
Assam	2	4	1	0	0	0	7
Jharkhand	0	0	1	1	0	0	2
Manipur	1	0	0	0	0	0	1
Meghalaya	1	0	0	0	0	0	1
Mizoram	1	0	0	0	0	0	1
Nagaland	1	0	0	0	0	0	1
Odisha	1	7	1	2	0	1	12
Sikkim	0	0	0	0	1	0	1
Tripura	1	0	0	0	0	0	1
West Bengal	4	17	4	0	1	0	26
E&NE	**12**	**28**	**7**	**2**	**2**	**1**	**52**
E&NE %	23.08	53.85	13.46	3.85	3.85	1.92	100.00
A & N	1	0	0	0	0	0	1
Andhra Pradesh	0	5	0	2	0	0	7
Karnataka	3	8	7	4	1	3	26

State/UT	Administrative Status of the Institutes						
	Central Govt.	**State Govt.**	**Autonomous**	**Deemed Univ.**	**Constituent College**	**Private**	**Total**
Kerala	1	20	10	1	5	4	41
Puducherry	1	0	1	0	0	0	2
Tamil Nadu	4	20	23	6	0	6	59
Telangana	2	5	2	1	0	0	10
South	**12**	**58**	**43**	**14**	**6**	**13**	**146**
South %	8.22	39.73	29.45	9.59	4.11	8.90	100.00
Delhi	2	1	3	2	0	0	8
Haryana	0	4	0	0	0	0	4
Himachal Pradesh	0	4	1	0	0	1	6
Jammu & Kashmir	0	3	0	0	0	0	3
Punjab	1	7	3	3	0	3	17
Uttarakhand	2	6	1	1	0	0	10
North	**5**	**25**	**8**	**6**	**0**	**4**	**48**
North %	10.42	52.08	16.67	12.50	0.00	8.33	100.00
Bihar	0	3	0	0	0	0	3
Chhattisgarh	1	3	0	0	0	0	4
Madhya Pradesh	0	2	10	0	0	0	12
Uttar Pradesh	6	7	13	1	3	3	33
Central	**7**	**15**	**23**	**1**	**3**	**3**	**52**
Central %	13.46	28.85	44.23	1.92	5.77	5.77	100.00
Goa	0	1	0	1	0	0	2
Gujarat	0	7	0	0	0	0	7
Maharashtra	3	16	5	1	2	12	39
Rajasthan	0	10	3	1	0	2	16
West	**3**	**34**	**8**	**3**	**2**	**14**	**64**
West %	4.69	53.13	12.50	4.69	3.13	21.88	100.00
National	**39**	**160**	**89**	**26**	**13**	**35**	**362**
National (%)	10.77	44.20	24.59	7.18	3.59	9.67	100.00

*Source: DST FIST survey

Table 4.2.3: Financial status of the grantee organisations

State/UT	Financial Status of the Institutes			
	Central Govt.	**State Govt.**	**Private**	**Total**
Arunachal	1	0	0	1
Assam	3	4	0	7
Jharkhand	1	0	1	2
Manipur	1	0	0	1
Meghalaya	1	0	0	1
Mizoram	1	0	0	1
Nagaland	1	0	0	1
Odisha	2	7	3	12
Sikkim	0	0	1	1
Tripura	1	0	0	1
West Bengal	4	18	4	26
E&NE	**16**	**29**	**9**	**54**
E&NE %	29.63	53.70	16.67	100
A & N	1	0	0	1
Andhra	0	5	2	7
Karnataka	5	13	8	26
Kerala	1	33	7	41
Puducherry	2	0	0	2
Tamil Nadu	6	39	14	59
Telangana	2	7	1	10
South	**17**	**97**	**32**	**146**
South %	11.64	66.44	21.92	100.00
Delhi	5	1	2	8
Haryana	0	4	0	4
Himachal	0	5	1	6
J& K	0	3	0	3
Punjab	3	9	5	17
Uttarakhand	2	7	1	10
North	**10**	**29**	**9**	**48**
North %	20.83	60.42	18.75	100.00

State/UT	Financial Status of the Institutes			
	Central Govt.	State Govt.	Private	Total
Bihar	3	0	0	3
Chhattisgarh	1	3	0	4
M P	2	7	3	12
Uttar Pradesh	14	16	3	33
Centre	**20**	**26**	**6**	**52**
Centre %	38.46	50.00	11.54	100.00
Goa	0	7	0	7
Gujarat	4	33	2	39
Maharashtra	0	13	3	16
Rajasthan	0	1	1	2
West	**4**	**61**	**6**	**71**
West %	5.63	85.92	8.45	100
National	**67**	**235**	**62**	**364**
National %	18.41	64.56	17.03	100.00

*Source: DST FIST survey

Table 4.2.4: Distribution of FIST grants by level and academic status of the institution

The academic status of institutions	Level of grants and the amount received (Rs. Lakhs)			
	Level L0	Level LI	Level LII	All grants (%)
Central Govt. Institution	-	5815.60	15089.90	20905.40 (25.50)
State Govt. Institution	1318.90	17457.70	9235.80	28012.50 (34.20)
Autonomous Institution	1833.30	5996.20	17188.30	25017.80 (30.50)
Deemed University	52.80	3191.70	1826.00	5070.50 (6.20)
Constituent college	230.50	335.40	383.00	948.80 (1.20)
Private Institution	461.80	1110.00	389.00	1960.80 (2.40)
Total	**3897.20**	**33906.60**	**44112.10**	**81915.80**

Table 4.2.5: Distribution of FIST grants and level by financial autonomy of the institution

The financial status of Institutions	Level of grants and the amount received (Rs. Lakhs)			
	Level L0	**Level LI**	**Level LII**	**All grants**
Central Govt.	80.00	8535.20	30259.20	38874.40 (47.50)
State Govt.	3057.80	21399.20	11028.10	35485.10 (43.30)
Private	759.40	3903.60	2170.10	6833.00 (8.30)
Missing	0.00	68.70	654.60	723.30 (0.90)
Total	**3897.20**	**33906.60**	**44112.10**	**81915.80**

Table: 4.2.6: Institutions having placement cell, IPR cell, and Incubation centre.

State/UT	Institutes	Placement cell	IPR Cell	Incubation Centre
Arunachal Pradesh	1	1	1	0
Assam	7	7	4	3
Jharkhand	2	2	2	1
Manipur	1	1	1	1
Meghalaya	1	1	1	1
Mizoram	1	1	1	1
Nagaland	1	1	1	1
Odisha	12	11	9	5
Sikkim	1	1	1	1
Tripura	1	1	1	0
West Bengal	26	23	6	7
E&NE	**54**	**50**	**28**	**21**
E&NE %	100.00	92.59	51.85	38.89
A & N	1	1	1	1
Andhra Pradesh	7	6	3	4
Karnataka	27	25	16	18
Kerala	46	44	22	16
Puducherry	2	1	2	1
Tamil Nadu	66	65	36	40
Telangana	10	10	5	6
South	**159**	**152**	**85**	**86**

State/UT	Institutes	Placement cell	IPR Cell	Incubation Centre
South %	100.00	95.60	53.46	54.10
Delhi	8	8	8	5
Haryana	4	4	4	4
Himachal Pradesh	6	6	6	6
Jammu & Kashmir	3	3	1	1
Punjab	17	16	12	11
Uttarakhand	12	12	6	2
North	**50**	**49**	**37**	**29**
North %	100.00	98.00	74.00	58.00
Bihar	3	2	0	2
Chhattisgarh	4	4	2	2
Madhya Pradesh	12	12	6	5
Uttar Pradesh	33	30	18	18
Central	**52**	**48**	**26**	**27**
Central %	100.00	92.31	50.00	51.92
Goa	2	2	2	1
Gujarat	8	6	3	3
Maharashtra	39	36	19	16
Rajasthan	16	12	8	4
West	**65**	**56**	**32**	**24**
West %	100.00	86.15	49.23	36.92
National (%)	**380**	**355 (93.40)**	**208 (54.70)**	**187 (49.20)**

*Source: DST FIST survey

Table 4.2.7: Availability of research labs in the institute

State/UT	Department	Research Lab			Lab Safety
		Biology	Chemistry	Physics	
Arunachal Pradesh	1	0	1	1	1
Assam	44	13	19	20	40
Jharkhand	13	5	6	10	13
Manipur	7	3	2	3	6
Meghalaya	9	4	2	3	9
Mizoram	3	1	2	3	2
Nagaland	3	1	1	0	3
Odisha	30	17	20	19	26
Sikkim	1	0	0	1	1
Tripura	5	2	1	2	5
West Bengal	94	41	46	44	76
E&NE	**210**	**87**	**100**	**106**	**182**
E&NE %	100.00	41.43	47.62	50.48	86.67
Andaman and Nicobar	1	1	1	0	1
Andhra Pradesh	33	21	18	17	30
Karnataka	98	52	55	48	88
Kerala	103	57	69	59	96
Puducherry	9	4	3	3	9
Tamil Nadu	222	127	136	131	216
Telangana	43	20	22	16	41
South	**509**	**283**	**304**	**274**	**481**
South %	100.00	55.60	59.72	53.83	94.50
Delhi	34	24	14	13	34
Haryana	19	8	7	7	19
Himachal Pradesh	17	12	8	7	16
Jammu & Kashmir	13	6	2	2	12

State/UT	Department	Research Lab			Lab Safety
		Biology	Chemistry	Physics	
Punjab	59	40	32	33	56
Uttarakhand	33	12	21	18	32
North	**175**	**102**	**84**	**80**	**169**
North %	100.00	58.29	48.00	45.71	96.57
Bihar	4	1	3	3	4
Chhattisgarh	8	2	4	4	6
Madhya Pradesh	24	8	13	12	23
Uttar Pradesh	92	47	44	45	85
Central	**128**	**58**	**64**	**64**	**118**
Central %	100.00	45.31	50.00	50.00	92.19
Goa	11	7	6	6	10
Gujarat	25	9	12	13	22
Maharashtra	78	36	50	39	72
Rajasthan	34	18	20	17	31
West	**148**	**70**	**88**	**75**	**135**
West %	100.00	47.30	59.46	50.68	91.22
National (%)	**1170**	**599 (51.20)**	**640 (54.70)**	**599 (51.20)**	**1085 (92.70)**

*Source: DST FIST survey

Section 4.3: Departments as Grantees

Table 4.3.1: Extent of Library and Internet Facilities in the Grantee Departments

State/UT	Dept.	Dept. Library	Internet Facility For			
			Faculty/ Scientist	Students/ Staff	Library	Office/ Admin
Arunachal Pradesh	1	1	1	1	1	1
Assam	44	41	43	43	42	42
Jharkhand	13	9	13	13	13	13
Manipur	7	4	6	6	5	6
Meghalaya	9	5	9	9	9	9
Mizoram	3	3	3	3	3	3
Nagaland	3	1	2	2	2	2
Odisha	30	28	30	30	27	30
Sikkim	1	1	1	1	1	1
Tripura	5	4	5	5	4	4
West Bengal	94	76	90	91	86	92
E&NE	**210**	**173**	**203**	**204**	**193**	**203**
E&NE %	100.00	82.38	96.67	97.14	91.90	96.67
Andaman & Nicobar	1	1	1	1	1	1
Andhra Pradesh	33	32	33	33	31	33
Karnataka	98	90	74	87	98	90
Kerala	103	98	71	98	103	98
Puducherry	9	2	9	9	9	9
Tamil Nadu	222	198	219	220	211	221
Telangana	43	37	43	43	39	42
South	**509**	**444**	**505**	**502**	**482**	**501**
South %	100.00	87.23	99.21	98.62	94.70	98.43
Delhi	34	21	34	34	29	33

State/UT	Dept.	Dept. Library	Internet Facility For			
			Faculty/ Scientist	Students/ Staff	Library	Office/ Admin
Haryana	19	10	19	19	19	19
Himachal Pradesh	17	16	16	16	14	15
Jammu & Kashmir	13	13	13	13	13	13
Punjab	59	54	59	58	57	59
Uttarakhand	33	29	33	33	31	32
North	**175**	**143**	**174**	**173**	**163**	**171**
North %	100.00	81.71	99.43	98.86	93.14	97.71
Bihar	4	4	4	4	4	4
Chhattisgarh	8	5	8	8	7	8
Madhya Pradesh	24	23	23	24	23	24
Uttar Pradesh	92	82	91	90	86	90
Central	**128**	**114**	**126**	**126**	**120**	**126**
Central %	100.00	89.06	98.44	98.44	93.75	98.44
Goa	11	4	11	11	11	11
Gujarat	25	23	25	25	23	25
Maharashtra	78	75	76	75	74	75
Rajasthan	34	32	32	32	31	31
West	**148**	**134**	**144**	**143**	**139**	**142**
West %	100.00	90.54	97.30	96.62	93.92	95.95
National (%)	**1170**	**1008 (86.20)**	**1152 (98.50)**	**1148 (98.10)**	**1097 (93.80)**	**1143 (97.70)**

*Source: DST FIST survey

Table 4.3.2: Computerization of Academic Activities in the Departments

State/UT	Department	Computerized Admission	Computerized Exam	Computational Facilities
Arunachal Pradesh	1	1	1	1
Assam	44	44	41	26
Jharkhand	13	13	11	12
Manipur	7	6	5	6
Meghalaya	9	8	8	9
Mizoram	3	3	3	3
Nagaland	3	2	1	2
Odisha	30	25	17	29
Sikkim	1	1	0	1
Tripura	5	4	3	5
West Bengal	94	86	52	86
E&NE	**210**	**193**	**142**	**180**
E&NE %	100.00	91.90	67.62	85.71
Andaman & Nicobar	1	1	0	0
Andhra Pradesh	33	33	27	31
Karnataka	98	84	98	96
Kerala	103	90	102	100
Puducherry	9	9	7	9
Tamil Nadu	222	204	191	218
Telangana	43	41	36	40
South	**509**	**462**	**461**	**494**
South %	100.00	90.77	90.57	97.05
Delhi	34	31	26	34
Haryana	19	18	15	19
Himachal Pradesh	17	13	11	16
Jammu & Kashmir	13	12	12	12
Punjab	59	55	42	59

State/UT	Department	Computerized Admission	Computerized Exam	Computational Facilities
Uttarakhand	33	30	19	32
North	**175**	**159**	**125**	**172**
North %	100.00	90.86	71.43	98.29
Bihar	4	4	4	3
Chhattisgarh	8	8	8	8
Madhya Pradesh	24	22	22	24
Uttar Pradesh	92	92	86	90
Central	**128**	**126**	**120**	**125**
Central %	100.00	98.44	93.75	97.66
Goa	11	10	9	11
Gujarat	25	23	15	22
Maharashtra	78	71	62	75
Rajasthan	34	33	21	32
West	**148**	**137**	**107**	**140**
West %	100.00	92.57	72.30	94.59
National	**1170**	**1008 (86.20)**	**1152 (98.50)**	**1148 (98.10)**

*Source: DST FIST survey

Section 4.4: At PIs level

Table 4.4.1: Gender of the PIs

State	Male	Female	Total	% Male	% Female
Arunachal	1	0	1	100.00	0.00
Assam	37	14	51	72.55	27.45
Jharkhand	11	4	15	73.33	26.67
Manipur	10	0	10	100.00	0.00
Meghalaya	11	0	11	100.00	0.00
Mizoram	3	0	3	100.00	0.00
Nagaland	3	0	3	100.00	0.00
Odisha	27	7	34	79.41	20.59
Sikkim	1	0	1	100.00	0.00
Tripura	4	1	5	80.00	20.00
West Bengal	109	11	120	90.83	9.17
E&NE	**217**	**37**	**254**	**85.43**	**14.57**
A& N	1	0	1	100.00	0.00
Andhra Pradesh	29	9	38	76.32	23.68
Karnataka	101	16	117	86.32	13.68
Kerala	81	30	111	72.97	27.03
Puducherry	11	0	11	100.00	0.00
Tamil Nadu	202	48	250	80.80	19.20
Telangana	37	16	53	69.81	30.19
South	**462**	**119**	**581**	**79.52**	**20.48**
Delhi	27	10	37	72.97	27.03
Haryana	15	6	21	71.43	28.57
Himachal Pradesh	14	3	17	82.35	17.65
J & K	11	3	14	78.57	21.43
Punjab	46	21	67	68.66	31.34
Uttarakhand	37	2	39	94.87	5.13
North	**150**	**45**	**195**	**76.92**	**23.08**
Bihar	4	0	4	100.00	0.00

State	Male	Female	Total	% Male	% Female
Chhattisgarh	7	2	9	77.78	22.22
Madhya Pradesh	18	6	24	75.00	25.00
Uttar Pradesh	100	15	115	86.96	13.04
Central	**129**	**23**	**152**	**84.87**	**15.13**
Goa	13	0	13	100.00	0.00
Gujarat	23	8	31	74.19	25.81
Maharashtra	77	15	92	83.70	16.30
Rajasthan	29	8	37	78.38	21.62
West	**142**	**31**	**173**	**82.08**	**17.92**
National	**1100**	**255**	**1355**	**81.18**	**18.82**

*Source: DST FIST survey

Table 4.4.2: Working Status of the PIs

State	PIs (No.)	%Working	%Superannuated	%Joined Other Inst.	Any other
Arunachal	1	0.00	0.00	100.00	0.00
Assam	51	52.94	37.25	1.96	7.84
Jharkhand	15	26.67	60.00	6.67	6.67
Manipur	9	66.67	33.33	0.00	0.00
Meghalaya	11	45.45	54.55	0.00	0.00
Mizoram	3	33.33	33.33	33.33	0.00
Nagaland	2	50.00	0.00	50.00	0.00
Odisha	34	47.06	38.24	5.88	8.82
Sikkim	1	0.00	0.00	100.00	0.00
Tripura	5	40.00	60.00	0.00	0.00
West Bengal	118	51.69	37.29	5.08	5.93
E&NE	**250**	**49.20**	**39.20**	**5.60**	**6.00**
A&N	1	100.00	0.00	0.00	0.00
Andhra Pradesh	38	39.47	50.00	5.26	5.26
Karnataka	117	33.33	55.56	1.71	9.40

State	PIs (No.)	%Working	%Superannuated	%Joined Other Inst.	Any other
Kerala	111	20.72	60.36	6.31	12.61
Puducherry	11	63.64	27.27	0.00	9.09
Tamil Nadu	250	32.80	44.40	3.20	19.60
Telangana	53	18.87	77.36	1.89	1.89
South	**581**	**30.46**	**52.67**	**3.44**	**13.43**
Delhi	37	51.35	48.65	0.00	0.00
Haryana	21	38.10	52.38	0.00	9.52
Himachal	17	11.76	76.47	11.76	0.00
J&K	15	26.67	60.00	6.67	6.67
Punjab	68	44.12	44.12	2.94	8.82
Uttarakhand	39	43.59	51.28	0.00	5.13
North	**197**	**40.61**	**51.27**	**2.54**	**5.58**
Bihar	4	0.00	75.00	25.00	0.00
Chhattisgarh	9	55.56	33.33	0.00	11.11
Madhya Pradesh	24	41.67	33.33	12.50	12.50
Uttar Pradesh	115	20.00	70.43	4.35	5.22
Central	**152**	**25.00**	**62.50**	**5.92**	**6.58**
Goa	13	46.15	53.85	0.00	0.00
Gujarat	31	29.03	58.06	9.68	3.23
Maharashtra	92	38.04	58.70	2.17	1.09
Rajasthan	37	29.73	51.35	5.41	13.51
West	**173**	**35.26**	**56.65**	**4.05**	**4.05**
National	**1353**	**35.40**	**51.59**	**4.07**	**8.94**

*Source: DST FIST survey

Chapter 5: Direct Impact

Abstract

All levels together, the total amount of grant sanctioned during 2000 – 2011 was Rs.961.95 crores, of which Southern states had a share of 42.95%, followed by E&NE states 18.33% and Central region states 14.15%. Out of 18.33% share of E&NE, West Bengal has a share of 9.87%, and with Odisha and Assam, it is 13.71%. Similarly, among the southern states, out of 42.95%, Tamil Nadu and Karnataka get a share of 31.24%. More striking is the central region, where out of a share of 14.15%, UP takes away12.84%.

Overall expenditure on equipment is about 89%, and that on repair is about 3%. FIST grant is quite comprehensive, contributing to the development of a Lab. A few states like Assam, Andhra Pradesh, and Goa have reported a very high percentage of non-working equipment, much higher than the national average of 18%. The common issue raised by almost all the grantees is that in many cases, equipment remains non-functional for a long time since the FIST grant does not have any provision of AMC.

The national average of percentage utilization in the range of 100% to 76% is about 57% of departments, with variations from high 68% to low 39% over different periods. External users of the equipment are mostly less than five a week in E&NE, South and North regions, but fewer in the Central and West regions. At the national level, more than 80% of the grantees have reported purchases within 4 months of the sanction. However, in later years, i.e., 2007 onwards, cases reporting delays beyond 4 months show an increasing trend, reaching as high as 23%. In E&NE, the percentage of cases beyond 4 months is higher than the national level, mostly due to inadequate transport communications in the North- East states.

Post FIST, there is an overall improvement of the working environment and facilities in the S&T institutions across the country.

About Direct Impact

The FIST programme is for augmenting the S&T infrastructure in the educational and research institutions. The direct impacts of the FIST grant are tangible changes in the infrastructure of the grantee institutions and occurring at the same time and space. Therefore, we begin with the volume of grants and the type of grants (level) received by the grantees. This is followed by facilities created, functional status, and extent of utilization of the same. We also try to throw some light on the administrative issues in the grantee institutes related to the execution of the projects granted under the FIST programme. The categories envisaged are listed below.

5.0: Direct Impact

1. Volume and level of grant
2. Facilities created/equipment procured
3. Equipment Computational facilities and Internet
4. Books and Library facilities
5. Others works
6. Utilization and functional status of the facilities/equipment

Administrative issues: Procurement, installation, maintenance.

5.1: Volume of Grant and Impact

For many different reasons, there are gaps between grant sanctioned and grant utilized. We, therefore, use both the sanctioned and received amount for the present purpose of evaluation. Tables 5.1.1 to 5.1.3 present level of grant-wise amount sanctioned and received. The information is presented state-wise. As mentioned in the Introduction (Chapter-1, Table 1) initially, Level -I and II were introduced in 2000, whereas Level-0 was introduced much later (in 2009) after a felt need of augmenting S&T infrastructure in colleges. Table 5.1.1 shows the total of 45.35 crores were sanctioned grant for 72 projects under Level-0. States in South region received 44 grants of Rs.26.55 crores, distantly followed by E&NE with 13 projects of Rs.9.28 crores North Region had 4 projects (all for Punjab) for Rs.2.50 crores, Central Region also had 4 projects for Rs.2.80 crores West Region had 7 projects for 4.82 crores, of which Maharashtra had 6 projects. Initially, the amount of grant under Level-0 was restricted to a limit of Rs.50 lakhs. Subsequently, it was raised to Rs.100 lakhs and Rs.150 lakhs in 2007 and then in 2017 respectively.

On the other hand, Level -I grants went to 31 out of 32 states, the tiny state of Arunachal being the exception (Table 5.1.2). The total number of grants was 876 for a sanctioned amount of Rs.409.12 crores. South region received grants of Rs.174.77 crores for 374 projects, followed by 172 projects of Rs.79.66 crores for E&NE states. States in the North region received 135 projects for 62.31 crores,and 92 projects for Rs.44.29 crores went to Central Region. West Region received 113 projects for 48.07 crores. The grant's limit was initially set to Rs.1 crores, which was raised to Rs.3 crores in 2006.

It is to be noted that there are wide variations within a region. Out of 18.33% share of E&NE, West Bengal has a share of 9.87%, and with Odisha and Assam, it is 13.71%. Similarly, among the southern states, out of 42.95%, Tamil Nadu and Karnataka get a share of 31.24%. More striking is the central region, where out of a share of 14.15%, UP takes away 12.84%. Maharashtra has a share of 6.33% out of a total 11.06% share of the West Region, and Punjab and Delhi together have 7% share of 13.51% of the North Region's share.

5.2: Facilities Created Under FIST

Most of the FIST grant has been utilized for the procurement of equipment and creating infrastructure facilities. This is reflected in table 5.2.1, which shows about 87% fund has been utilized for equipment, and 5% for the internet. Table 5.2.2 returns similar information state-wise and region-wise. Compared to E&NE and South regions (97% and 99% respectively), the North and Central Regions spent 88% and 80% respectively, for equipment. In cases of Goa and Maharashtra spending on equipment is more than 100%. As it was revealed during the course of the study, such cases are not unusual and arising mainly due to unforeseen increases in the price of equipment and/or lack of clarity on appropriability of certain accruals to the fund received (e.g., interest earned on the grant amount received). Overall expenditure on equipment is about 89% and that on repair is about 3%. Table 5.2.3 and 5.2.4 present investments in other works, namely, Lab renovation, Air-conditioning, library books, Internet, and other small works. Table 5.2.1 to 5.2.4 show that the FIST grant is quite comprehensive in contributing to the development of Lab facilities. Table 5.2.5 details the number of equipment purchased and the present status of that equipment. It is evident from the table that in many cases, information about the present status is not available. A few states like Assam, Andhra Pradesh and Goa have reported very high percentage of non-working equipment, much higher than the national average of 18% (Table 5.2.5).

5.3: Utilization and Functional Status of the Facilities/Equipment

What is the present status of the equipment procured under FIST grants? Table 5.3.1 presents an overall picture for regions. It is to be noted that while the first set of equipment (2002-4) in E&NE has better than the national average, during the later periods, E&NE records are poorer than rest of the regions. The issue is particularly important in North-Eastern states. During the course of the study it has been understood that repairing, maintenance, and spare parts for the installed equipment are major problem mainly due to transport bottleneck. That explains older equipment working better than the newer ones. The working status of the equipment is presented region-wise with reference to

different ranges of cost of equipment in table 5.3.2. As it is reflected in the table, the same problem persists for the states in North-East.

5.4: AMC and Management of the Equipment

Table 5.4.1 and 5.4.2 are on the status of AMC for the equipment. Tables throw light on an important issue related to the management of the equipment. As AMC ensures smooth functioning of the equipment over its lifetime, the common issue raised by almost all the grantees is that in many cases equipment remains non-functional for a long time because of administrative confusion about the expenses for AMC. Since FIST grant does not have any provision of AMC, the grantee departments and PIs find it difficult to convince the administration and finance of the respective institutions for allocation of fund for AMC for the equipment funded by external sources; in our case DST-FIST. This issue is reflected in the data presented in tables 5.4.1 and 5.4.2. Year of purchase-wise or cost of equipment-wise; either way, it is evident that most of the equipment does not have the AMC. However, the study has come across many cases where the PIs and the project team went out of the set protocol for AMC for the continuation of the R&D activities. This is how, in many cases, much equipment is functioning even much beyond its projected lifetime.

5.5: Utilization of Equipment

In this section, we focus on the utilization of equipment. Tables 5.5.1a to 5.5.1f (for National level, E&NE, South, North, Central, and West regions respectively) present the extent of utilization of the equipment. 57% of departments (national average) reported utilization of their equipment in the bracket of 100 to 76%. The variations are from high 68% to low 39% departments over different periods. In the case of E&NE percentage, utilization decreases as we approach the current year – from high 75% in 2000-03 to 15% in 2015-18. South has comparatively more consistent utilization of equipment over the periods. However, the status of equipment utilization is most commendable in northern states, reaching more than 200% in certain years (2003-06 and 2009-12). The North region is followed by the South and Central regions.

Table 5.5.2 presents external and internal users of equipment per week. External users (students and researchers) of the equipment are mostly less than five users a week in E&NE, South and North regions, but fewer in the Central and West regions. Table 5.5.3 presents the cost of the equipment-wise extent of utilization of equipment.

5.6: Issues Related to Procurement and Installations of Equipment

Other major administrative issues internal to the grantee institutions are the purchase and installation of the equipment. There are delays between receiving the sanction and purchase of the equipment, and also between purchase and installations of the equipment. In some cases, there are reasons, external to the grantee institutions, behind the delays in the purchase and/or between purchase and installation. At the National level, the gap beyond seven months between purchase and installation is about 11% (Table 5.6.1). While most of the regions are around the national level of delay, unusual delays are reported from the institutions in the Central region, where average delay (beyond 7 months are reported in cases as high as 33% in 2009, 31% in 2007, and 24% in 2005 and 2006 respectively.

Table 5.6.2 shows that at national level, more than 80% of the grantees have reported purchases within 4 years of the sanction. However, in later years, i.e., 2007 onwards, cases reporting delays beyond 4 years show an increasing trend, reaching as high as 23%. In E&NE, the percentageof cases beyond 4 years is higher than the national level, mostly due to inadequate transport communications in the North- East states.

5.7: Impact on Working Environment

Table 5.7.1 and 5.7.2 present the general environment or comfort in the workplace, i.e., department and the laboratory. We call it the input side of the working environment. The tables are based on the qualitative responses received from the PIs or HODs. Table 5.7.1 presents the softer aspects of the working environment, whereas table 5.7.2 presents the facilities in physical forms. While generally very high percentage of positive responses received for all the factors, more or less similar pattern (%) of responses across the regions and National level are also to be noted. It, therefore, appears that post FIST there is an overall improvement of the working environment and facilities in the S&T institutions across the country.

Tables for Chapter 5: Direct Impact

(Refers to FIST grants for 2000 – 2011)

Section 5.1: Volume and level of Grant

Table 5.1.1: Amount sanctioned and received for Level-0 grants

States/UT	No. of Units	Sanctioned Amt. (Rs. Lakhs)	Received Amt. (Rs. Lakhs)
Arunachal	X	X	X
Assam	1	61.00	51.00
Jharkhand	X	X	X
Manipur	X	X	X
Meghalaya	X	X	X
Mizoram	X	X	X
Nagaland	X	X	X
Odisha	X	X	X
Sikkim	X	X	X
Tripura	X	X	X
West Bengal	12	866.50	711.60
E&NE total	**13**	**927.50**	**762.60**
A & N	X	X	X
A P	X	X	X
Karnataka	4	263.50	174.80
Kerala	19	1100.90	967.40
Puducherry	X	X	X
Tamil Nadu	20	1202.00	1023.90
Telangana	1	88.50	80.30
South total	**44**	**2654.90**	**2246.40**
Delhi	X	X	X
Haryana	X	X	X
H P	X	X	X

States/UT	No. of Units	Sanctioned Amt. (Rs. Lakhs)	Received Amt. (Rs. Lakhs)
J & K	X	X	X
Punjab	4	252.00	221.60
Uttarakhand	X	X	X
North total	**4**	**252.00**	**221.60**
Bihar	X	X	X
Chhattisgarh	X	X	X
Madhya Pradesh	2	130.00	104.00
Uttar Pradesh	2	149.50	139.00
Central Total	**4**	**279.50**	**243.00**
Goa	X	X	X
Gujarat	X	X	X
Maharashtra	6	392.50	335.80
Rajasthan	1	90.00	87.80
West total	**7**	**482.50**	**423.60**
National	**72**	**4535.40**	**3897.20**

*Source: DST FIST survey

Table 5.1.2: State wise distribution of amount sanctioned and received for Level-I grants

States/UT	No. of Units	Sanctioned Amt. (Rs. Lakhs)	Received Amt. (Rs. Lakhs)
Arunachal	X	X	X
Assam	36	1471.40	1314.40
Jharkhand	11	459.20	626.40
Manipur	9	432.50	349.80
Meghalaya	7	286.00	209.70
Mizoram	3	139.50	97.00
Nagaland	3	73.00	60.00
Odisha	27	1441.70	1124.00
Sikkim	1	20.00	15.00
Tripura	5	114.30	94.60

States/UT	No. of Units	Sanctioned Amt. (Rs. Lakhs)	Received Amt. (Rs. Lakhs)
West Bengal	60	3528.60	2749.10
E&NE total	**162**	**7966.20**	**6640.00**
A & N	1	80.00	72.00
A P	29	1581.80	1310.40
Karnataka	63	3216.00	2742.00
Kerala	79	2865.30	2358.70
Puducherry	7	379.40	345.40
Tamil Nadu	159	7486.20	6051.60
Telangana	36	1868.70	1544.10
South total	**374**	**17477.40**	**14424.20**
Delhi	16	789.40	701.80
Haryana	19	837.30	747.20
H P	16	721.80	594.40
J & K	13	498.80	385.90
Punjab	44	2230.40	1870.50
Uttarakhand	27	1153.80	959.60
North total	**135**	**6231.50**	**5259.40**
Bihar	4	98.50	70.90
Chhattisgarh	9	316.50	241.90
M P	19	636.30	504.20
Uttar Pradesh	60	3378.00	2785.50
Central Total	**92**	**4429.30**	**3602.50**
Goa	11	570.50	426.30
Gujarat	23	1300.60	1132.90
Maharashtra	55	1995.40	1713.40
Rajasthan	24	941.00	708.00
West total	**113**	**4807.50**	**3980.60**
National	**876**	**40911.90**	**33906.70**

*Source: DST FIST survey

Table 5.1.3: State wise amount sanctioned and received for Level-II grants

States/UT	No. of Units	Sanctioned Amt. (Rs. Lakhs)	Received Amt. (Rs. Lakhs)
Arunachal	1	75.70	63.00
Assam	14	2079.30	1882.70
Jharkhand	4	557.70	400.50
Manipur	1	53.00	47.00
Meghalaya	4	301.80	275.10
Mizoram	X	X	X
Nagaland	X	X	X
Odisha	7	569.40	244.60
Sikkim	X	X	X
Tripura	X	X	X
West Bengal	48	5102.80	4099.10
E&NE total	79	8739.70	7012.00
A & N	X	X	470.40
A P	9	385.10	319.50
Karnataka	50	10130.10	8766.80
Kerala	13	845.50	727.20
Puducherry	4	507.50	X
Tamil Nadu	71	7752.60	6979.00
Telangana	16	1565.20	1381.00
South total	163	21186.00	18643.90
Delhi	22	3408.30	3134.10
Haryana	2	73.00	56.50
H P	2	185.00	97.70
J & K	2	170.00	129.50
Punjab	20	1310.50	1162.60
Uttarakhand	12	1364.50	1277.10
North total	60	6511.30	5857.50
Bihar	X	X	X
Chhattisgarh	X	X	X
Madhya Pradesh	3	79.00	51.50

States/UT	No. of Units	Sanctioned Amt. (Rs. Lakhs)	Received Amt. (Rs. Lakhs)
Uttar Pradesh	53	8826.50	7981.50
Central Total	56	8905.50	8033.00
Goa	2	228.00	83.10
Gujarat	8	331.50	305.20
Maharashtra	31	3705.50	3272.50
Rajasthan	12	1079.40	904.80
West total	53	5344.40	4565.60

*Source: DST FIST survey

Table 5.1.4: State wise distribution of amount sanctioned and received for all grants

States/UT	Sanctioned Amt. (Rs. Lakhs)	(%)	Received Amt. (Rs. Lakhs)	(%)
Arunachal	75.70	0.08	63.00	0.08
Assam	3611.70	3.75	3248.10	3.97
Jharkhand	1016.90	1.06	1026.90	1.25
Manipur	485.50	0.50	396.80	0.48
Meghalaya	587.80	0.61	484.80	0.59
Mizoram	139.50	0.15	97.00	0.12
Nagaland	73.00	0.08	60.00	0.07
Odisha	2011.10	2.09	1368.50	1.67
Sikkim	20.00	0.02	15.00	0.02
Tripura	114.30	0.12	94.60	0.12
West Bengal	9497.90	9.87	7559.80	9.23
E&NE total	**17633.40**	**18.33**	**14414.50**	**17.60**
A & N	80.00	0.08	72.00	0.09
A P	1966.90	2.04	1629.90	1.99
Karnataka	13609.60	14.15	11683.60	14.26
Kerala	4811.70	5.00	4053.30	4.95
Puducherry	886.90	0.92	815.80	1.00
Tamil Nadu	16440.80	17.09	14054.60	17.16
Telangana	3522.30	3.66	3005.40	3.67
South total	**41318.20**	**42.95**	**35314.60**	**43.11**

States/UT	Sanctioned Amt. (Rs. Lakhs)	(%)	Received Amt. (Rs. Lakhs)	(%)
Delhi	4197.70	4.36	3835.90	4.68
Haryana	910.30	0.95	803.70	0.98
H P	906.80	0.94	692.10	0.84
J & K	668.80	0.70	515.40	0.63
Punjab	3792.90	3.94	3254.80	3.97
Uttarakhand	2518.30	2.62	2236.70	2.73
North total	**12994.80**	**13.51**	**11338.60**	**13.84**
Bihar	98.50	0.10	70.90	0.09
Chhattisgarh	316.50	0.33	241.90	0.30
Madhya Pradesh	845.30	0.88	659.70	0.81
Uttar Pradesh	12354.00	12.84	10905.90	13.31
Central Total	**13614.30**	**14.15**	**11878.40**	**14.50**
Goa	798.50	0.83	509.40	0.62
Gujarat	1632.10	1.70	1438.10	1.76
Maharashtra	6093.40	6.33	5321.70	6.50
Rajasthan	2110.40	2.19	1700.50	2.08
West total	**10634.40**	**11.06**	**8969.70**	**10.95**
National	**96195.10**	**100.00**	**81915.80**	**100.00**

*Source: DST FIST survey

Section 5.2: Facilities Created Under FIST

Table 5.2.1: Investment on infrastructure created under FIST grant (2000-2011)

Description	Cost (Rs. Lakhs) (%)
Equipment	72169.90 (87.00)
Internet	4182.00 (5.00)
Equipment repairs	2684.50 (3.20)
Renovation	1824.30 (2.20)
Books	962.10 (1.20)
Other works	898.40 (1.10)
Air condition	251.70 (0.30)

*Source: DST FIST survey

Table 5.2.2: Investment on infrastructure created under FIST grant

States/UT	Investment on Equip (Rs.Lakhs)	Investment on Repair (Rs. Lakhs)	Equip as % of Received Amount	Repair as % of Received Amount
Arunachal	62.50	0.50	99.21	0.79
Assam	1947.90	66.80	59.97	2.06
Jharkhand	1091.00	6.70	106.24	0.65
Manipur	274.70	25.30	69.23	6.38
Meghalaya	426.40	13.40	87.95	2.76
Mizoram	83.50	0.00	86.08	0.00
Nagaland	46.80	3.00	78.00	5.00
Odisha	1265.50	15.40	92.47	1.13
Sikkim	10.40	0.00	69.33	0.00
Tripura	62.50	0.50	66.07	0.53
West Bengal	7228.60	173.40	95.62	2.29
E&NE total	**12499.80**	**305.00**	**97.41**	**1.54**
A & N	72.00	0.00	100.00	0.00
A P	1274.20	30.50	78.18	1.87
Karnataka	9730.00	265.50	83.28	2.27
Kerala	3309.00	61.70	81.64	1.52
Puducherry	502.50	241.80	61.60	29.64
Tamil Nadu	12816.20	230.70	91.19	1.64
Telangana	2970.90	59.10	98.85	1.97
South total	**30674.80**	**889.30**	**99.43**	**0.98**
Delhi	3337.80	59.70	87.01	1.56
Haryana	675.90	10.50	84.10	1.31
Himachal	638.20	15.50	92.21	2.24
J & K	345.50	1.30	67.04	0.25
Punjab	2703.60	58.30	83.07	1.79
Uttarakhand	1996.20	24.10	89.25	1.08
North total	**9697.20**	**169.40**	**88.13**	**1.32**
Bihar	49.10	0.00	69.25	0.00

States/UT	Investment on Equip (Rs.Lakhs)	Investment on Repair (Rs. Lakhs)	Equip as % of Received Amount	Repair as % of Received Amount
Chhattisgarh	168.40	4.00	69.62	1.65
MP	541.20	4.70	82.04	0.71
UP	9908.90	219.00	90.86	2.01
Central total	**10667.60**	**227.70**	**80.06**	**1.00**
Goa	630.80	25.20	123.83	4.95
Gujarat	1131.70	20.80	78.69	1.45
Maharashtra	5437.60	1022.70	102.18	19.22
Rajasthan	1430.20	24.60	84.10	1.45
West total	**8630.30**	**1093.30**	**103.97**	**3.20**
National	**72169.70**	**2684.70**	**88.63**	**3.30**

*Source: DST FIST survey

Table 5.2.3: Investment on renovation, air conditioning and other works

States/UT	Renovation Rs. Lakhs	% of National	Air Conditioning (Rs. Lakhs) (%)	% of National	Other Works (Rs. Lakhs) (%)	% of National
Arunachal	0.00	0.00	0.00	0.00	0.00	0.00
Assam	167.20	9.20	9.40	3.70	24.70	2.70
Jharkhand	0.70	0.00	1.50	0.60	18.40	2.00
Manipur	13.00	0.70	0.00	0.00	3.20	0.40
Meghalaya	4.50	0.20	3.30	1.30	16.80	1.90
Mizoram	X	0.00	X	0.00	X	0.00
Nagaland	106.70	5.80	13.00	5.20	43.00	4.80
Odisha	45.10	2.50	3.40	1.40	17.20	1.90
Sikkim	8.00	0.40	0.00	0.00	0.00	0.00
Tripura	7.20	0.40	X	0.00	0.00	0.00
West Bengal	106.70	5.80	13.00	5.20	43.00	4.80
E&NE total	**459.10**	**25.00**	**43.60**	**17.40**	**166.30**	**18.50**
A & N	0.00	0.00	0.00	0.00	0.00	0.00
A P	52.30	2.90	6.00	2.40	27.40	3.00

States/UT	Renovation Rs. Lakhs	% of National	Air Conditioning (Rs. Lakhs) (%)	% of National	Other Works (Rs. Lakhs) (%)	% of National
Karnataka	238.60	13.10	14.50	5.80	62.70	7.00
Kerala	131.90	7.20	13.30	5.30	65.20	7.30
Puducherry	12.00	0.70	0.20	0.10	7.90	0.90
Tamil Nadu	187.70	10.30	23.10	9.20	169.00	18.80
Telangana	170.20	9.30	61.30	24.40	48.20	5.40
South total	**792.70**	**43.50**	**118.40**	**47.20**	**380.40**	**42.40**
Delhi	46.80	2.60	39.30	15.60	67.10	7.50
Haryana	10.40	0.60	2.30	0.90	0.10	0.00
Himachal	10.20	0.60	0.00	0.00	7.00	0.80
J & K	20.30	1.10	1.80	0.70	1.20	0.10
Punjab	47.10	2.60	6.00	2.40	55.20	6.10
Uttarakhand	22.20	1.20	0.00	0.00	0.70	0.10
North total	**157.00**	**8.70**	**49.40**	**19.60**	**131.30**	**14.60**
Bihar	0.00	0.00	0.00	0.00	0.00	0.00
Chhattisgarh	8.00	0.40	9.10	3.60	6.00	0.70
M P	16.70	0.90	4.60	1.80	4.50	0.50
U P	204.40	11.20	11.10	4.40	184.80	20.60
Central Total	**386.10**	**21.20**	**74.20**	**29.40**	**326.60**	**36.40**
Goa	4.80	0.30	4.40	1.70	0.00	0.00
Gujarat	70.60	3.90	3.10	1.20	3.10	0.30
Maharashtra	122.70	6.70	10.00	4.00	33.20	3.70
Rajasthan	95.00	5.20	10.90	4.30	32.00	3.60
West total	**293.10**	**16.10**	**28.40**	**11.20**	**68.30**	**7.60**
National	**1824.30**	**X**	**251.70**	**X**	**898.40**	**X**

*Source: DST FIST survey

Table 5.2.4: Investment on Books and Internet

States/UT	Books (Rs. Lakhs) (%)	Internet (Rs. Lakhs) (%)
Arunachal	X	X
Assam	45.50(4.70)	138.60(3.40)
Jharkhand	0.00(0.00)	10.40(0.30)
Manipur	10.30(1.10)	25.60(0.60)
Meghalaya	26.50(2.80)	24.800.60)
Mizoram	7.10(0.70)	5.00(0.10)
Nagaland	6.00(0.60)	5.00(0.10)
Odisha	10.00(1.00)	57.20(1.40)
Sikkim	0.00(0.00)	5.00(0.10)
Tripura	3.70(0.40)	22.20(0.50)
West Bengal	99.80(10.40)	351.50(8.60)
E&NE total	**208.90**	**645.30**
A & N	X	X
A P	23.50(2.40)	70.60(1.70)
Karnataka	63.50(6.60)	418.80(10.30)
Kerala	99.10(10.30)	367.40(9.00)
Puducherry	13.40(1.40)	53.30(1.30)
Tamil Nadu	167.10(17.40)	747.10(18.30)
Telangana	40.30(4.20)	161.20(3.90)
South total	**406.90**	**1918.40**
Delhi	21.90(2.30)	148.70(3.60)
Haryana	14.00(1.50)	60.80(1.50)
Himachal	8.80(0.90)	102.60(2.50)
J & K	12.20(1.30)	74.50(1.80)
Punjab	37.40(3.90)	209.90(5.10)
Uttarakhand	28.10(2.90)	81.40(2.00)
North total	**122.40**	**676.90**
Bihar	0.00(0.00)	19.70(0.50)
Chhattisgarh	10.80(1.10)	26.10(0.60)
M P	10.70(1.10)	62.70(1.50)
U P	69.90(7.30)	422.80(10.40)

States/UT	Books (Rs. Lakhs) (%)	Internet (Rs. Lakhs) (%)
Central Total	**91.40**	**531.30**
Goa	1.00(0.10)	23.90(0.60)
Gujarat	33.50(3.50)	146.00(3.60)
Maharashtra	66.90(7.00)	231.30(5.70)
Rajasthan	31.10(3.20)	108.20(2.70)
West total	**131.50**	**509.40**
National	**962.10**	**4182.00**

*Source: DST FIST survey

Table 5.2.5: Working status of the equipment purchased under FIST

State/UTs	No. of Items Purchased	Status			
		Working		Non-Working	
		N	%	N	%
Arunachal	19	19	100.00	0	0.00
Assam	355	162	45.63	151	42.54
Jharkhand	63	44	69.84	11	17.46
Manipur	36	25	69.44	7	19.44
Meghalaya	80	42	52.50	16	20.00
Mizoram	23	20	86.96	3	13.04
Nagaland	6	5	83.33	1	16.67
Odisha	208	119	57.21	59	28.37
Sikkim	11	10	90.91	1	9.090
Tripura	15	14	93.33	1	6.67
West Bengal	1060	562	53.02	108	10.19
E&NE total	**X**	**X**	**X**	**X**	**X**
A & N	7	6	85.71	1	14.29
A P	153	97	63.40	56	36.60
Karnataka	490	368	75.10	119	24.29

State/UTs	No. of Items Purchased	Status			
		Working		Non-Working	
		N	%	N	%
Kerala	537	425	79.14	104	19.37
Puducherry	57	49	85.96	8	14.04
Tamil Nadu	1157	958	82.80	195	16.85
Telangana	219	186	84.93	32	14.61
South total	**X**	**X**	**X**	**X**	**X**
Delhi	213	164	77.00	28	13.15
Haryana	127	100	78.74	27	21.26
Himachal	145	123	84.83	22	15.17
J & K	101	67	66.34	7	6.93
Punjab	507	431	85.01	75	14.79
Uttarakhand	221	155	70.14	14	6.33
North total	**X**	**X**	**X**	**X**	**X**
Bihar	785	613	78.09	172	21.91
Chhattisgarh	143	115	80.42	28	19.58
M P	66	57	86.36	9	13.64
U P	5	4	80.00	1	20.00
Central Total	**X**	**X**	**X**	**X**	**X**
Goa	65	34	52.31	31	47.69
Gujarat	239	194	81.17	45	18.83
Maharashtra	761	656	86.20	105	13.80
Rajasthan	244	196	80.33	48	19.67
West total	**X**	**X**	**X**	**X**	**X**
National	**8118**	**6020**	**74.16**	**1485**	**18.29**

*Source: DST FIST survey

Section 5.3: Utilization and functional status of the facilities/equipment

Table 5.3.1: Year of procurement and functioning status of equipment

Year Equipment Purchased	Working (%)					
	National	E&NE	South	North	Central	West
2002-4	58.60	63.41	58.48	56.19	58.29	58.66
2005-9	73.80	61.90	75.64	71.11	77.34	77.52
2010-14	85.00	66.01	90.00	92.66	94.55	94.76
2015-18	71.10	31.49	94.44	98.00	95.88	100.00
Missing	53.50	30.41	78.03	87.72	76.88	0.00

*Note: Missing is for year of purchase
*Source: DST FIST survey

Table 5.3.2: Cost of equipment and functioning status

Cost (Rs. Lakhs)	Working (%)					
	National	E&NE	South	North	Central	West
< 5	72.66	50.84	80.52	77.91	78.75	81.43
5-10	76.92	63.52	78.86	82.73	76.00	81.62
10-20	76.09	54.84	78.26	82.83	83.13	83.65
20-30	83.78	84.38	80.65	85.71	83.33	90.63
30-40	79.53	77.27	52.38	88.24	70.37	94.74
40-50	86.46	84.62	84.78	81.82	91.67	92.86
50-60	82.86	60.00	90.91	100.00	72.73	100.00
60+	88.75	95.00	88.18	80.00	85.00	100.00
Missing	57.26	41.46	56.76	76.12	54.55	0.00

*Note: Missing is for cost of equipment
*Source: DST FIST survey

Section 5.4: AMC and management of the equipment

Table 5.4.1: Cost of equipment and AMC status

Cost Purchased	% of Equipment with Annual Maintenance					
	National	E&NE	South	North	Central	West
< 5	8.94	9.29	16.28	5.33	4.46	3.16
5-10	12.29	13.84	15.67	10.79	11.00	2.94
10-20	13.12	14.52	15.58	14.14	9.64	6.73
20-30	25.10	39.06	27.96	21.43	11.90	9.38
30-40	19.69	27.27	16.67	23.53	29.63	0.00
40-50	27.08	38.46	30.43	27.27	33.33	0.00
50-60	25.71	20.00	45.45	25.00	18.18	0.00
60+	27.92	32.50	29.09	40.00	20.00	10.00
Missing	12.82	12.20	10.81	8.96	54.55	0.00

*Note: Missing is for year of purchase. Upper limit in cost column is excluded
*Source: DST FIST survey

Table 5.4.2: AMC status of equipment by year of procurement

Year of Purchased	No. of Equipment	Annual Maintenance		
		Yes, No. (%)	No, No. (%)	Missing, No. (%)
2000-2004	1091	94 (8.60)	908 (83.20)	89 (8.20)
2005-2009	2627	286 (10.90)	2105 (80.10)	236 (9.00)
2010-2014	3192	443 (13.90)	2325 (72.80)	424 (13.30)
2015-2019	471	27 (5.70)	288 (61.10)	156 (33.10)
Missing	737	69 (9.40)	403 (54.70)	265 (36.00)
Total	8118	919 (11.30)	6029 (74.30)	1170 .40)

*Note: Missing is for year of purchase
*Source: DST FIST survey

Table 5.5.1a: Year of purchase and utilization of equipment (National)

Purchase Year	No. of Equipment	Percent Utilization			
		76-100	51-75	26-50	<=25
2000-2004	1242	67.87	5.72	2.17	2.17
2005-2009	2781	59.73	6.15	4.71	3.09
2010-2014	2898	56.35	9.18	4.24	3.11
2015-2019	460	44.35	12.61	4.35	1.52
Missing	737	38.67	6.78	3.12	2.44
Total	8118	56.98	7.59	3.99	2.81

*Source: DST FIST survey

Section 5.5: Utilization of equipment

Table 5.5.1b: Year of purchase and utilization of equipment (E&NE)

Purchase Yr.	Percent Utilization				
	No. of Equipment	≤ 25	26-50	51-75	76-100
2000- 2003	128	1.56	3.13	2.34	75.00
2003-2006	391	0.26	0.77	3.07	54.48
2006-2009	200	0.00	0.00	7.50	53.50
2009-2012	326	0.92	1.23	5.83	40.18
2012-2015	306	0.98	0.65	6.21	42.16
2015-2018	137	0.00	0.00	4.38	15.33
Missing	388	0.52	1.03	4.64	22.42
Total	1876	0.59	0.69	4.90	41.79

*Source: DST FIST survey

Table 5.5.1c: Year of purchase and utilization of equipment (South)

Purchase Year	Percentage Utilization				
	No. of Equipment	≤ 25	26-50	51-75	76-100
2000-2003	296	4.73	5.07	5.74	68.58
2004-2007	616	3.25	4.22	6.33	74.35
2008-2011	822	3.16	7.18	12.29	65.57
2012-2015	709	8.46	8.04	16.08	54.30
2016-2019	45	6.67	6.67	20.00	51.11
Missing	132	4.55	6.06	5.30	69.70
Total	2620	4.92	6.41	10.95	64.89

*Source: DST FIST survey

Table 5.5.1d: Year of purchase and utilization of equipment (North)

Purchase Year	Percentage Utilization				
	No. of Equipment	76-100	51-75	26-50	≤ 25
2000-2003	117	52.99	2.56	2.56	4.27
2003-2006	352	218.80	13.68	2.56	1.71
2006-2009	221	105.13	3.42	0.85	0.85
2009-2012	331	212.82	11.11	8.55	2.56
2012-2015	208	131.62	4.27	1.71	3.42
2015-2018	28	92.86	0.00	0.00	0.00
Total	1257	69.21	35.04	16.24	12.82

*Source: DST FIST survey

Table 5.5.1e: Year of purchase and utilization of equipment (Central)

Purchase Year	No. of Equipment	Percent Utilization				
		76-100	51-75	26-50	<=25	No Information
2000-2004	187	70.59	8.56	0.53	1.07	19.25
2005-2009	353	53.54	6.52	12.18	3.97	23.80
2010-2014	202	71.29	11.88	4.95	3.47	8.42
2015-2019	97	57.73	25.77	2.06	1.03	13.40
Missing	160	54.55	11.23	3.74	3.74	12.30
Total	999	62.36	10.91	6.31	3.10	17.32

*Source: DST FIST survey

Table 5.5.1: Year of purchase and utilization of equipment (West)

Purchase Year	No. of Equipment	Percent Utilization			
		76-100	51-75	26-50	<=25
2000-2004	179	59.20	6.70	0.00	0.00
2005-2009	568	54.00	4.80	2.80	5.10
2010-2014	531	39.00	7.20	4.00	2.60
2015-2019	31	48.40	9.70	12.90	0.00
Total	1309	48.50	6.10	3.10	3.30

*Source: DST FIST survey

Table 5.5.2: Number of users of equipment per week (external and internal)

No. of Users Per Week	Equipment Used by (%)									
	E&NE		South		North		Central		West	
	Int	Ext	Int	Ext	Int	Ext	Int	Ext	Int	Ext
0 – 5	19.00	46.60	17.20	48.30	19.00	46.60	16.10	16.40	24.29	26.40
5 – 10	12.60	5.10	13.40	6.30	12.60	5.10	18.70	5.20	18.42	4.90
10 – 15	6.50	2.10	11.80	5.90	6.50	2.10	7.80	1.90	7.90	0.70
15+	32.80	4.30	40.80	6.00	32.80	4.30	35.20	1.10	49.29	4.00
Missing	29.10	41.90	16.90	33.50	29.10	41.90	21.10	5.40	X	X

Int = Internal ; Ext = External
*Source: DST FIST survey

Table 5.5.3: Cost of equipment and utilization (National)

Cost Range Rs. Lakhs	No. of Equipment	Percent Utilization			
		76-100	51-75	26-50	<=25
< 5	5468	2888	377	201	156
5-10	951	642	84	47	28
10-20	690	454	56	33	24
20-30	275	175	36	13	5
30-40	124	84	10	9	4
40-50	98	60	14	3	1
50-60	36	24	5	0	1
60+	242	172	23	8	5
Missing	234	127	11	10	4
Total	8118	4626	616	324	228

*Source: DST FIST survey

Section 5.6: Issues related to procurement and installations of equipment

Table 5.6.1a: Gap between Purchase and Installation of Equipment by year of sanction (National)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 7 Months	After 7 Months	Missing
2000	833	68.79	13.33	17.89
2001	10	60.00	40.00	0.00
2002	964	74.07	9.75	16.18
2003	739	76.73	9.88	13.40
2004	477	70.44	10.90	18.66
2005	393	75.83	11.70	12.47
2006	587	78.88	10.73	10.39
2007	685	83.07	11.24	5.69
2008	742	83.83	11.32	4.85
2009	393	79.39	12.98	7.63
2010	988	70.65	11.84	17.51
2011	1307	86.15	8.57	5.28
Total	8118	77.41	10.89	11.70

*Source: DST FIST survey

Table 5.6.1b: Gap between Purchase and Installation of Equipment by year of sanction (E&NE)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 7 Months	After 7 Months	Missing
2000	190	46.32	13.16	40.53
2002	199	58.29	23.12	18.59
2003	204	70.10	8.33	21.57
2004	72	72.22	8.33	19.44
2005	71	45.07	11.27	43.66
2006	99	53.54	5.05	41.41
2007	109	85.32	8.26	6.42
2008	147	72.11	19.05	8.84
2009	52	55.77	17.31	26.92
2010	347	50.43	10.95	38.62
2011	388	75.52	11.60	12.89
Total	1878	0.00	0.00	0.00

*Source: DST FIST survey

Table 5.6.1c: Gap between Purchase and Installation of Equipment by year of sanction (South)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 7 Months	After 7 Months	Missing
2000	298	78.19	10.74	11.07
2002	254	81.89	6.30	11.81
2003	224	87.50	8.04	4.46
2004	122	86.07	9.02	4.92
2005	86	79.07	15.12	5.81
2006	166	89.76	8.43	1.81
2007	309	85.44	10.68	3.88
2008	237	86.92	10.55	2.53
2009	261	81.99	11.88	6.13
2010	290	86.21	11.03	2.76
2011	366	92.35	6.83	0.82
Total	2613	X	X	X

*Source: DST FIST survey

Table 5.6.1d: Gap between Purchase and Installation of Equipment by year of sanction (North)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 7 Months	After 7 Months	Missing
2000	120	84.17	10.83	5.00
2002	216	100.00	0.00	0.00
2003	110	63.64	27.27	9.09
2004	72	61.11	25.00	13.89
2005	68	98.53	1.47	0.00
2006	71	83.10	16.90	0.00
2007	85	87.06	3.53	9.41
2008	193	86.01	5.70	8.29
2009	35	91.43	8.57	0.00
2010	160	85.63	10.00	4.38
2011	181	91.16	4.97	3.87
Total	1311	X	X	X

*Source: DST FIST survey

Table 5.6.1e: Gap between Purchase and Installation of Equipment by year of sanction (Central)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 7 Months	After 7 Months	Missing
2000	151	60.93	17.22	21.85
2002	170	41.76	6.47	51.76
2003	130	59.23	13.08	27.69
2004	135	48.89	7.41	43.70
2005	50	50.00	24.00	26.00
2006	58	46.55	24.14	29.31
2007	54	46.30	31.48	22.22
2008	67	80.60	17.91	1.49
2009	6	66.67	33.33	0.00
2010	59	50.85	8.47	40.68
2011	119	84.87	7.56	7.56
Total	999	X	X	X

*Source: DST FIST survey

Table 5.6.1f: Gap between Purchase and Installation of Equipment by year of sanction (West)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 7 Months	After 7 Months	Missing
2000	76	77.63	22.37	0.00
2002	125	98.40	1.60	0.00
2003	71	85.92	14.08	0.00
2004	76	90.79	9.21	0.00
2005	118	89.83	10.17	0.00
2006	193	90.67	9.33	0.00
2007	128	88.28	11.72	0.00
2008	98	91.84	8.16	0.00
2009	39	84.62	15.38	0.00
2010	132	80.30	19.70	0.00
2011	253	90.51	9.49	0.00
Total	1309	X	X	X

*Source: DST FIST survey

Table 5.6.2a: Gap between sanction and purchase of the equipment (National)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 4 Years	After 4 Years	Missing
2000	833	82.23	6.00	11.76
2001	10	100.00	0.00	0.00
2002	964	82.68	4.67	12.66
2003	739	82.81	7.04	10.15
2004	477	80.50	7.13	12.37
2005	393	84.22	3.82	11.96
2006	587	84.67	7.84	7.50
2007	685	80.73	15.33	3.94
2008	742	83.69	11.73	4.58
2009	393	81.42	14.50	4.07
2010	988	61.03	23.18	15.79
2011	1307	83.01	12.47	4.51
Total	8118	X	X	X

*Source: DST FIST survey

Table 5.6.2b: Gap between sanction and purchase of the equipment (E&NE)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 4 Years	After 4 Years	Missing
2000	188	70.21	2.13	27.13
2002	199	78.39	2.01	14.57
2003	204	73.04	9.80	14.71
2004	72	59.72	6.94	19.44
2005	71	45.07	14.08	40.85
2006	99	48.48	10.10	41.41
2007	109	56.88	25.69	5.50
2008	147	49.66	27.89	8.16
2009	52	51.92	13.46	0.00
2010	347	10.66	19.60	37.46
2011	388	57.73	1.55	11.86
Total	1878	X	X	X

*Source: DST FIST survey

Table 5.6.2c: Gap between sanction and purchase of the equipment (South)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 4 Years	After 4 Years	Missing
2000	298	81.88	7.05	11.07
2002	254	85.04	3.15	11.81
2003	224	91.96	3.57	4.46
2004	122	87.70	7.38	4.92
2005	86	93.02	1.16	5.81
2006	166	92.17	6.02	1.81
2007	309	85.11	11.00	3.88
2008	237	94.09	3.38	2.53
2009	261	84.67	9.20	6.13
2010	290	87.24	10.00	2.76
2011	366	95.08	4.10	0.82
Total	2613	X	X	X

*Source: DST FIST survey

Table 5.6.2d: Gap between sanction and purchase of the equipment (North)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 4 Years	After 4 Years	Missing
2000	120	85.00	11.67	3.33
2002	216	92.13	7.41	0.46
2003	110	86.36	10.00	3.64
2004	72	83.33	2.78	13.89
2005	68	98.53	1.47	0.00
2006	71	98.59	1.41	0.00
2007	85	88.24	2.35	9.41
2008	193	89.12	2.59	8.29
2009	35	82.86	17.14	0.00
2010	160	86.88	8.75	4.38
2011	181	88.40	7.73	3.87
Total	1311	X	X	X

*Source: DST FIST survey

Table 5.6.2e: Gap between sanction and purchase of the equipment (Central)

Year of Sanction	% of Equipment Installed			
	Total Equip (no.)	Within 4 Years	After 4 Years	Missing
2000	151	89.40	3.97	6.62
2002	170	59.41	4.12	36.47
2003	130	70.77	5.38	23.85
2004	135	76.30	2.22	21.48
2005	50	72.00	2.00	26.00
2006	58	91.38	8.62	0.00
2007	54	90.74	7.41	1.85
2008	67	89.55	10.45	0.00
2009	6	83.33	16.67	0.00
2010	59	76.27	5.08	18.64
2011	119	84.87	12.61	2.52
Total	999	X	X	X

*Source: DST FIST survey

Table 5.6.2f: Gap between sanction and purchase of the equipment (West)

Year of Sanction	% of Equipment Installed		
	Total Equip (no.)	Within 4 Years	After 4 Years
2000	76	94.74	5.26
2002	125	100.00	0.00
2003	71	98.59	1.41
2004	76	93.42	6.58
2005	118	98.31	1.69
2006	193	89.64	10.36
2007	128	81.25	18.75
2008	98	94.90	5.10
2009	39	97.44	2.56
2010	132	97.73	2.27
2011	253	99.60	0.40
Total	1309	X	X

*Source: DST FIST survey

Section 5.7: Impact on Working Environment

Table 5.7.1: Impact on Working Environment of the grantee department

Working Environment	Responses Indicating Improvement (%)					
	National	**E&NE**	**South**	**North**	**Central**	**West**
Cleanliness	81.80	80.90	83.90	77.70	82.80	80.00
Room Temp., Light & Ventilation	72.90	72.40	75.70	66.30	76.50	69.50
Sufficient Working Space	68.80	86.80	72.90	64.60	70.30	69.50
Communication: Internet, Telephone, etc.	84.70	81.90	63.60	80.00	86.70	83.00
Personnel Development Opportunities	91.80	86.70	93.90	89.70	92.20	94.50
Administrative and Office Support	66.20	65.30	72.30	57.20	66.50	61.40
Motivation for innovation	95.40	93.10	95.70	97.20	93.80	96.50

*Source: DST FIST survey

Table 5.7.2: Impact on facilities of the grantee department

Facilities	Number of Respondents (%)					
	National	**E&NE**	**South**	**North**	**Central**	**West**
Lab Facility (Equipment, Instruments) and its maintenance.	745.00 (21.20)	147.00 (22.90)	333.00 (21.40)	115.00 (20.30)	86.00 (21.20)	64.00 (19.20)
Computation and Internet Facility	459.00 (13.10)	97.00 (15.10)	195.00 (12.50)	73.00 (12.90)	51.00 (12.60)	43.00 (12.90)
Classroom, Lab and working space Renovated	311.00 (8.90)	63.00 (9.80)	141.00 (9.00)	43.00 (7.60)	32.00 (7.90)	32.00 (9.60)
Teaching and Learning Environment	231.00 (6.60)	39.00 (6.10)	91.00 (5.80)	38.00 (6.70)	39.00 (9.60)	23.00 (6.90)
Student's (UG , PG and PhD) facility improved	199.00 (5.70)	27.00 (4.20)	91.00 (5.80)	40.00 (7.10)	28.00 (6.90)	13.00 (3.90)
Library (Increase in number of books)	117.00 (3.30)	21.00 (3.30)	52.00 (3.30)	22.00 (3.90)	10.00 (2.50)	12.00 (3.60)
Receiving other extramural grants	97.00 (2.80)	16.00 (2.50)	43.00 (2.80)	18.00 (3.20)	14.00 (3.40)	6.00 (1.80)
Addition of Faculty /Staff /Collaboration.	21.00 (0.60)	3.00 (0.50)	11.00 (0.70)	4.00 (0.70)	1.00 (0.20)	2.00 (0.60)
None/Nil/No Suggestion	187.00 (5.30)	2.00 (0.30)	0.00 (0.00)	1.00 (0.20)	11.00 (2.70)	00 (0.00)

*Source: DST FIST survey

Chapter 6: Indirect Impact

Abstract

Indirect impacts are expected but not mandated impacts out of the programme. These are the kind of impacts which are caused by the action that are later in time or farther removed in the distance but are still reasonably foreseeable.

There are overwhelming evidence and responses suggesting highly significant positive changes post FIST. There has been a change in the workplace, capacity building, manpower strength, and research output. However, there are issues related to AMC of the equipment procured under FIST and the help of technical staff for operation and maintenance of the equipment.

A bibliometric study provides full support to the above observation. The study shows that, as it is expected, till 2003 (3 years after the introduction of FIST), there were only two papers acknowledging FIST, and the number went up to 7289 by 2020. It is indicative of the fact that FIST was an effective catalyser in S&T research in the country.

6.0. About Indirect Impact

The FIST programme aims to augment the S&T education and research through funding of critical equipment, improvement in the academic ambiance, and creating facilities conducive to academic activities. Overall, the programme intends to build up teaching and research capabilities in the S&T departments. In the earlier chapter, we have tried to enumerate the direct impact of the programme. Direct impacts are those that directly flow from the programme. These can also be called the first-order impact. The second-order impacts are expected impacts once the FIST programme is implemented in a department. These are the kind of impacts which are caused by the action that are later in time or farther removed in the distance but are still reasonably foreseeable. It is expected to be reflected in the quality and quantity of the activities of the department. These impacts are called indirect because these are second-order impacts; these are expected but not mandated. Again, FIST is one among many contributors to the academic activity and productivity of a department. While it is not possible to single out FIST augmented changes and improvements in the activities and output of a department, it is also true that FIST, being a pioneering S&T infrastructure augmentation program, has a substantial contribution in the post FIST improvement in productivity. This is the reason this set of impacts is separately treated as indirect impact. Following are the impacts included in the group of indirect impact.

Indirect Impact

1. Impact on volume and quality of research
2. Impact on academic programs
3. Change in the sanctioned strength of seat
4. Change in student intake
5. Change in pass percentage of students qualifying in National examinations
6. Impact on capacity building
7. Impact on the volume of manpower
8. Trends in patent and commercialization of technology
9. The trend in product and process development
10. Impact on awards and recognition
11. Bibliometric study of publications acknowledging FIST

6.1: Impact on Research and Academic Activities

Table 5.7.1 and 5.7.2 in chapter-5 have presented the general responses in favour of significant improvement in the working environment after implementation of the FIST grant-related programme. Significant improvement in the working environment is expected to be reflected in the grantee departments' output or productivity. This is examined in Table 6.1.1. The table presents highly significant changes in all dimensions of the research and academic activities (conferences, seminar, workshops, new academic courses, collaborations, etc.) across different regions. The trend and pattern of the changes are also similar across the regions. The only exception, however, is in the West region for international conferences and management development programme. These two programmes have recorded changes more than 100 percent in other regions, but these were in single digits in the West.

6.2: Impact on Manpower

Manpower or the faculty profile in the departments depends on the general policy and growth pattern of an organisation. However, it can be fairly assumed that new equipment does trigger new research ideas, initiative, and need for additional manpower. The southern region is much better off in the changes in the grantee departments' faculty profile scenario. It has been learned during the course of

the interviews that utilization of the equipment had faced the problem of dedicated technical manpower for operation and maintenance of, particularly high-cost equipment. In many cases department managed sanctions from the institute for temporary technical staff, but such cases are rarer than normal. Table 6.2.1, briefs on the manpower scenario. Most of the new recruitment happens at the Assistant Professor level, as is shown by the positive changes in all the regions. The professor level's positive changes are mainly through promotion from Associate/Reader grades; as a result, changes in the Associate professor grade are very subdued and, in some cases, negative. It is evident from the table that changes in the Technical Staff category are discouraging.

6.3: Impact on Capacity Building

Like manpower, sanctioned seats in the institutes also depend on the overall policy decision of the management. However, strengthened S&T infrastructures through the FIST grant definitely add to the claim for more seats. Post FIST changes in the sanctioned seats show (Table 6.3.1) positive changes in all levels of S&T courses. However, there are regional variations in the changes, most notable of which are the changes in the West Region, where except in graduation courses (change, in this case, is the highest of all regions) changes are quite subdued and negative in the case M.Phil. Course. As expected, admission in the courses at all levels shows positive changes post FIST, except subdued changes in the West with a negative change in M.Phil. Course (Table 6.3.2).

The impact on pass percentage is shown in table 6.3.3. The table has to be read a bit carefully. The post Fist number of students appearing for the exams is much higher than that post FIST. Although the absolute number of graduated students is much higher in post FIST, percentage change would show negative changes due to a higher base in the post FIST data. Table 6.3.3, therefore, shows only the post FIST pass percentage, which, as it is evident from the table, is very high for all the regions, the average is above 90%. A similar trend is visible for improvement in results and students qualifying at the national level exams. In both the cases, as cautioned earlier, changes are not solely for FIST, but FIST initiated improved S&T infrastructure would be one of the factors behind these changes. Table 6.3.4 and 6.3.5 show the percentage change in the students' improved performance in the university exams and the national level exams, respectively.

6.4: Impact on S&T Output

Again, FIST is not the only contributor to the changes in different forms of S&T output. There would be many other factors. Nevertheless, FIST would be one of the essential catalysers in the overall improvement in the activities of the grantee departments. Table 6.4.1 presents the region-wise

scenario on different types of publications from the department. It is evident from the table that there have been very significant positive changes in all forms of publications across all regions. Most notable among the changes is in the publication of the original articles, which has seen more than 100% increases in all the regions except West, where it is about to 86%. Another set of output is in the form of new innovations in different forms, like, new products and/or processes, Patents, Consultancy, and also opportunities towards other grants. This picture is presented in table 6.4.2. The table reflects a somewhat less enthusiastic response about issues like Patents, Commercialisation of technology, and product and process development compared to Paper published, citation, and impact factor. Table 6.4.3 shows post FIST changes in awards and recognitions to faculties, along with national and international exposures. The general picture is more than 100% positive changes in all the categories. In some cases, like international certification and international collaborations, changes are in the range of 300% and above. In most of the categories, Institutions in the South have done better than institutes in other regions.

6.5: Research Outcome of DST-FIST Funding in India- A Bibliometric Analysis

(*This is a brief of the study. The full text of the study done by JSS Academy of Technical Education; Bengaluru*)

The bibliometric study was undertaken to evaluate the impact of the DST-FIST scheme on scientific research publication growth. The data was extracted in WoS and used VOS viewer for visualization of bibliometric networks. This study consolidates bibliometric analysis and visualization on publications acknowledging the DST-FIST scheme/program. The study is able to identify a number of prominent researchers, their specific field of study, and country collaboration and publication sources in various research domains. This study also revealed interesting information regarding authors who published the maximum number of papers, preferred sources of publication, most cited references, top ten authors, keywords, and soon.

Some interesting results covering DST-FIST acknowledged publications are summarized as follows: The publication acknowledging DST-FIST was published in the year 2003, although DST- FIST was established in the year 2000. The publications fluctuated at a low level during the initial period of 2003; however, after 2010, the number of publications grew rapidly. During 2003, the number of publications was only 2, and during 2020 the number of publications reached 7289. The analysis revealed a 25.6% annual percentage growth rate in publications each year. This clearly indicates that DST-FIST acted as a facilitator to improve the research rigor across the country in various research domains.

Domain Analysis

A disciplinary distribution study revealed the focus areas of research publications acknowledging DST-FIST. It is quite evident that 47% of the total publications favoured to "Chemistry" domain, followed by "Biological Sciences (12%)", "Materials Engineering (10%)", "Physics (5%)," etc. The findings revealed that the publications from basic science departments have a higher degree of research articles; incidentally, the funding for these domains is also ranked one. (*JSS Academy of Technical Education, Bengaluru, Page 31. The research outcome of DST-FIST funding in India- A Bibliometric Analysis.)* With respect to collaborative research work, India has a huge network of collaboration among countries like the USA, Spain, England, Russia, France, Singapore, South Korea, etc.

In terms of institutions, the Indian Institute of Technology has the highest number of publications and citations, followed by the University of Calcutta. This implies that the Indian Institute of Technology is the bellwether in effectively utilizing FIST funds for quality research publications.

Citations

The most common analysis in the bibliometric study is citation analysis. It measures the importance of publication work by counting the number of times it has been referred/cited by other authors. This also indicates the relevance of the research area. With respect to the number of citations, the trend graph revealed a positive growth up to 2014; however, it gradually took a decreasing trend after 2015 onwards. In order to identify the downward shift in citations, a domain analysis was carried out, which revealed that there was diversification in domain areas; for ex: Materials were a part of basic science; later, it emerged as a new research domain overall. The probable reason for the decreasing trend is assumed to be progressive changes in the research domain, the other factors like quality of the research paper, minimum time to gain the citations, obsolescence of research area, etc.

The Journal Royal Society of Chemistry ranks first among top journals in which the majority of the research papers were published. This clearly shows that the majority of the articles published acknowledging DST-FIST support were published in Tier 1 journals, which indeed talks about the quality of scientific research work carried out across various institutions in the nation. In the analysis of keywords, we have found that more focus is on chemistry in the research area of "oxidative stress," followed by "crystal structure," "X-ray diffraction," etc. Keyword co-occurrence network gave insights regarding main research themes in across various institutions in India.

Author

It is essential to study the most influential/productive authors and their affiliations; author-based analysis was carried out. The findings revealed that Ghosh A from the University of Calcutta, department of organic chemistry, is the most influential author with 124 articles published acknowledging DST-FIST, with an article fractionalized count of 32.5 and h-index of 27. And also, Ghosh A has topped the local citations table with a count of 464 citations. Co-citation analysis refers to the citing of two publications of the same author reflected in other articles. The co-citation network analysis revealed 11 clusters of publications that are frequently cited together. An author based bibliographic network yielded 24 clusters and revealed information about linkages and grouping of research works produced by various authors. Further, the analysis provides an understanding of the changes occurring over time and the trends in author-based knowledge networks.

From this, it can be concluded that DST- FIST's support for science and technology infrastructure has been a boon and a motivational factor for researchers and academicians across the country, inspiring them to be in active research and make significant contributions in diversified areas of research.

Tables for Chapter 6: Indirect Impact

(Refers to FIST grants for 2000 – 2011)

Section 6.1: Impact on Research and Academic Activities

Table 6.1.1: Impact on Capacity Building of the grantee Department

Capacity in	% Change After FIST					
	National	**E&NE**	**South**	**North**	**Central**	**West**
Research Publication & Collaboration	32.50	26.60	33.60	34.90	33.00	34.40
National Seminar/ Conf	94.40	114.80	97.20	75.30	98.70	103.42
International Seminar/ Conf	109.10	43.50	138.90	176.00	87.00	5.82
Workshops	176.60	148.40	217.60	102.00	117.10	177.51
Short term training Program	170.80	190.60	170.00	206.30	100.80	181.67
Faculty Development Program	146.90	161.30	168.60	91.50	99.30	106.30
Management Development Program	116.50	121.10	177.00	125.00	165.50	8.20
Upgradation of Technical staff	192.40	116.70	275.40	104.60	150.00	320.83
Others	116.50	100.00	123.30	362.50	190.90	210.29

*Source: DST FIST survey

Section 6.2: Impact on Manpower

Table 6.2.1: Impact on faculty manpower profile

Manpower	% Change After FIST					
	National	E&NE	South	North	Central	West
Asst.Prof.	25.90	12.30	42.10	14.10	18.60	11.74
Ass.Prof.	3.80	-3.70	16.50	-20.80	-5.80	-3.64
Prof.	20.80	27.70	19.40	16.10	26.40	27.97
Scientist	131.80	223.70	-5.80	68.90	163.30	223.68
Research staff	103.10	12.80	101.60	223.00	24.70	13.28
Tech Staff	8.50	9.90	24.60	-10.20	-1.80	10.55
Admn Staff	3.80	21.20	11.80	-5.90	3.60	21.70

*Source: DST FIST survey

Section 6.3: Impact on Capacity Building

Table 6.3.1: Impact on Sanctioned Seats in Various Courses

Courses	% Change After FIST					
	National	E&NE	South	North	Central	West
Graduation	23.40	25.80	29.90	18.80	21.30	41.66
Post-graduation	31.10	45.00	29.10	35.60	31.80	16.95
M. Phil.	13.80	19.30	15.40	21.60	16.10	-0.99
Ph.D.	50.30	96.70	63.70	50.10	37.80	5.85
PG Diploma	28.50	31.40	13.70	-5.90	138.20	1.66

*Source: DST FIST survey

Table 6.3.2: Impact on Admission (%) in Various Courses

Courses	% Change After FIST					
	National	E&NE	South	North	Central	West
Graduation	25.50	24.70	33.90	18.80	21.30	14.57
Post-graduation	45.70	201.00	31.20	35.60	31.80	16.90
M. Phil.	22.50	14.50	25.00	21.60	31.80	-25.80
Ph.D.	62.60	7.20	71.90	50.10	37.80	28.60
PG Diploma	44.40	2.70	32.00	-5.90	138.20	80.20

*Source: DST FIST survey

Table 6.3.3: Impact on Pass Percentage in Various Courses

Courses	% Change After FIST					
	National	E&NE	South	North	Central	West
Graduation	80.40	86.83	82.80	83.30	82.30	73.65
Post-graduation	91.80	91.18	100.00	92.30	90.80	77.77
M. Phil.	92.30	97.31	100.00	92.70	90.30	80.95
Ph.D.	83.10	62.75	88.80	69.20	100.00	90.58
PG Diploma	95.40	94.50	97.20	89.70	87.30	93.95

*Source: DST FIST survey

Table 6.3.4: Students Passed with quality improved or First Division

Courses	% Change After FIST					
	National	E&NE	South	North	Central	West
Graduation	48.80	71.26	48.20	59.60	51.80	46.90
Post-graduation	68.00	80.41	76.80	76.00	72.90	41.50
M. Phil.	114.70	85.92	100.00	83.40	86.80	64.00
Ph.D.	81.80	88.29	85.80	72.20	90.70	77.20
PG Diploma	54.20	97.79	38.90	80.40	75.20	75.50

*Ph.D. = Awarded

*Source: DST FIST survey

Table 6.3.5: Change in the number of students qualifying in National Examinations

Courses	% Change After FIST					
	National	E&NE	South	North	Central	West
NET/ SLET	179.90	180.91	417.90	148.10	73.70	-14.13
GATE	102.80	178.03	101.20	165.00	237.20	114.39
Others	88.20	177.29	141.00	66.50	75.90	56.30

*Source: DST FIST survey

Section 6.4: Impact on S&T output

Table 6.4.1: Changes in Publication

S&T Output	% Change After FIST					
	National	E&NE	South	North	Central	West
Books	111.20	97.70	167.80	98.10	2.90	56.10
Books Chapter	181.50	110.20	229.90	128.80	10.90	139.15
Original articles	133.00	163.90	144.80	125.50	114.80	86.90
Review articles	97.50	98.60	110.40	96.10	70.30	117.39
Case reports/ Editorial Notes	121.30	186.80	160.70	83.20	42.90	131.79
Articles in Conference Proceeding	116.20	167.40	127.70	84.70	89.30	82.94
Paper Presentation in Conference	128.50	182.00	139.90	140.60	76.00	112.38
Monograph	172.10	185.70	209.20	102.00	267.50	117.65
Others	109.60	75.40	464.78	80.90	10.50	289.08

*Source: DST FIST survey

Table 6.4.2: Trend in Research Funding and Output

S&T Output	Responses Suggesting Improvement (%)					
	National	E&NE	South	North	Central	West
Intramural Grants	66.60	65.70	67.20	71.40	64.10	62.40
Extramural Grants	78.90	80.00	79.40	83.40	80.40	68.90
Patents Filed	44.30	39.50	48.80	38.30	46.10	41.60
Commercialization of Technology	26.90	17.60	33.00	21.10	22.60	29.70
Product and Process Development	40.50	35.20	45.60	36.60	39.10	36.90
Papers Published	92.70	89.10	95.30	94.30	96.90	83.70
Trend in Impact Factor	93.40	88.60	96.10	96.00	94.50	87.00
Trend in Citation Index	92.20	88.60	94.30	93.10	96.10	85.00
Consultancy	54.60	44.30	67.60	43.40	39.80	50.60
Extension Work	67.70	56.60	76.00	58.80	62.50	69.00

*Source: DST FIST survey

Table 6.4.3: Awards and Recognitions by Faculty/ Scientists

Awards/ Recognition	% Change After FIST					
	National	E&NE	South	North	Central	West
Intl. Awards by Faculty	160.50	165.90	189.30	165.00	156.50	137.50
National awards by Faculty	136.90	183.80	165.80	153.70	87.60	56.41
Intl. Recognition to Faculty	157.10	81.20	188.30	194.90	169.80	143.94
National Recognition to Faculty	159.70	186.30	193.10	185.80	136.90	118.32
Intl. Fellowship	142.90	158.50	216.70	88.00	225.10	84.31
National Fellowship	149.00	112.20	152.60	220.60	90.60	69.90
Intl. Collaboration	216.10	154.90	337.60	122.30	58.50	103.30
National Collaboration	167.20	146.80	163.00	202.80	73.70	104.84
Intl. Certification	305.30	300.00	337.00	138.90	220.30	172.73
National Certification	136.00	168.80	126.70	97.00	276.50	76.67
Intl. Exchange Program	131.30	153.30	174.00	44.90	100.00	144.83
National Exchange Program	184.30	212.10	231.00	128.00	208.00	171.43

*Source: DST FIST survey

Chapter 7: Evaluation of Impact: Direct and Indirect

Abstract

The chapter examines both direct and indirect impacts in terms of certain selective attributes at the state, institution, and Principal Investigator (PIs) levels. The chapter ends with the focus on a qualitative assessment of the areas where the FIST programme has contributed to improvement and impediments faced while implementing the FIST programme.

Evaluating Direct Impact- Correlation between % share in the FIST project and improvement in the work environment is -0.29, and between share in the FIST grant and work environment is -0.26. Does it suggest that many of the grantee institutes are not capable enough to handle bigger (in number and fund) projects?

The Correlation coefficient derived for relations between the age of the institutions and working status and utilization of the equipment procured under FIST grants is -0.30, which extends some sort of support to a hypothesis that the institute's age is a factor in the upkeep of the equipment.

Working PIs in relation to working status and utilization of the equipment return coefficients of -0.28 and 0.17, respectively. The working environment has been examined again in terms of the professional status of the PIs (HOD/Professor) for a positive correlation coefficient of 0.31, suggesting PIs in senior positions help improvement in the working environment.

Evaluating Indirect Impact- focused mainly on the academic achievement of the department's faculty, high positive correlation coefficients suggest that higher share in FIST project and FIST fund and with higher % of the working status of the equipment result to higher academic achievements. At the institution level, facilities available show a negative correlation with academic achievements. It suggests that academic leadership is important for deriving benefits from the S&T infrastructure. This is somewhat reflected at the PI level, where it is seen that the middle-level leadership of associate professors are highly positively correlated with academic achievements.

Lack of funds for AMC turned out as a major issue. This issue did come up on many occasions during visits and discussions with the PIs and the faculty of various institutes. Inadequate space and also lack of enough faculties are the other woes.

7.1: Evaluation of Direct Impacts

In chapter-4, we have elaborated upon the attributes of the grantees in four tires, namely, States, Institutions, Departments, and Principal Investigators (PIs) as grantees at different tiers. We have also seen that high positive correlation coefficients indicate that relative shares in GDP, population, and number of S&T institutions and age of the institutions in a state might explain the variations in relative shares in number of projects and amount of grants granted to the institutions in a state.

We want to investigate further if these attributes do explain the impacts of the FIST programme. This is not to suggest that these attributes will explain the variations in impact (if any). However, these attributes do matter in the activities and productivity of the departments, and in turn of the institutes, and the States.

For this purpose, we re-organize the attributes as shown in the following tables. We propose to evaluate the impacts (both Direct and Indirect) in terms of comparative positions of the states, institutions, departments, and PIs in different states. In this chapter, we look into the direct impact. Indirect impacts are treated separately in chapter-9.

Although there are various issues related to the direct impact of FIST funding discussed in Chapter-5, for the present purpose, we focus only on facilities created and the present working status of those created through FIST funding.

7.2: Evaluating at the State Level

Table 7.2.1 presents a state-wise aggregated scenario of the status of the equipment installed using FIST grants. We have used, in addition to states' share in number of projects and funds, share in the total expenditure on equipment. No meaningful correlation was found at the state level for both working status and utilization of equipment. This implies that the variations have to be seen at more disaggregated levels. Table 7.2.2 focuses on improvingthe working environment and States' share in FIST projects and Grants. The table returns correlation coefficients as follows:

The correlation between % share in the FIST project and improvement in the work environment is -0.29, and between share in the FIST grant and work environment is -0.26. Does it suggest that many of the grantee institutes are not capable enough to handle bigger (in number and fund) projects?

Sl. No.	Correlation Between	Correlation Coefficient	Table Source
1	% share in FIST project and improvement in work environment	r = -0.29	Table 7.2.2
2	% share in FIST grant and improvement in work environment	r = -0.26	Table 7.2.2

7.3: At Institute Level

The age of the institution can be used as a proxy to the old established practices of management that might sometimes create obstacles for relaxations required for the implementation of infrastructure projects with the flow of fresh funding. In Chapter-4, we have seen that there are reasonably strong correlations between the age of the institute and the share of the FIST fund. Table 7.3.1 shows the relations between age of the institutions and working status, and utilization of the equipment procured under FIST grants. The correlation coefficient derived for working status is -0.30 that extends some sort of support to a hypothesis that the age of the institute is a factor in the upkeep of the equipment. However, there is no correlation with the utilization of equipment. Another issue we tried to examine is the level of the existing facility and working status, and utilization of equipment. Table 7.3.1 and 7.3.2 do not show any meaningful relations with working status. Tables also show a positive correlation (0.19 and 0.17, respectively) with the utilization of equipment.

Another major distinction among the institutions is in terms of academic autonomy and source of financial support. In the present study, academic autonomy has been approximated by identifying the institutes set up by Central Govt., State Govt., or Deemed University, Constituent College, or a private venture. Similarly, financial status has been captured again as Central Govt., State Govt. or other funding sources. Besides that, the category of funding levels under FIST as Level-0, Level -I, and Level -II also indicate about the type of organization. Tables 7.3.3 to 7.3.8 present responses received from PIs and HODs on direct and indirect areas where improvements have been realized. Table 7.3.3 briefs the responses from the institutes distinguished in terms of academic autonomy. It is interesting to observe that the table can be more or less sharply divided between double-digit and single-digit responses.

New equipment and computational facilities and the Internet – these are the areas where positive responses see double-digit figures. And there are not many variations in responses across the different categories of academic autonomy, exceptions being autonomous institutes and Constituent colleges. For improvement in other facilities like Classrooms, Library, additional faculty, and overall teaching and learning environment, the responses are subdued. Table 7.3.4 does the follow up to understand the impediments for improvement. As it has been talked about in earlier occasions as well, lack of funds for AMC turned out as a major issue. This issue did come up on many occasions during visits and discussions with the PIs and the faculty of various institutes. Inadequate space and also lack of enough faculties are the other woes. Similar issues were taken up for institutes with financial autonomy and institutions under Level-0, Level -I, and Level -II levels in tables 7.3.5 and

7.3.6 (for Financialautonomy) and 7.3.7 and 7.3.8 (for grant levels). The responses remain the same in all the cases, along with the responses on impediments.

7.4: At PIs Level

We attempted to see if the working status and utilization of the equipment has any relation with the status of the PIs. We do not expect the gender of the PIs to have any meaningful connections with the working status of the equipment because female PIs are very insignificant in number. At the PI level, we have examined two aspects: the percentage of PIs working and the status of the PIs. For the later, we have considered the PIs who are HODs/professors and Associate Professor with the hypothesis in mind that HODs with many more administrative responsibilities might not be able to give full attention that is needed for the functional status and utilization of the equipment. Also, much of the equipment's functional status depends on a set of administrative supports and regulations. We, therefore, do not expect good positive relations in these cases. Table 7.4.1 presents state-wise information on working PIs and relates those with working status and equipment utilization. The table returns a correlation of -0.28 and 0.17, respectively. The negative coefficient is quite intriguing. But even a cursory look at the data reveals that in many cases where the percentage of working PIs is comparatively smaller, the working equipment percentage is higher. Table 7.4.2 is about the professional status of the PIs. We have taken the PIs who are HODs/professors and associate professors. The table returns a correlation coefficient of -0.32 for the working status of the equipment and 0.21 for the utilization of equipment in the case of HOD/Professor. For Associate Professors, coefficients are 0.01 and -0.19. The results lend reasonable support to the hypothesis mentioned above. In table 7.4.3, the average improvement in the working environment has been examined again in terms of the professional status of the PIs (HOD/Professor). The table has returned a positive correlation coefficient of 0.31, suggesting PIs in senior positions help improvement in the working environment.

7.5: Evaluation of Indirect Impact

As we have elaborated in Chapter-7, indirect impacts are those which cannot be attributed to the FIST programme alone, but at the same time FIST programme has definitely contributed to the changes that have been observed post FIST. Also, there are impacts that would be considered as the second-order impacts because those either are not mandated or estimated but expected to be realized. Chapter-7 has presented the list of the expected indirect impacts of the programme. Two main streams of indirect impacts are being considered: credibility and capability of the students and

faculty. We examine again with a few state levels, institution level, and PI level attributes.

Capacity improvement has been aggregated at the state level. The aggregation has been done taking an average of all responses on the following categories: Research Publication & Collaboration, National Seminar/ Conference, International Seminar/ Conference, Workshops, Short term training Program, Faculty Development Program, Management Development Program, Up-gradation of Technical staff, Others.

7.6: At the State Level

We estimate simple correlations with states' share in FIST grants (projects and fund) and percentage of working equipment with average percentage improvements in the academic activities at the state level as shown in table 7.6.1.

Correlation coefficients derived are as follows:

Sl. No.	Correlation Between	Correlation Coefficient	Table Source
1	Percentage average improvement and share in number of projects	r = 0.62	Table 7.6.1
2	Percentage average improvement and share in FIST fund = 0.48	r = 0.48	Table 7.6.1
3.	Percentage average improvement and working equipment = 0.49	r = 0.49	Table 7.6.1

Interesting implications can be drawn from the above correlation coefficients. First, more is the FIST support better is academic achievements. And also, better the working equipment better are academic activities.

7.7: At Institution Level

At the institution level, we try the age of the institution (50 and above), facilities in the institution, and Internet and Computation facility. These are presented in tables 7.7.1, 7.7.2, and 7.7.3.

Correlation coefficients derived are presented below:

Sl. No.	Subject Attributes	Correlation Coefficient	Table Source
1	The average improvement in academic performance and age of the institution	r = 0.10	Table 7.7.1
2	The average improvement in academic performance and facilities in the institution	r = -0.32	Table 7.7.2

If not the magnitudes, signs of the coefficients returned by table 7.7.1 and 7.7.3 are intuitively expected. The same is not apparent for table 7.7.2, where the coefficient is -0.32. We would like to interpret it as – it is not facilities as much, but the department's leadership that works as a booster for academic performance.

7.8: At PI Level

Table 7.8.1 places the state-wise average responses on improvement in capacities with the working status of the PIs. We estimated two correlations: one with the Associate professor and the other Principal and HOD taken together. The coefficients are shown below:

Coefficient of correlation between:

Sl. No.	Correlation Between	Correlation Coefficient	Table Source
1	Improvement in capacity and HOD and Principal taken together = -0.30	r = -0.30	Table 7.8.1
2	Improvement in capacity and Associate professor = 0.30	r = 0.30	Table 7.8.1

Exactly equal magnitude with opposite sign is interesting, but indicates the importance of the middle level professionals in the educational and research institutions.

7.9: Impediments

Impacts have to be examined and understood in terms of the impediments faced while implementing the FIST, utilizing and maintaining the equipment procured with FIST grants. In this section, we evaluate the improvements and impediments both through the academic autonomy of the institutions. Both sets of information on improvements and impediments were created through text data analysis of the views and opinions of the PIs and/or HODs.

Respondents were asked to write down the kind of problems faced in the course of implementation of the activities proposed in the FIST grants. Respondents were not as candid in giving responses in the written form as they were while discussing the matter. Hence the table should not be read in terms of percentage responses to different issues. Instead, the table indicates the existence of the impediments demanding attention. However, among the listed issues most discussed ones are: (a) Fund-related delay in fund release, AMC; (b) Need of supporting staff (tech) for operation and maintenance of the equipment; (c) In many cases, administrative support has been felt inadequate.

Table 7.9.1 presents the responses on areas of perceived improvements through the FIST grants. It is interesting to observe that the order of importance of the areas of improvement followsa similar pattern across the region and at national levels. As expected, getting new equipment is the most important improvement area, followed by computational facilities and renovation of classrooms and laboratories.

Table 7.9.2 shows responses on impediments faced while implementing FIST projects. AMC for the equipment not being a part of the FIST grant opined as the most important impediment deriving optimum benefit from the equipment. Delay in release of funds is also considered as an important problem. At the institutional level lack of infrastructure and adequate space are shown as the second most important impediment. This is followed by inadequate staff and faculty. It is more felt connected with the technical manpower needed for the operation and maintenance of the equipment. Internet and computational facility are at the bottom in the list of impediments. Table 7.9.3 juxtaposes the regional perspective with the national perspective and suggests the same pattern of opinion on impediments.

Tables for Evaluation of Impact: Direct and Indirect

(Refers to FIST grants for 2000 – 2011)

Evaluation of Direct Impact

Section 7.2: At State level

Table 7.2.1: States' share in the project, fund, and expenses on equipment and working status of the equipment

State	% of Projects	% of Total Amount	No. of Items Purchased	Share in Expenditure on Equip	% of Working Equip	Utilization of Equip (50% and Above)
Arunachal	0.07	0.08	19	0.10	100.00	NA
Assam	3.75	3.75	355	2.70	45.63	48.17
Jharkhand	1.10	1.06	63	1.50	69.84	90.48
Manipur	0.74	0.50	36	0.40	69.44	75.00
Meghalaya	0.81	0.61	80	0.60	52.50	76.25
Mizoram	0.22	0.15	23	0.10	86.96	95.65
Nagaland	0.22	0.08	6	0.10	83.33	33.33
Odisha	2.50	2.09	204	1.80	57.21	47.06
Sikkim	0.07	0.02	11	0.01	90.91	NA
Tripura	0.37	0.12	18	0.10	93.33	50.00
West Bengal	8.83	9.87	1060	10.0	53.02	36.79
E&NE	**X**	**X**	**X**	**X**	**X**	**X**
A & N	0.07	0.08	7	0.10	85.71	85.71
Andhra	2.80	2.04	153	1.80	63.40	81.70
Karnataka	8.61	14.15	490	13.50	75.10	64.29
Kerala	8.17	5.00	537	4.60	79.14	56.80
Puducherry	0.81	0.92	57	0.70	85.96	77.19

State	% of Projects	% of Total Amount	No. of Items Purchased	Share in Expenditure on Equip	% of Working Equip	Utilization of Equip (50% and Above)
Tamil Nadu	18.40	17.09	1157	17.8	82.80	66.03
Telangana	3.90	3.66	219	4.10	84.93	84.93
South	**X**	**X**	**X**	**X**	**X**	**X**
Delhi	2.80	4.36	213	4.60	77.00	83.57
Haryana	1.55	0.95	127	0.90	78.74	62.99
Himachal	1.32	0.94	145	0.90	84.83	72.41
J & K	1.10	0.70	101	0.50	66.34	39.60
Punjab	5.00	3.94	507	3.70	85.01	76.13
Uttarakhand	2.87	2.62	221	2.80	70.14	50.68
North	**X**	**X**	**X**	**X**	**X**	**X**
Bihar	0.29	0.10	5	0.10	80.00	40.00
Chhattisgarh	0.66	0.33	66	0.20	86.36	65.15
M P	1.77	0.88	143	0.70	80.42	62.24
U P	8.46	12.84	785	13.70	78.09	67.26
Central	**X**	**X**	**X**	**X**	**X**	**X**
Goa	0.96	0.83	65	0.90	52.31	70.77
Gujarat	2.28	1.70	239	1.60	81.17	42.26
Maharashtra	6.77	6.33	761	7.50	86.20	47.83
Rajasthan	2.72	2.19	244	2.00	80.33	51.64
West	**X**	**X**	**8117**	**X**	**X**	**X**
Total	**100.00**	**100.00**	**X**	**X**	**74.16**	**X**

*Source: DST FIST survey

Table 7.2.2: States' share in FIST grant and improvement in work environment*

State	% of Projects	% of Total Amount	Avg Work * Improvement
Arunachal	0.07	0.08	0.57
Assam	3.75	3.75	0.78
Jharkhand	1.10	1.06	0.88
Manipur	0.74	0.50	0.79
Meghalaya	0.81	0.61	0.74
Mizoram	0.22	0.15	0.95
Nagaland	0.22	0.08	0.86
Odisha	2.50	2.09	0.83
Sikkim	0.07	0.02	1.00
Tripura	0.37	0.12	0.94
West Bengal	8.83	9.87	0.74
E&NE	**X**	**X**	**0.83**
A & N	0.07	0.08	0.73
Andhra	2.80	2.04	0.75
Karnataka	8.61	14.15	0.81
Kerala	8.17	5.00	0.82
Puducherry	0.81	0.92	0.78
Tamil Nadu	18.40	17.09	0.64
Telangana	3.90	3.66	0.69
South	**X**	**X**	**0.81**
Delhi	2.80	4.36	0.76
Haryana	1.55	0.95	0.82

State	% of Projects	% of Total Amount	Avg Work * Improvement
Himachal	1.32	0.94	0.84
J & K	1.10	0.70	0.76
Punjab	5.00	3.94	0.86
Uttarakhand	2.87	2.62	0.90
North	**X**	**X**	**0.73**
Bihar	0.29	0.10	0.80
Chhattisgarh	0.66	0.33	0.87
M P	1.77	0.88	0.82
U P	8.46	12.84	0.82
Central	**X**	**X**	**0.83**
Goa	0.96	0.83	0.80
Gujarat	2.28	1.70	0.85
Maharashtra	6.77	6.33	0.87
Rajasthan	2.72	2.19	0.68
West	**X**	**X**	**0.80**
Total	**100.00**	**100.00**	**0.82**

* Note: This is average of all the responses under the heading changes in Work Environment. For the present purpose we have taken responses suggesting improvement and Significant Improvement.

*Source: DST FIST survey

Section 7.3: At Institution Level

Table 7.3.1: Age of the Organisation and working status of the Equipment

State	Age of the Organisation		
	50 years and above	**% of Working Equip**	**% of Utilization of Equip**
Arunachal	0.00	100.00	NA
Assam	41.17	45.63	48.17
Jharkhand	73.33	69.84	90.48
Manipur	0.00	69.44	75.00
Meghalaya	0.00	52.50	76.25
Mizoram	0.00	86.96	95.65
Nagaland	0.00	83.33	33.33
Odisha	61.76	57.21	47.06
Sikkim	0.00	90.91	NA
Tripura	0.00	93.33	50.00
West Bengal	70.83	53.02	36.79
E&NE	**54.33**	**X**	**X**
A & N	0.00	85.71	85.71
Andhra	52.63	63.40	81.70
Karnataka	54.7	75.10	64.29
Kerala	61.25	79.14	56.80
Puducherry	0.00.	85.96	77.19
Tamil Nadu	56.23	82.80	66.03
Telangana	60.78	84.93	84.93
South	**55.88**	**X**	**X**

State	Age of the Organisation		
	50 years and above	**% of Working Equip**	**% of Utilization of Equip**
Delhi	47.05	77.00	83.57
Haryana	56.41	78.74	62.99
Himachal	0.00	84.83	72.41
J& K	0.00	66.34	39.60
Punjab	3.16	85.01	76.13
Uttarakhand	2.63	70.14	50.68
North	**2.26**	**X**	**X**
Bihar	100.00	78.09	40.00
Chhattisgarh	22.22	80.42	65.15
M P	54.17	86.36	62.24
Uttar Pradesh	70.54	80.00	67.26
Central	**65.77**	**X**	**X**
Goa	39.48	52.31	70.77
Gujarat	26.32	81.17	42.26
Maharashtra	5.56	86.20	47.83
Rajasthan	46.67	80.33	51.64
West	31.11	X	0.80
Total %	**47.60**	**74.16**	**0.82**
National	**645.00**	**X**	**X**

*Source: DST FIST survey

Table 7.3.2: Existing facilities and the working status of the Equipment

State	Facilities*	% of Working Equip	% of Utilization of Equip
Arunachal	1.67	100.00	NA
Assam	0.89	45.63	48.17
Jharkhand	1.01	69.84	90.48
Manipur	1.21	69.44	75.00
Meghalaya	1.17	52.50	76.25
Mizoram	1.38	86.96	95.65
Nagaland	1.60	83.33	33.33
Odisha	1.13	57.21	47.06
Sikkim	2.50	90.91	NA
Tripura	0.97	93.33	50.00
West Bengal	0.84	53.02	36.79
E&NE	**0.95**	**X**	**X**
A & N	2.00	85.71	85.71
Andhra	0.86	63.40	81.70
Karnataka	1.06	75.10	64.29
Kerala	1.09	79.14	56.80
Puducherry	0.98	85.96	77.19
Tamil Nadu	1.04	82.80	66.03
Telangana	1.00	84.93	84.93
South	**1.03**	**X**	**X**
Delhi	1.16	77.00	83.57
Haryana	1.29	78.74	62.99

State	Facilities*	% of Working Equip	% of Utilization of Equip
Himachal	1.42	84.83	72.41
J & K	0.96	66.34	39.60
Punjab	1.08	85.01	76.13
Uttarakhand	0.99	70.14	50.68
North	**1.11**	**X**	**X**
Bihar	1.26	78.09	40.00
Chhattisgarh	1.42	80.42	65.15
M P	1.28	86.36	62.24
U P	1.11	80.00	67.26
Central	**1.16**	**X**	**X**
Goa	1.04	52.31	70.77
Gujarat	0.93	81.17	42.26
Maharashtra	1.20	86.20	47.83
Rajasthan	1.06	80.33	51.64
West	**1.10**	**X**	**X**

*Note: Values for facilities were constructed in the following way. In a state 5 departments getting FIST grants, how many of them were having the listed facilities (except internet and computational facilities, which treated separately). If 4 out of 5 departments have facility F1, it gets a value 0.8 for one facility. If the score is same for the next facility then score is 0.8+0.8= 1.6.

*Source: DST FIST survey

Table 7.3.3: Internet and Computational facilities and working status of the Equipment

State/UT	Internet and Computation Facility	% of Working Equip	% of Utilization of Equip
Arunachal	2.00	100.00	NA
Assam	1.80	45.63	48.17
Jharkhand	1.85	69.84	90.48
Manipur	1.56	69.44	75.00
Meghalaya	1.81	52.50	76.25
Mizoram	2.00	86.96	95.65
Nagaland	1.14	83.33	33.33
Odisha	1.75	57.21	47.06
Sikkim	1.67	90.91	NA
Tripura	1.70	93.33	50.00
West Bengal	1.71	53.02	36.79
E&NE	**1.74**	**X**	**X**
A & N	1.33	85.71	85.71
Andhra	1.90	63.40	81.70
Karnataka	1.84	75.10	64.29
Kerala	1.84	79.14	56.80
Puducherry	1.73	85.96	77.19
Tamil Nadu	1.88	82.80	66.03
Telangana	1.85	84.93	84.93
South	**1.88**	**X**	**X**
Delhi	1.76	77.00	83.57
Haryana	1.79	78.74	62.99

State/UT	Internet and Computation Facility	% of Working Equip	% of Utilization of Equip
Himachal	1.70	84.83	72.41
J & K	1.92	66.34	39.60
Punjab	1.85	85.01	76.13
Uttarakhand	1.77	70.14	50.68
North	**1.80**	**X**	**X**
Bihar	1.92	78.09	40.00
Chhattisgarh	1.88	80.42	65.15
M P	1.91	86.36	62.24
U P	1.92	80.00	67.26
Central	**1.92**	**X**	**X**
Goa	1.75	52.31	70.77
Gujarat	1.76	81.17	42.26
Maharashtra	1.85	86.20	47.83
Rajasthan	1.78	80.33	51.64
West	**1.81**	**X**	**X**

*Source: DST FIST survey

Section 7.4: At PIs level

Table 7.4.1: Working status of the PIs and Equipment

State	% of PI Working	% of Working Equip	% of Utilization of Equip
Arunachal	0.00	100.00	NA
Assam	52.94	45.63	48.17
Jharkhand	26.67	69.84	90.48
Manipur	66.67	69.44	75.00
Meghalaya	45.45	52.50	76.25
Mizoram	33.33	86.96	95.65
Nagaland	50.00	83.33	33.33
Odisha	47.06	57.21	47.06
Sikkim	0.00	90.91	NA
Tripura	40.00	93.33	50.00
West Bengal	51.69	53.02	36.79
E&NE	**49.20**	**X**	**X**
A&N	100.00	85.71	85.71
Andhra Pradesh	39.47	63.40	81.70
Karnataka	33.33	75.10	64.29
Kerala	20.72	79.14	56.8
Puducherry	63.64	85.96	77.19
Tamil Nadu	32.80	82.80	66.03
Telangana	18.87	84.93	84.93
South	**30.46**	**X**	**X**

State	% of PI Working	% of Working Equip	% of Utilization of Equip
Delhi	51.35	77.00	83.57
Haryana	38.10	78.74	62.99
Himachal	11.76	84.83	72.41
J&K	26.67	66.34	39.60
Punjab	44.12	85.01	76.13
Uttarakhand	43.59	70.14	50.68
North	**40.61**	**X**	**X**
Bihar	0.00	78.09	40.00
Chhattisgarh	38.04	81.17	42.26
Madhya Pradesh	41.67	80.42	65.15
Uttar Pradesh	20.00	86.36	62.24
Central	**25.00**	**80.00**	**67.26**
Goa	51.69	53.02	36.79
Gujarat	29.03	52.31	70.77
Maharashtra	38.04	81.17	42.26
Rajasthan	29.73	86.20	47.83
West	35.26	80.33	51.64
National	**35.40**	**X**	**X**

*Source: DST FIST survey

Table 7.4.2: Professional Status of the PIs and working status of the Equipment

State	% of Associate Professor	% of HOD/ Professor	% of Working Equip	% of Utilization of Equip
Arunachal	0.00	0.00	100.00	NA
Assam	1.96	94.12	45.63	48.17
Jharkhand	6.67	93.33	69.84	90.48
Manipur	0.00	100.00	69.44	75.00
Meghalaya	0.00	100.00	52.50	76.25
Mizoram	0.00	66.67	86.96	95.65
Nagaland	0.00	100.00	83.33	33.33
Odisha	14.71	79.41	57.21	47.06
Sikkim	0.00	100	90.91	NA
Tripura	20.00	80.00	93.33	50.00
West Bengal	7.50	78.33	53.02	36.79
E&NE	**4.62**	**81.08**	**X**	**X**
Andaman Nicobar	0.00	100.00	85.71	85.71
Andhra Pradesh	2.63	86.84	63.40	81.7
Karnataka	1.71	49.57	75.10	64.29
Kerala	13.51	47.75	79.14	56.8
Puducherry	0.00	100.00	85.96	77.19
Tamil Nadu	6.80	64.00	82.80	66.03
Telangana	13.21	79.25	84.93	84.93
South	**5.41**	**75.34**	**X**	**X**
Delhi	5.26	94.74	77.00	83.57

State	% of Associate Professor	% of HOD/ Professor	% of Working Equip	% of Utilization of Equip
Haryana	4.76	76.19	78.74	62.99
Himachal Pradesh	0.00	88.89	84.83	72.41
Jammu Kashmir	0.00	86.67	66.34	39.60
Punjab	4.48	65.67	85.01	76.13
Uttarakhand	12.82	82.05	70.14	50.68
North	**4.55**	**82.37**	**X**	**X**
Bihar	0.00	86.96	78.09	40.00
Chhattisgarh	0.00	91.67	80.42	65.15
Madhya Pradesh	0.00	100.00	86.36	62.24
Uttar Pradesh	1.74	100.00	80.00	67.26
Central	**0.43**	**94.66**	**X**	**X**
Goa	0.00	92.31	52.31	70.77
Gujarat	0.00	93.55	81.17	42.26
Maharashtra	3.26	70.65	86.20	47.83
Rajasthan	21.62	59.46	80.33	51.64
West	**6.22**	**78.99**	**X**	**X**
National	**2.53**	**87.87**	**74.16**	**X**

*Source: DST FIST survey

Table 7.4.3: Improvement in working environment and status of the PIs

State	Avg Improvement *	% of Principal	% HOD/ Professor	% Associate Professor
Arunachal	0.57	100.00	0.00	0.00
Assam	0.78	3.92	94.12	1.96
Jharkhand	0.88	0.00	93.33	6.67
Manipur	0.79	0.00	100.00	0.00
Meghalaya	0.74	0.00	100.00	0.00
Mizoram	0.95	33.33	66.67	0.00
Nagaland	0.86	0.00	100.00	0.00
Odisha	0.83	5.88	79.41	14.71
Sikkim	1.00	0.00	100.00	0.00
Tripura	0.94	0.00	80.00	20.00
West Bengal	0.74	14.17	78.33	7.50
E&NE	**0.83**	**14.30**	**81.08**	**4.62**
A & N	0.86	0.00	100.00	0.00
Andhra Pradesh	0.90	10.53	86.84	2.63
Karnataka	0.73	48.72	49.57	1.71
Kerala	0.82	38.74	47.75	13.51
Puducherry	0.82	0.00	100.00	0.00
Tamil Nadu	0.87	29.20	64.00	6.80
Telangana	0.80	7.55	79.25	13.21
South	**0.83**	**19.25**	**75.34**	**5.41**
Delhi	0.64	0.00	94.74	5.26
Haryana	0.69	19.05	76.19	4.76

State	Avg Improvement *	% of Principal	% HOD/ Professor	% Associate Professor
Himachal Pradesh	0.81	11.11	88.89	0.00
Jammu &Kashmir	0.76	13.33	86.67	0.00
Punjab	0.82	29.85	65.67	4.48
Uttarakhand	0.84	5.13	82.05	12.82
North	**0.76**	**13.08**	**82.37**	**4.55**
Bihar	0.68	0.00	100.00	0.00
Chhattisgarh	0.87	0.00	100.00	0.00
Madhya Pradesh	0.85	8.33	91.67	0.00
Uttar Pradesh	0.80	11.30	86.96	1.74
Central	**0.80**	**4.91**	**94.66**	**0.43**
Goa	0.73	7.69	92.31	0.00
Gujarat	0.75	6.45	93.55	0.00
Maharashtra	0.81	26.09	70.65	3.26
Rajasthan	0.82	18.92	59.46	21.62
West	**0.78**	**14.79**	**78.99**	**6.22**
National	**0.82**	**9.60**	**87.87**	**2.53**

*Source: DST FIST survey

Note: Responses like ‘improved’ and ‘significantly improved’ were taken together for each items from each department. Average of the department level responses was used for average for a State.

Tables for Evaluation of Indirect Impact

Section 7.6: At the state level

Table 7.6.1: States' share in FIST grants and percentage improvement in academic capability

State	% of Average Improvement *	% of Projects	% of Total Amount	% of Working Equip
Arunachal	0.00	0.07	0.08	100.00
Assam	36.45	3.75	3.75	45.63
Jharkhand	6.60	1.10	1.06	69.84
Manipur	32.50	0.74	0.50	69.44
Meghalaya	31.25	0.81	0.61	52.50
Mizoram	16.67	0.22	0.15	86.96
Nagaland	-8.33	0.22	0.08	83.33
Odisha	30.26	2.50	2.09	57.21
Sikkim	0.00	0.07	0.02	90.91
Tripura	40.00	0.37	0.12	93.33
West Bengal	26.71	8.83	9.87	53.02
E&NE	**19.28**	**X**	**X**	**X**
Andaman Nicobar	0.00	0.07	0.08	85.71
Andhra Pradesh	3.32	2.80	2.04	63.40
Karnataka	9.62	8.61	14.15	75.10
Kerala	29.78	8.17	5.00	79.14
Puducherry	18.79	0.81	0.92	85.96
Tamil Nadu	131.63	18.40	17.09	82.80
Telangana	61.03	3.90	3.66	84.93

State	% of Average Improvement *	% of Projects	% of Total Amount	% of Working Equip
South	**36.31**	**X**	**X**	**X**
Delhi	57.01	2.80	4.36	77.00
Haryana	26.05	1.55	0.95	78.74
Himachal Pradesh	27.00	1.32	0.94	84.83
Jammu Kashmir	22.23	1.10	0.70	66.34
Punjab	29.12	5.00	3.94	85.01
Uttarakhand	24.22	2.87	2.62	70.14
North	**30.94**	**X**	**X**	**X**
Bihar	-27.08	0.29	0.10	80.00
Chhattisgarh	2.91	0.66	0.33	86.36
Madhya Pradesh	50.80	1.77	0.88	80.42
Uttar Pradesh	7.80	8.46	12.84	78.09
Central	**8.61**	**X**	**X**	**X**
Goa	27.47	0.96	0.83	52.31
Gujarat	2.62	2.28	1.70	81.17
Maharashtra	26.99	6.77	6.33	86.20
Rajasthan	13.24	2.72	2.19	80.33
West	**17.58**	**X**	**X**	**X**
National	**X**	**100.00**	**100.00**	**74.16**

*Source: DST FIST survey

Note: Percentage of the average changes in capacity building and other contributions. Percentage change after FIST support for each department and then average for the state was calculated.

Section 7.7: At the Institution Level

Table 7.7.1: Age of the grantee institutions and percentage improvement in academic capability

State	% of Average Improvement *	50 years and Above
Arunachal	0.00	0.00
Assam	36.45	41.17
Jharkhand	6.60	73.33
Manipur	32.50	0.00
Meghalaya	31.25	0.00
Mizoram	16.67	0.00
Nagaland	-8.33	0.00
Odisha	30.26	61.76
Sikkim	0.00	0.00
Tripura	40.00	0.00
West Bengal	26.71	70.83
E&NE	**19.28**	**54.33**
Andaman Nicobar	0.00	0.00
Andhra Pradesh	3.32	52.63
Karnataka	9.62	54.70
Kerala	29.78	61.25
Puducherry	18.79	0.00
Tamil Nadu	131.63	56.23
Telangana	61.03	60.78
South	**36.31**	**55.88**
Delhi	57.01	47.05

State	% of Average Improvement *	50 years and Above
Haryana	26.05	56.41
Himachal Pradesh	27.00	0.00
Jammu &Kashmir	22.23	0.00
Punjab	29.12	3.16
Uttarakhand	24.22	2.63
North	**30.94**	**2.26**
Bihar	-27.08	100.00
Chhattisgarh	2.91	22.22
Madhya Pradesh	50.80	54.17
Uttar Pradesh	7.80	70.54
Central	**8.61**	**65.77**
Goa	27.47	39.48
Gujarat	2.62	26.32
Maharashtra	26.99	5.56
Rajasthan	13.24	46.67
West	**17.58**	**31.11**
National	**X**	**47.60**

*Source: DST FIST survey

Note: Percentage of the average changes in capacity building and other contributions. Percentage change after FIST support for each department and then average for the state was calculated.

Table 7.7.2: Facilities available in the institute and percentage improvement in academic capability

State/UT	% of Average Improvement*	Facilities*
Arunachal	0.00	1.67
Assam	36.45	0.89
Jharkhand	6.60	1.01
Manipur	32.50	1.21
Meghalaya	31.25	1.17
Mizoram	16.67	1.38
Nagaland	-8.33	1.60
Odisha	30.26	1.13
Sikkim	0.00	2.50
Tripura	40.00	0.97
West Bengal	26.71	0.84
E&NE	**19.28**	**0.95**
Andaman Nicobar	0.00	2.00
Andhra Pradesh	3.32	0.86
Karnataka	9.62	1.06
Kerala	29.78	1.09
Puducherry	18.79	0.98
Tamil Nadu	131.63	1.04
Telangana	61.03	1.00
South	**36.31**	**1.03**
Delhi	57.01	1.16
Haryana	26.05	1.29

State/UT	% of Average Improvement*	Facilities*
HimachalPradesh	27.00	1.42
Jammu &Kashmir	22.23	0.96
Punjab	29.12	1.08
Uttarakhand	24.22	0.99
North	**30.94**	**1.11**
Bihar	-27.08	1.26
Chhattisgarh	2.91	1.42
Madhya Pradesh	50.80	1.28
Uttar Pradesh	7.80	1.11
Central	**8.61**	**1.16**
Goa	27.47	1.04
Gujarat	2.62	0.93
Maharashtra	26.99	1.20
Rajasthan	13.24	1.06
West	**17.58**	**1.10**
National	**X**	**X**

*Source: DST FIST survey

Note: Percentage of the average changes in capacity building and other contributions. Percentage change after FIST support for each department and then average for the state was calculated.

Table 7.7.3: Internet and computation facilities available in the institute and percentage improvement in academic capability

State	% of Average Improvement*	Internet and Computation Facility
Arunachal	0.00	2.00
Assam	36.45	1.80
Jharkhand	6.60	1.85
Manipur	32.50	1.56
Meghalaya	31.25	1.81
Mizoram	16.67	2.00
Nagaland	-8.33	1.14
Odisha	30.26	1.75
Sikkim	0.00	1.67
Tripura	40.00	1.70
West Bengal	26.71	1.71
E&NE	**19.28**	**1.74**
Andaman & Nicobar	0.00	1.33
Andhra Pradesh	3.32	1.90
Karnataka	9.62	1.84
Kerala	29.78	1.84
Puducherry	18.79	1.73
Tamil Nadu	131.63	1.88
Telangana	61.03	1.85
South	**36.31**	**1.88**
Delhi	57.01	1.76

State	% of Average Improvement*	Internet and Computation Facility
Haryana	26.05	1.79
Himachal Pradesh	27.00	1.70
Jammu & Kashmir	22.23	1.92
Punjab	29.12	1.85
Uttarakhand	24.22	1.77
North	**30.94**	**1.80**
Bihar	-27.08	1.92
Chhattisgarh	2.91	1.88
Madhya Pradesh	50.80	1.91
Uttar Pradesh	7.80	1.92
Central	**8.61**	**1.92**
Goa	27.47	1.75
Gujarat	2.62	1.76
Maharashtra	26.99	1.85
Rajasthan	13.24	1.78
West	**17.58**	**1.81**
National	**X**	**X**

*Source: DST FIST survey

Note: Percentage of the average changes in capacity building and other contributions. Percentage change after FIST support for each department and then average for the state was calculated.

Section 7.8: At PIs level

Table 7.8.1: Professional status of the PIs and improvement in the capacity

State	% of Average Improvement *	% of Principal	% of HOD/ Professor	% of Associate Professor
Arunachal	0.00	100.00	0.00	0.00
Assam	36.45	3.92	94.12	1.96
Jharkhand	6.60	0.00	93.33	6.67
Manipur	32.50	0.00	100.00	0.00
Meghalaya	31.25	0.00	100.00	0.00
Mizoram	16.67	33.33	66.67	0.00
Nagaland	-8.33	0.00	100.00	0.00
Odisha	30.26	5.88	79.41	14.71
Sikkim	0.00	0.00	100.00	0.00
Tripura	40.00	0.00	80.00	20.00
West Bengal	26.71	14.17	78.33	7.50
E&NE	**19.28**	**14.30**	**81.08**	**4.62**
Andaman Nicobar	0.00	0.00	100.00	0.00
Andhra Pradesh	3.32	10.53	86.84	2.63
Karnataka	9.62	48.72	49.57	1.71
Kerala	29.78	38.74	47.75	13.51
Puducherry	18.79	0.00	100.00	0.00
Tamil Nadu	131.63	29.20	64.00	6.80
Telangana	61.03	7.55	79.25	13.21
South	**36.31**	**19.25**	**75.34**	**5.41**
Delhi	57.01	0.00	94.74	5.26

State	% of Average Improvement *	% of Principal	% of HOD/ Professor	% of Associate Professor
Haryana	26.05	19.05	76.19	4.76
Himachal Pradesh	27.00	11.11	88.89	0.00
Jammu Kashmir	22.23	13.33	86.67	0.00
Punjab	29.12	29.85	65.67	4.48
Uttarakhand	24.22	5.13	82.05	12.82
North	**30.94**	**13.08**	**82.37**	**4.55**
Bihar	-27.08	0.00	100.00	0.00
Chhattisgarh	2.91	0.00	100.00	0.00
Madhya Pradesh	50.80	8.33	91.67	0.00
Uttar Pradesh	7.80	11.30	86.96	1.74
Central	**8.61**	**4.91**	**94.66**	**0.43**
Goa	27.47	7.69	92.31	0.00
Gujarat	2.62	6.45	93.55	0.00
Maharashtra	26.99	26.09	70.65	3.26
Rajasthan	13.24	18.92	59.46	21.62
West	**17.58**	**14.79**	**78.99**	**6.22**
National	**X**	**9.61**	**87.87**	**2.53**

*Source: DST FIST survey

Note: Percentage of the average changes in capacity building and other contributions. Percentage change after FIST support for each department and then average for the state was calculated.

Section: 7.9: Impediments

Table 7.9.1: Areas where improvements have been observed

Areas of Improvement	Responses by Academic Autonomy (%)						
	National	Central Govt.	State Govt.	Auto. Instt.	Deemed Univ.	Const College	Private Instt.
New Lab Equipment and their Maintenance.	21.20	21.80	18.90	25.20	19.30	26.80	20.90
Computational facilities and internet	13.10	11.70	15.40	11.10	9.20	10.70	11.50
Renovation of Classrooms, Labs and work space	8.90	8.00	9.90	6.80	9.20	14.30	10.80
Teaching and Learning Environment	6.60	6.50	5.90	7.90	6.10	3.60	8.60
Improved facilities for UG, PG & Ph.D. students	5.70	5.20	5.60	6.50	4.80	3.60	5.00
Increase in number of library books	3.30	2.30	3.90	3.00	1.80	7.10	3.60
Receiving other extramural grants	2.80	3.40	2.40	3.00	3.10	1.80	2.90
Additional Faculty & Staff	0.60	X	0.40	0.90	0.40	1.80	1.40
All responses	3509.00	597.00	1588.00	901.00	228.00	56.00	139.00

*Source: DST FIST survey

Table 7.9.2: Responses on Impediments towards improvement (academic autonomy)

Impediments	Number of Responses No. (%)						
	National	**Central Govt.**	**State Govt.**	**Auto Instt.**	**Deemed Univ.**	**Const College**	**Private Instt.**
Lack of funds for AMC grants & delay in funds release	32.40	28.90	31.00	37.20	34.60	30.30	30.00
Lack of infrastructure space, equipment & books in library	18.20	17.40	18.70	18.80	14.60	24.20	14.30
Lack of faculty & other staff	9.30	8.40	9.10	11.20	6.90	9.10	5.70
No Significance impediments	4.10	5.00	2.30	7.00	0.80	12.10	4.30
Lack of Administrative cooperation	2.90	2.50	3.60	2.60	1.50	6.10	X
Lack of computational and internet facility	1.80	0.80	2.50	1.70	1.50	X	X
All responses	2141.00	357.00	1008.00	543.00	130.00	33.00	70.00

*Source: DST FIST survey

Table 7.9.3 Impediments in execution of DST-FIST project

(Regional perspectives)

States	Responses %					
	National	**E&NE**	**South**	**North**	**Central**	**West**
Delay in Funds release/ more funds needed/ Annual maintenance grants.	32.40	31.20	31.90	40.10	30.60	27.70
Lack of Infrastructure /lack of Space/lack of equipment or Instrument/lack of books in library	18.20	19.90	16.60	15.60	18.60	10.30
Lack of faculty/Trained Manpower/Staff/ Administrative Staff	9.30	5.50	9.70	12.10	12.80	6.60
Lack of Administrative and Office support	2.90	3.80	2.60	1.80	5.40	2.30
Computation and Networking facility not provided	1.80	2.40	2.00	1.20	0.80	4.20
Total	2141.00	417.00	918.00	339.00	242.00	437.00

*Factors obtained by text data analysis

*Source: DST FIST survey

Chapter 8: Success Stories of FIST Support

Abstract

Two most important success cases were culled out from each region. For this purpose, success has been seen as certain achievements beyond the boundary of the requirement of the projected outcome from the projects. Ten stories, thus selected, bring out a few following interesting dimensions.

The leadership of the PIs in particular and the faculty members, in general, has been the mainstay of the projects' successful implementation. In many cases teething trouble and the post-installation, proper functioning of the equipment has been resolved in novel ways using informal connections with other institutions. It is leadership again that motivated broader utilization of the equipment by students and researchers. And such endeavours are reflected in research output, recognitions, and collaborations.

Another aspect that comes out succinctly is administrative support. Most of the success stories indicate that administrative support has been crucial for implementing the project and extending the utilization of the same within and beyond the department and institution.

In cases where the utilization of the equipment and related expertise extended towards societal benefits, both the leadership and administrative support were found to be indispensable.

Success Stories

What should we consider as the success of a program like DST-FIST? In simple accounting terminology, if the grant received under the program has been utilized for the purposes specified in the grant, the same would be considered as a success. However, the grant's output and the outcome would vary depending upon the way it has been used for harnessing the research and academic capabilities of the grantee department. The expectation of impact under the FIST program has been that the grant would be utilized in such a way that the performance would be reflected in the expansion of the activities of the department in terms of student intake, courses offered, publications research activities, Ph.D.'s, collaborations, etc.

While most of the departments studied, barring a few, reported significant positive changes in the academic and research activities, the departments that stand out are the ones that could expand their academic activities through new collaborations. And in most cases, the same could happen due to the dynamic leadership of the head of the department. Therefore, in our perception, leadership is the singular most important factor that could expand the project's success boundary beyond the defined criteria. Following are the stories from all five regions.

8.1 Successes stories from East and North East region

Department of Zoology, North-Eastern Hill University

Department of Ocean Engineering & Naval Architecture, IIT Kharagpur

8.2 Successes stories from the Southern region

St. Berchmans College, Changanassery, Kerala

C. Abdul Hakeem College, Melvisharam, Vellore, Tamil Nadu

8.3 Successes stories from Northern region

Division of Genetics, Dept of Paediatrics, AIIMS, New Delhi

Department of Crop Improvement, College of Agriculture, Chaudhary Sarwan Kumar Himachal Pradesh KrishiVishwavidyalaya, Palampur, HP

8.4 Successes stories from the Central region

School of Materials Science and Technology, IIT (BHU), Varanasi

Department of Electrical Engineering, Dayalbagh Educational Institutes, Agra

8.5 Successes stories from the Western region

New Arts, Commerce and Science College, Ahmednagar

Department of chemistry, M K Bhavnagar University, Bhavnagar

8.1: Success Stories from the East and North-East Region

We have chosen two cases where the role of leadership is the visible determinant of the success that pushed the boundary.

Story1: Department of Zoology, North-Eastern Hill University

About the institute and the department: The department was established in 1974. They received two FIST grants. The first one is 2000 and the other in 2014. They offer Undergraduate, Postgraduate, M.Phil. and Ph.D. courses. Financially they are supported by the central government. In 2000 they received a Level -II project from DST FIST. They have all kinds of internet and computational facilities, but separate chemical research labs and separate physical research labs are required.

About Grant: The Department of Zoology received an amount of Rs.46.5 Lakhs in the year 2001 (DST Project Code SR/FIST/LSII-039/2000 (Level -II)). Prof. K. Chatterjee was the project coordinator at the time of the first FIST grant. Rs.40 lakhs were used for the procurement of equipment's 50,439 was used to establish the internet and communication facility, and Rs.1.5 lakhs were used for the repair and maintenance of existing equipment.

Academic Achievements: Academic achievement of the department has been quite significant. Original articles published Before FIST were 108 that went up to 130 After the FIST program. The number of Review articles published before FIST was 2 and after FIST was 4. The number of conference papers the department produced Beforethe FIST program was 10. After FIST: 14 Number of international awards Before FIST were 12, and after FIST, the department received even more than 18 awards. The department's number of National awards deserves to be mentioned from 3 before FIST to 6 after FIST. Other achievements of this department, like the following, also deserves to be mentioned. The number of International recognitions Before FIST: 10 After FIST: 12. National recognition Before FIST: 2 After FIST: 6. National seminar Before FIST: 4 After FIST: 6. International Seminar before FIST: 1 After FIST: 2.

Attributes of the success: The department was very satisfied with its procurement of instruments. The fund was utilized properly to meet all the necessary requirements. They received all kinds of administrative support in the process of procurement. With the support of DST FIST, they could maintain their infrastructure in a satisfactory manner. They increased their computational and majorequipment facilities. Along with these developments, there has been a significant rise noticed in the enrolment of research scholars, and the number of Ph.D. awarded students. Central facilities for

research for this institution enhanced with proper maintenance of the equipment with manpower.

What is most commendable is the passion and dedication of Prof. Saha, head of the department. Prof. N. C. Saha and his scholars spend a long time in the laboratory, which they are visibly proud of. Prof. Saha has an infectious enthusiasm that motivates the scholars to come up with new research ideas. This is reflected in the collaborative research works with the younger faculties of the university's physics and chemistry departments. In this connection, we had the opportunity to meet the faculty members who are collaborating with the Zoology department. There are several papers published in international journals. These papers are the result of the inter-departmental collaborative works. The collaborators were also applauding the Zoology department's dynamism and initiatives and Prof. Saha and his research team.

Impediments faced: No impediments faced

Story 2: Department of Ocean Engineering & Naval Architecture, IIT Kharagpur

DST-FIST code: SR/FIST/ETII-034/2003 (LEVE -II)

About the institute and the department: The department was established in 1952. They offer Undergraduate, Postgraduate, and Ph.D. courses. They got a level 2 project in 2003. They have placement cells in the organization, IPR cell, incubation center, lab safety, and other computational and internet facilities.

About Grant: The Department of Ocean and Naval Architecture of IIT Kharagpur received an amount of Rs.100 lakhs in the year 2004. Prof. D. Sen was the project coordinator at the time of this FIST grant. The entire amount of funds received was used for the procurement of equipment. The department purchased a Wave Generation System; its current status states that it is in good working condition. While no AMC was received, this equipment has managed to generate funds worth 102.3 lakhs.

Academic Achievements: In terms of research publication, the improvement is rather impressive; original articles published by the department has gone up to 80 (after FIST) from 10 (before FIST),articles in conference proceedings went up to 55 (after FIST) from 10 (before FIST), and paper presentation in the conference has increased staggeringly as well 15 (before FIST) to 75 (After FIST).Attributes of the success: According to the department, the DST FIST has proven to be a huge success, as it has made the following possibilities like -Performing experiments in the hydrodynamics

Lab, Manpower training with the facility acquired, Development of Knowledge base in the field of experimental Hydrodynamics. The faculty number has gone up from 10 (before FIST) to 14 (after FIST). The sanctioned strength of graduate students went up to 61 (after FIST) from 22 and that of 8 (before FIST) to 21 (after FIST) for post-graduate students. The rise in the Sanctioned strength of Ph.D. students has been relatively high from a mere 5 it has gone up to 45 (after FIST). The success rate of students admitted, and the number of students graduated after completing their respective courses/thesis has been 100 percent. It can be safely said the DST FIST project has benefited this department greatly, and scholars and faculty of this department have made impressive progress in terms of research and building potential for future researchers in this discipline.

The department has shown extraordinary alacrity when the installed Wave Generation System was giving trouble. The system has been imported from Denmark. Getting it repaired by the original company was found to be very expensive. After rigorous searching within the country, they found appropriate expertise in Jadavpur University and Cultivation of Science, Jadavpur. The whole process began with informal interactions and visits that finally resulted in long-term collaborations. Together they could not only bring the Wave generating system functional without incurring many expenses, they have build-up capabilities of erecting such a system. The result has been the expansion of the departmental activities to several new dimensions and also providing services to various civil and defence requirements. Again, this is an example of the leadership of the head of the department that could motivate not only his own colleagues but peers from other institutions as well.

Impediments faced: Department didn't face much of an impediment, except for the fact that the funds for installing wave beach were not granted.

8.2: Success Stories from the Southern Region

Success stories are an important tool for evaluating the impact of any implemented project. Success stories are usually directed towards creating awareness among potential users by providing guidelines for the accomplishment of the project. The success stories provide different stakeholders with real-worldexamples, and help them to set expectations in terms of implementation time, budget, various constraints and how to tackle them, etc. This chapter presents the success stories of various departments/institutions supported by the DST-FIST scheme. In this context, the DST-FIST scheme is exclusively meant for establishing world-class infrastructural and equipment facilities in the area of science and technology among the institutions in India. Across the country, 1604 institutions, of which 25% of projects in the southern region have reaped the benefits of the DST-FIST scheme

during 2000- 2011. Considering the growth and volume of FIST funds provided between 2000-2011,it can be said that, the FIST scheme has made a significant impact on science and technology infrastructure development across the country. Using DST-FIST grants, a total of 2620 equipment were procured across different institutions in the southern region, and the average cost of the equipment is Rs.12,58,118. The highest cost of the equipment purchased under FIST grants in the southern region is Rs.9,05,81,156. In this context, the DST-FIST recipients institutions with different project level different types and located at different type's areas have shared their success stories. Such stories can act as a roadmap and motivate other institutions to avail the benefits provided by the Government of India to improve S&T facilities in their respective institutions by learning real-time lessons. The success stories shared by various selected departments/institutions supported by the FIST scheme across the southern region are as follows:

Story 1: St. Berchmans College, Changanassery, Kerala

About the Institute: St. Berchmans Autonomous College is the first higher education institution of the Archdiocese of Changanacherry. This institution was founded in 1922 by Venerable Mar Thomas Kurialacherry, Bishop of Changanassery diocese. With the noble aim of the Universal Catholic Church, it was started to mold young men and women who will strive for excellence in every walks of life and human service. The college is recognized under section 2 (f) and section 12B of the UGC Act 1956. The college was first accredited at Five Star in 1999 and reaccredited at A+ in 2006. In the third cycle of accreditation in 2012, the college was again graded at A. The Government of Kerala and UGC granted autonomy to this college in the year 2014. In 1996 and 1997, it won the coveted "R Shankar Award" for the Best College in the State, instituted by Kerala's Government. In 2004, the UGC identified the college under its "College with Potential for Excellence" scheme. All the science departments are supported by the FIST of DST.

Details of the Grant:

a) Amount of grant received: Rs.70.50 lakhs

b) Year of grant: 2010

c) Level of grant: Level-0

d) Purpose: - To strengthen science and technology research for the post-graduate science departments of St. Berchmans College.

Scientific and Societal Impact:

The increase in research papers from 75 (before 2010) to 132; book chapters from 2 to 22; books from 1 to 6.

a) The increase in the number of students qualifying NET and GATE from 120 to253.

b) Able to get an Extramural grant of Rs.73,71,000 received from various funding agencies such as UGC, BRFST, and KSCSTE.

The FIST scheme grant has immensely improved the infrastructural facilities in all science departments of the institutions. The institution was able to establish a three-storied centre building for the research, which offers facilities for R&D projects.

Attributes of the success: The institution is well noticed for the faithfulness in integrity among the faculty to serve the society for the development of humankind. The educational and administrative culture in the institutions has a more significant impact.

Story 2: C. Abdul Hakeem College, Melvisharam, Vellore, Tamil Nadu

About the Institute: The Melvisharam Muslim Educational Society (M.M.E.S.) was established in 1919. Society has gradually progressed across these 8 decades. It manages 11 institutions, including M.M.E.S. Arts and Science College for women. The college is affiliated with Thiruvalluvar University, Vellore. The NAAC has reaccredited the college with an 'A' Grade. At present, the college offers instruction in 31 courses at the Under-Graduate level and 6 courses at the Post-Graduate level, apart from facilities for research leading to the award of Ph.D.

Details of the Grant:

a) Amount of grant received: Rs.42.50 lakhs

b) Year of grant: 2010

c) Level of grant: Level-0

d) Purpose: - To strengthen science and technology research for postgraduate science departments of C. Abdul Hakeem College, Melvisharam, Vellore, Tamil Nadu.

Scientific and Societal Impact

Zoology department:

a) The number of international publications has been increased from 80 to 176 and citations from 1209 to 7391.

b) All publications have been published in International journals (SCI), having the impact factor ranged from 2.05 to5.01.

c) No. of research projects have been increased from 12 to 20 and the project's cost from Rs.300 lakhs to Rs.1200 lakhs.

d) Production of Ph.D. students increased from 13 to 28 after FIST implementation.

e) Established two National repositories in this department for the benefit of research organizations and laboratory has been accredited by NABL (ISO17025:2017).

Chemistry department:

a) The number of international publications has been increased from 0 to 125 and citations from 0 to1298.

b) Most of the publications are international publications published in SCI journals with the impact factor ranged from 0.05 to 5.155.

c) No. of research projects has been increased from 0 to 4 with the total cost of Rs.40 lakhs.

d) Production of Ph.D. students increased from0 to 17 after FIST implementation.

e) The grant provided by the FIST scheme has immensely improved the infrastructural facilities in all zoology and chemistry departments of the institutions.

f) Faculty members in the department of zoologyhave receivedNational and International recognition and also awarded with State,and National Level awards for their research works.

g) FIST implementation in the department includes international publications, production of Ph.D. candidates, development and commercialization of technologies (diagnostic kits and immune stimulants), and service to research organizations by providing research materials.

h) The outcome of DST-FIST implementation in the chemistry department includes an increase in research projects and consultancy services regardingthe chemical and leather industries.

Attributes of the success: The College has a unique administration system that facilitates ease in handling financial related aspects. Leadership and directive attitude of management towards the implementation of any projects.

8.3: Success Stories from the Northern Region

Story 1: All India Institute of Medical Sciences (AIIMS)

The All-India Institute of Medical Sciences (AIIMS) was established as an institution of national importance by an Act of Parliament in 1952, with the objects to develop patterns of teaching in Undergraduate and Post-graduate Medical Education in all its branches to demonstrate a high standard of Medical Education in India; to bring together in one place educational facilities of the highest order for the training of personnel in all important branches of health activity, and to attain self-sufficiency in Post-graduate Medical Education.

The institute has comprehensive facilities for teaching, research, and patient-care. AIIMS conducts teaching programs in medical and para-medical courses both at undergraduate and post-graduate levels and awards its own degrees. Teaching and research are conducted in 42 disciplines. In medical research, AIIMS is the lead, having more than 600 research publications by its faculty and researchers in a year.

Twenty-five clinical departments, including four super specialty centres, manage practically all types of disease conditions with support from pre-and Para-clinical departments.

Department of Neurosurgery, AIIMS, New Delhi

The Department of Neurosurgery started in March 1965, with only two faculty members and a few beds. Since then, the department has made a long journey to become an important training centre, having provided training in the area of neurosurgery to over 140 neurosurgeons. The department claims that the training provided is considered the best in the country, as evaluated by an independent assessment system.

The department is considered as the ultimate for Neurosurgical patient care in India. It is equipped with ultra-modern technology and equipment such as an Operating microscope, Laser, CUSA, Ultrasound, Intra-operative MRI, Gamma Knife, and Image Guidance System, which are necessary to provide State-of-the-art care at par with the best neurosurgical centers anywhere in the world. With a moderate beginning in 1965, when only 50 patients were operated upon, more than 3000 patients have operated on annually at the department.

Academic Impact of FIST grant

The department has approved a grant of Rs.85 lakhs in the year 2006 at Level -II. The total grant included Rs.80 lakhs for 2 nos. of Cadavers and dissection facilities and balance grant for maintenance of the equipment. According to the department, the grant was timely as it met a long-felt need of the department to strengthen its teaching and training facilities in micro neurosurgery. The department procured 6 nos. of cadavers along with all essential instruments and the work stations. The facility created helped in teaching and hands-on training in micro neurosurgery to in house doctors/students.

The training modules developed in-house were validated with the help of IIT, Delhi, and once the module was validated and objectively checked, these were used for training own doctors and other doctors from within the country and outside the country.

The department has been at the forefront in the areas of research and academic activities. The research activities comprise based on clinical practice and laboratory-based work. These include clinico-pathological research on head injury, neuro-tuberculosis, glioma, pituitary tumors, peripheral nerve, brachial plexus injury & intracranial aneurysms. Laboratory-based studies neural transplant has been developed as a national facility by DST (1984-1990). The department has participated in a large number of multi-centric studies at National and International levels. The department for the advancement and promotion of neurosurgery in the country regularly organized the "Annual AIIMS

Micro Neurosurgery Workshop" where eminent faculties of National and International repute along with AIIMS faculty, demonstrate their surgical skills. There is a live telecast of operations, and delegates directly communicate with operating surgeons.

The department claims to have the largest number of scientific publications in National and International Journals by any Indian neurosurgical centre. It has created a forum (http://aiimsnets.org/neurosurgeryeducation.asp) to support, coordinate, and enhance efforts to generate scientific information useful to Neurosurgical trainees and specialists.

The NETS have an Indo-German Collaboration with the Department of Neurosurgery, Barmherzige Bruder Hospital, Trier, Germany, supported by the Department of Biotechnology, Govt. of India. Under this collaboration program NETS conducts Bilateral Workshops, Seminars, Tele-education meets, and Faculty-exchange programmes with the aim of imparting education and skills training to trainee neurosurgeons coming from different parts of the world. NETS Facility is benefitting the trainees and the faculty by enriching their knowledge and experience.

Societal Impact

The small initiative was taken with the financial support under FSIT in the area of neurosurgery as a departmental training facility grew into full-fledged and an important National Training Centre, much in demand in the country. Considering its importance, it was thus separated out as a training facility under the name Neurosurgery Education and Training School (NETS) within AIIMS.

The training school's main objective is to disseminate information & supplement the surgical knowledge of the trainee / trained neurosurgeons, and networking the neurosurgeons working in different parts of the world on its discussion forum.

The virtual education material on its website, in the form of a video library, webinars, and tele-education material, updates the neurosurgeons to the recent advances in the relevant subject. The interaction of the inept trainee neurosurgeons with the experienced and masters in the field provides an enriched mingling of anatomy, pharmacology, pathology, radiology, neurology, and surgical techniques related to neurosurgery.

The NETS has inter-departmental collaboration with the Department of Anatomy and Department of Forensic Medicine, AIIMS, to provide the trainees with adequate knowledge about the complex micro-anatomy of the central nervous system before embarking upon the other training modules. It is also working on the development of synthetic, semi-synthetic, and cadaver-based neuro-anatomy models to enhance the learning experience for the trainee neurosurgeons.

The NETS has strong collaborations with the Department of Computer Science and Engineering and the Department of Biomedical Engineering of the Indian Institute of Technology-Delhi for the development of Neuro-Technology based systems to enhance the learning experience of the trainee neurosurgeons.

Department of Paediatrics (Division of Genetics), AIIMS

As a part of the Department of Paediatrics, the Division of Genetics has been a pioneer in providing genetic service in India since 1966. Over the years, it has developed into one of the premier human genetics division in the country and has been designated as a WHO collaborating center (five times) and center of excellence for the Ministry of Health training.

The Division of Genetics actively contributes to the preventive and therapeutic aspects of various genetic disorders through advancements in various genetic testing and related technology, with the goal of enhancing patient care. It serves as a centre for offering comprehensive Medical Genetics services, providing integrated clinical and laboratory genetics services to India and neighbouring countries' large referral population.

Academic Impact of FIST grant

The Division received FIST support of Rs.100 lakhs from DST In 2005-06 for improvement of infrastructure to broadly support facilities for research and post-graduate teaching in the department. In fact, the FIST program provided a significant impetus to the teaching activities of the Division by way of augmenting capacity building and engaging of research personnel at the level of Scientists and other research staff. The Division has an active Ph.D. program, which till date has produced about 20 Ph.D. students. The number of Ph.D. students dramatically increased after and between 2007 and 2017, the Ph.D. program in the Division of Genetics and had the highest number of Ph.D. students in any clinical department at AIIMS.

For the last three years, the Division also has a DM Medical genetics program. The Division organizes short term and long-term training to students/doctors' trainees from across India and abroad, both in Clinical and Laboratory Genetics. There has been a significant impact in volume and quality of research; the original articles by the Division have shown a tremendous increase, by more than 200% post FIST grant. The Impact Factor of articles, papers published in SCI /SCIE journals has also shown a significant increase as a result of the FIST grant.

Post FIST grant, the Division has increased its faculty by almost 100%, and now the Division has a faculty of 4 comprising 1 Professor, 1 Associate Professor, and 2 Assistant Professor supported by a Technical Staff of 4 and Administrative staff of 2. The faculty and the Ph.D. students have received National and International Fellowships and Awards & Recognitions of ICMR, Dept. of Biotechnology, UGC, etc., including the prestigious fellowship of European Cytogenetics Association.

Scientific and Societal Impact

The FIST grant has enabled the Division to make significant Scientific and Societal Impact in the diagnosis and treatment of genetic disorders. The FIST grant comprised a grant of Rs.100 lakhs, including Rs.90 lakhs for the equipment and Rs.10 lakhs for maintenance in the year 2005-2006. The department was released Rs.100 lakhs, and it procured the following equipment:

Applied Biosystems Genetic Analyzer 3130 18.08.07 20.01.08 76 Lakhs

Automated Karyotyping System Jan 2008 Feb 200823 Lakhs (Euro 34,700)

According to the Department, the grant was received at a time when the field of Genetic medicines and diagnostics was seeing a paradigm shift due to increasing emphasis on human genome sequencing. Capillary sequence-based diagnostics were emerging as the gold standard for most of the recognized single-gene disorders, and the technology was being utilized to identify newer disease genes and variants.

The Applied Biosystems Genetic Analyzer 3130 was at the time the latest generation of 4- capillary electrophoresis instrument for sequencing and fragment analysis. Karyotyping is used as a tool for detecting a variety of genetic disorders by the study of the chromosomal defect in the woman. These two equipments thus added to the department greatly enhanced capabilities in terms of developing sensitive and cost-effective diagnostic methodologies for laboratory confirmation of a single gene andchromosomal disorders in postnatal and prenatal settings. With the help of the equipment, the

department could develop numerous diagnostic tests such as QF-PCR, MLPA, Sanger sequencing, etc., considered the gold standard tests in the diagnosis of genetic disorders. These developed tests are now applied in the field by regularly using them as clinical tests on the patients. The tests are provided at an extremely reasonable price (provision of free testing for non-affording families), covering only the cost of the consumables utilized in performing the tests. The patient care services have grown many folds over the years both in terms of the numbers of patients being served and the number of tests being provided. This impact on patient care is thus unique. The Division claims to earn annually from the clinical diagnostic tests using these equipment-around Rs.5 lakhs per year from the Genetic Analyser 3130 for sequencing and fragment analysis and around Rs.12 lakhs per year from Karyotyping System for detecting genetic disorders.

Story 2: Dept of Crop Improvement, College of Agriculture, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishva Vidyalaya, Palampur, HP

The Institute: Himachal Pradesh Krishi Vishva Vidyalaya (renamed as Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishva Vidyalaya in June 2001) was established on 1st November 1978. The College of Agriculture (established in May 1966) formed the nucleus of the new farm University. It is ICAR accredited and ISO 9001:2015 certified institution. The Indian Council of Agricultural Research has ranked this University at eleventh place among all country's farm universities.

The University has been given the mandate for making provision for imparting education in agriculture and other allied branches of learning, furthering the advancement of learning and research, and undertaking application /extension of such sciences, especially to the rural people of Himachal Pradesh.

Over the years, this University has contributed significantly in transforming the farm scenario of Himachal Pradesh. The University has released 155 improved varieties of crops, including Wheat, Paddy, Maize, Barley, Pulses, and Vegetables, etc. It has developed human resources, varieties, and technologies and transferred these to the farming community enabling the State to receive the "Krishikarman award" of the Government of India four times in a row for food grain production, amongsmall states of the country. The State has earned its name for hill agricultural diversification, and the farming community has imposed its faith in the University.

Department of Crop Improvement (College of Agriculture)

The College of Agriculture, established in 1966, encompasses 13 departments engaged in teaching, research, and extension in various agricultural spheres at undergraduate (UG) & Postgraduate (PG) levels. The Department of Crop Improvement is one of the leading departments of the college. The teaching and extension activities of this department are also supported by 12 Research Centers, and 8 Krishi Vigyan Kendras spread over the entire State of Himachal Pradesh. The Mission of the Department is to "Generate Excellent Human Resource in Plant Breeding & Genetics and Improve Crops by sustainable utilization of Indigenous & Exotic Gene-Pools following modern plant breeding approaches for enhancing food production, productivity & nutritional level in accelerated & précised manner under changing climatic scenario." The broad objective of the college is to develop and enhance the professional skills of the students in the diversification of hill agriculture, Updating/upgrading existing courses at UG and PG levels with the aim to make the students job creators rather than job seekers, improve the teaching and learning processes in the college through the use of modern technologies, etc.

Academic Impact of FIST grant: The Department has sanctioned a grant of Rs.82.276 lakhs at level-1 in the year 2011 to strengthen the post-graduate teaching and research facilities in the department. The department is engaged in teaching and extensive research in the discipline of plant breeding and area of crop improvement using the techniques of 'Doubled Hapoloidy breeding' and 'Molecular Cytogenetics.' The department had earlier established a 'High-tech Molecular Cytogenetics & Tissue Culture Lab (MCT Lab). The FIST grant enabled the department to upgrade and make MCT Lab. It was a state-of-the-art laboratory by addition of modern instrument/ machinery that helped accelerate the on-going teaching and research endeavour. The financial support enabled the department to procure the following State of the art equipment:

i) FISH Finder and Metaphase Finder (Applied Spectral Imaging)

ii) Phase Contrast Microscope

iii) Bio Spectrophotometer

The department is claimed to have made improvements in volume and quality of research. The increase in original articles, review articles, articles, and papers presentation in conference and conference proceedings ranges from 50 % to 100% post FIST grant. Students' sanctioned strength in various courses, their admission, pass percentage shown increase, especially in PG courses and Ph.D.

by around 100%. Presently 51 students (33 PG and 18 Ph.D.) are on a roll for their Master's & Doctoral research, and most of them with prestigious scholarships and fellowships. The faculty and students of the department have received recognitions and awards both at the national and international level post FIST grants. In the area of capacity building, the department International Seminar/Conferences, workshop and short-term training programmes for scientists and technical staff up-gradation besides faculty Development Programmes. The department has initiated 'New Experiments' on Genomic in situ hybridization (GISH) 'Fluorescence in situ hybridization (FISH)' for crop improvement. The work in the department's crop improvement area using a new technique has enabled the department to attract research scholars from foreign countries and international fame experts in the area to the institute.

Scientific and Societal Impact: The Department has developed expertise in the spheres of (i) Doubled Haploid(DH) Breeding and (ii) Molecular Cytogenetics leading to innovations of developing a novel technique of Chromosome Elimination Mediated Approach of DH Breeding in Wheat following Wheat × Imperatorcylindrica system and establishing unique facilities of GISH & FISH tools of molecular Cytogenetics. The DH Breeding has actually been used to accelerate:

i) developing of mapping populations especially in wheat and
ii) accelerate varietal development programme and released HIM PRATHAM as First Doubled Haploid Wheat Variety of the country

HIM PRATHAM is the first wheat variety in the country using the fast-breeding method of DH and is more stable in changing climatic conditions. The GISH & FISH novel tools of molecular Cytogenetics approach are being used to

i) Physically map the alien chromosomal introgressions in targeted plant species, crops and
ii) Genome homology studies

The department has been awarded by the State of Himachal Pradesh for its achievement. The department today is leading amongst all the agricultural universities/institutes in the innovative spheres of Doubled Haploidy Breeding & Molecular Cytogenetics used for Accelerated & High Precision Crop Improvement.

8.4: Success Stories from Central Region

Throughout our field visits and interaction with grantee Universities, Institutions, it was perceived that most of them had gained immensely from the FIST scheme. Simultaneously there are also few cases where the expected gain could not be obtained due to various reasons at the institutions. Still, it is encouraging to note that there are more to the accomplishment of the FIST scheme and very minor cases of unexpected outcomes. Following are the prosperous winnings made as an outcome of distinct facilities (i.e., equipment, infrastructure, networking, and maintenance) fabricated with the financial support under the FIST.

Story1: School of Materials Science and Technology, IIT (BHU), Varanasi

About the Institute: Banaras Hindu University (BHU), formerly known as Central Hindu College, was founded by Madan Mohan Malaviya in 1916. It is a public institution with a 1300-acre main campus situated in Varanasi, Uttar Pradesh, and the second 2700-acre campus at Barkachha in the district Mirzapur, Uttar Pradesh. Indian Institute of Technology (Banaras Hindu University) Varanasi (abbreviated as IIT BHU) is a public technical and research Institute located in Varanasi, UttarPradesh, India. Founded in 1919 as the Banaras Engineering College, it became the Institute of Technology, Banaras Hindu University in 1968. It was designated an Indian Institute of Technology in 2012. IIT BHU Varanasi has 16 departments and 3 inter-disciplinary schools. Indian Institute of Technology (Banaras Hindu University) celebrated its centenary year in 2019-2020. It organized a global alumnus meet and other cultural events during the celebration. The 80-year-old BENCO Chimney was also re-erected to commemorate the institute's completion of a century.

About the Department: The School of Materials Science and Technology is an internationally renowned Centre of Materials Education and Research. It was established in 1978 following the recommendations of the V^{th} plan Visiting Committee of the UGC. It serves as University's nodal centre for fostering interdisciplinary teaching and research in the field of materials science and technology.

Details of the Grant: The department received two FIST grants during the period of evaluation, one in 2000 and the other in 2006. The details and purpose of these grants are given below:

First Grant:

- Amount of grant received: Rs.105 lakhs
- Year of grant: 2000
- Level of grant: Level -II
- Purpose: Purchased equipment named 18KW XRD for growth in research and quality of publications, 5-year dual degree programme (B.Tech and M.Tech) after the successful completion of FIST-1 grant, school again applied and after reviewing the presentation/ideas, DST sanctioned grant in the year 2006 under the FIST programme.

Second Grant:

- Amount of grant received: 267 lakhs
- Year of grant: 2006
- Level of grant: Level -I
- Purpose: To strengthen research, purchase of equipment- SEM, VSM, Thermal Analysis System, etc., Renovation of the lab, and purchase of books.

Scientific and Societal Impact:

- A few scientific achievements gained by the school with the help of all facilities developed using the FIST grants are as following:
- Development of biodegradable polymers and their controlled bio-degradation, based on nanocomposites formation
- Development of Ammonia gas sensor for Phenols
- Development of a microbial biosensor for Phenols
- Development of nanoparticles and nanorods of zinc oxides semiconductors doped with transition metals
- Discovery of new phases and phase transitions in multi ferroic ceramic oxides,
- Investigation of Origin of high piezoelectric response in PZTCeramics.
- By using all the facilities created in the school using the grant, student's achievements can be seen as follows:
- Many Ph.D. students visited abroad to present their work and do research work under collaborative projects

- Four IDD students got the opportunity to work in prestigious institutions in Japan through NIIMs sponsored project and Germany through DAAD fellowships
- Some students got the National Doctoral Fellowship of AICTE, and some students awarded GE Foundation Fellowship
- Some students selected as Assistant Professor in various prestigious institutes/universities
- Many are working in renowned companies.

By seeing such progress made by the school, DST sanctioned an amount of Rs.395 L under the FIST programme in the year 2018. So that school could make more progress in the future and helps in the overall development of an institute.

Story2: Department of Electrical Engineering, Dayalbagh Educational Institutes, Agra

About the institute: The Dayalbagh Educational Institute is located amidst the tranquil environs of Dayalbagh, a self-contained colony renowned for its serene environment and secular establishments, in which its inhabitants lead an active, disciplined, and co-operative community life dedicated to service, conforming to the high spiritual ideals of their faith. The Colony of Dayalbagh, which translates as Garden of the Merciful, was founded on the Basant Day in 1915 by Huzur Sahabji Maharaj, the fifth Revered Leader of Radhasowami Faith by planting a Mulberry tree as an Ashram or the spiritual home of the followers of the faith. The headquarters of Radhasowami Satsang Sabha is located here.

About the Department: The Department supports Under-Graduate, Post-Graduate and Doctoral Programmes. At the UG and PG level, a broad-based course structure enables the students to acquirecore competence and specialization in the fields of Power Systems, Electrical Machines, Electronics and Computer Science by way of core courses, electives, and focused projects. The effectiveness of the programmes is indicated by the excellent performance of our students in competitive examinations such as GATE, CAT, GRE, etc. Further, the fact that the students score very high percentile (>99 percentile) in Electrical Engineering, Electronics and Communications Engineering, and Computer Science clearly shows the department's broad-based programme's superiority.

Details of the Grant

- Amount of grant received: Rs.35.50 lakhs
- Year of grant: 2003
- Level of grant: Level -I
- Purpose: Construction of Power lab, EHV Transmission line simulation panel, RLC Loading Panel, High Voltage equipment, ETAP software, 100 KV AC test system, and Soft computing Lab.

Scientific and Societal Impact: New experiments in the Power System lab has been introduced to UG as well as PG level using ETAP software.

- Various experiments for UG and PG being setup on the 100KV AC test system.
- Soft computing lab is used to host labs for various courses.
- B.Tech. student projects completed.

Some of the State-of-the-art Evolutionary algorithms which have been designed and developed in the soft computing lab are as follows:

- Hybrid Evolutionary Algorithm(HEA)
- Gross-To-Fine search
- HEADEGTFS
- Elitist Multi-Objective Stochastic Search Technique-II
- Real-parameter Quantum Evolutionary Algorithm
- A novel RQEA based multi-objective optimization technique
- Two Stochastic search method, HSSUC, and RQEAUC, based on HSS and RQEA
- Two new techniques, HSSUCR and RQEAUCR

A number of Neural Network models are Fuzzy Systems Approaches have been developed to solve problems in the above-mentioned areas. Transmission line simulation panel is being used for the research in power systems

- Evaluation of electrical parameters
- Voltage and current profile of uncompensated line control no load
- Effect of compensation
- Efficiency and regulation
- Reactive power support studies

- Power system loading and limit analysis
- Stability studies

8.5: Success Stories from the Western Region

Story 1: New Arts, Commerce and Science College, Ahmednagar

The college is affiliated with Savitribai Phule, Pune University, Pune. Department was established in 1975 and PG course in 1991, and Ph.D. course in 1993.

Address for communication: Principal, Dr. B. H. Zaware, New Art, and Commerce & Science College Ahmednagar. bhaskarzaware@gmail.com

1) About DST-FIST Grant This Department received DST-FIST support in the year 2008 at Level -I, and the amount sanction was 36.50 lakhs. 1st Instalment: SR/FST/CSI-180/2008, Amount: 36.50 lakhs, 2nd Instalment: SR/FST/CSI-180/2008(C), Amount: 6.29 lakhs, 2nd Instalment: SR/FST/CSI-180/2008(G) Amount: 02.50 lakhs, the total Amount Received was: 34,20,036/-
2) Details of the Grants received.

SL. No.	Year of Sanction	Name of the Equipment	Cost of Equipment in Rs.	Status
1	2008	TGA & FITR & GC	2229795.00	Working

3) Utilization of the facilities created/Available under FIST support:

The department has a sufficient number of advanced and sophisticated instruments for conducting practicals, project work, and research. Under this funding, the department has established a well-furnished Instrumentation Laboratory with FTIR, AAS, TGA, and GC. And UV Visible Spectrophotometer, as well as they have established 15 computerized labs with internet facility. After DST support, 22 book chapters, 88 original articles, 78 articles in conference proceedings, and 27 paper presentations in the conference, research publication increased from the department.

Support by Staff Members while Utilization of Amount: Dr. A. E. Athare, Head Department of Chemistry, considering the need of todays' era and the requirement of students, the college has organized various workshops. The technical experts have also conducted research activities. Other faculty members have supported the Head for Fund Utilization in various manners.

Important Factors: Facility for online tests, growth in research, and students could handle instruments. Freedom of Choice of Dealers and Exemption on Custom Duty. Creates Interest in Research area, Got benefit to research Students and Staff and Increased in Ph.D. Students. Sufficient Grant Maintenance. Released Amount in Two Instalments due to which Instrument Purchase is Easy.

Students in SET, NET, and GATE examinations. About 100 students passed the SET/NET/GATE examination. Department of Chemistry is a recognized center for M.Phil. and Ph.D. Department of Chemistry is in collaboration with National Chemical Laboratory, Pune, Department of Chemistry, Savitribai Phule, Pune University, Pune, and Agharkar Research Institute Pune. C- MET, Pune, for research and other academic activities. Department has a separate placement cell. Department of Chemistry arranges campus interviews for B.Sc. and M.Sc. students. Different companies like Calyx pharmaceuticals, Bombay, Orchid pharmaceuticals, Aurangabad, MacLeod's pharmaceuticals, Mumbai, Lupin Pharmaceuticals, Mumbai, Gharda chemicals, Ltd, Ratnagiri. Sun pharmaceuticals, Ahmednagar. Canpex, Pvt. Ltd., Ashti. Beed. Frequently visit the department for conducting campus interviews. Department has a separate Departmental Library. Department has a computer lab with an internet facility.

Extra efforts are taken by the college for successful implementation of the DST – FIST Programme:

1. Much major equipment was procured by the college by direct import from the manufacturer and claimed Customs Duty Exemption. College procures all the equipment earliest and avoided cost escalation due to foreign exchange fluctuation.
2. New practical experiments were designed and conducted at the Undergraduate and Post Graduate level. So that students learn to use new and advanced equipment/technology.
3. As a part of Scientific Social Responsibility college conducted Hands-on training workshops for the students and teacher of other colleges. These workshops helped them to understand the principle, working, and handling of advanced analytical instruments.
4. Facilities established under the DST FIST scheme were extended to Researchers, Teachers, and Students of other colleges for their sample analysis.

Story 2: Department of chemistry, M. K. Bhavnagar University, Bhavnagar

About Department: Department of Chemistry was a part of M. k. Bhavnagar University Bhavnagar, Bhavnagar. This department is Gujarat state Government. Department was established in 1968 and PG course in 1968 and Ph.D. course in1970.

Address for communication: Prof. Nisheeth C. Desai (HOD), department of chemistry, M.K. Bhavnagar University Bhavnagar, dnisheeth@gmail.com

About DST-FIST Grant: This Department support DST-FIST in the year 2010 at Level -I, and the amount sanction was 36.50 lakhs with the following breakup:

SL. No.	Name of the Equipment	Cost of Equipment in Rs.	Status
1	Conductivity-TDS meter	18000.00	Non-Working
2	Ph Meter	13000.00	Non-Working
3	Abbe Refractometer	190000.00	Non-Working
4	Hydrogenator	140000.00	Working
5	Nitrogen Air goes Generator	425000.00	Working
6	Karl-Fisher Titrator	73000.00	Working
7	Analytical Balance	149000.00	Non-Working

Outcome of the support: 01 book chapter, 35 original articles, 2 review articles, 20 articles in conference proceedings, 25 paper presentation in the conference.

Activity/ Knowledge sharing: National seminar/conferences:20, International seminar/conferences-10, Workshop:7, Faculty Developmentprogram:2.

Achievements: As a district with limited resources and ample small and medium businesses, including the Alang Ship recycling industries, dehydration industries of onion in Mahuva, Antacid and Fine Chemicals of the Chitra Industrial estate, using the financial assistance of the FIST program, the department purchased some instruments like hydrogenator, microprocessor-based pH and conductivity meter, five-digit analytical balance, refractometer, air and nitrogen gas generators, etc. The aim was to improve students' exposure to these instruments, thereby helping them get placements in the local industries and across the country. The department developed the entire instrumentation center with the help of FIST and our own endowment fund. Today, this center is not just fully

functional but also provides support to the MSME's of the surrounding areas of Bhavnagar. Department has regular collaborations with large scale industries such as Sumitomo India (P) Ltd, Acrylic Limited, and Jenburkt Pharmaceuticals Ltd. The state-of-art experimentation facilities developed due to DST-FIST's funding helped our Ph.D. students and faculties publish 75+ research papers in leading national and international journals. The hands-on experience of working with instruments of international standards has contributed to developing the students' scientific exposure and insights. The world of possibilities has expanded; the result being students can opt for scientific careers in research, industries, and enterprises. The computer laboratory established because of the DST funding is instrumental in making the students digital-ready to compete with the world.

In the near future, with the COVID-19 pandemic, this lab is going to host webinars and virtual conferences so that students will no longer face the location barriers in gaining knowledge. Students from all walks of life and economic backgrounds are getting placements in pharma and fin chem. Industries situated around Ahmedabad, Vadodara, Vapi, and Ankleshwar right after their M. Sc. Due to the DST-FIST reorganization, the department is now considered a thought leader in the field of Chemistry among the stalwarts. We could create a lasting impression on the National Assessment and Accreditation Council (NAAC) and Academic & Administrative Assurance (AAA), Government of Gujarat. Summarizing, the DST-FIST grant has enabled us to reach new places of success.

- In the FIST program, DST has a sanctioned computer lab, and due to the establishment of the computer lab, M.Sc. and Ph.D. students are well equipped with the computational program and computational skills.
- The purchase of instruments from the FIST program had helped to establish the analytical ability of M.Sc. and Ph.D. students.
- Due to the DST – FIST program, the department's faculty members are in a position to publish more than 75 research papers in National and International Journals of repute.
- The cumulative impact factor of the faculties is more than100.
- From DST – FIST budget, we have established the hydrogenator, and due to this setup, the students are exposed to hazardous free reactions.
- Due to the recognition of the FIST program, the overall impact of the department in the NAAC is also recognized, and as a whole, the grade of a university is increased.
- The recognition of the Department as DST – FIST is highly useful for the placement of the students in Pharma, Fine-Chem, and Research institutes.

Chapter 9: Summary, Conclusions, and Recommendations

Summary

The present study evaluated 1359 FIST grants amounting to Rs. 96194.8 lakhs, provided to 1170 departments from 380 institutions across the country for grants during 2000-2011. Since the project grant is given for 5 years, the study effectively covers the impact up to the year 2016.

Structure of the Report

The report is structured in nine main chapters, the ninth chapter being on summary and conclusion. The first chapter introduces the orientation of the study with a brief reference to other programmes that address the S&T infrastructure for S&T research and education. It also draws attention to the S&T infrastructure-related concerns in different countries and schemes and programmes thereof. The highlight of the discussion is to address the high rate of obsolescence, management, maintenance, and sharing for optimum utilization of the expensive equipment to derive the best possible outcome.

Methodological Note

The methodological guideline for the study has been drawn from the review of selective literature to narrow down to empirically examinable issues. Among other aspects, the distinction between Direct and Indirect impacts turned out to be an important methodological emphasis. Based on the methodological guideline, detailed planning was done for the kind of data and information that was to be collected in line with the objectives of the study. The study has been executed through five regional units (East and North East, South, North, Central, and West) coordinated through a Central unit. The study has been designed to focus on the characteristics of the grantees and corresponding impacts, direct and indirect.

Conclusions

Grants and Grantees

Grantees have been seen in four different tiers: States, Institutions, Departments, and Principal Investigators (PIs). The overall picture that emerges is a policy push towards building up capacity and capability in the lesser endowed regions and institutes. There are states with very few S&T institutes along with states that have in hundreds. Among the grantees, there are more than hundred years old institutes along with others that are less than 10 years old. The recent decades have witnessed private initiatives towards establishing S&T Institutions. The FIST grant over the years

included such private institutes as well. However, Public institutions in India received a major share of the FIST grant. About 47.5% of the funds were provided to Central Government Institutions and 43.3% to State Government Institutions. Only 8.3% (information missing for 0.9%) went to private institutions and constituent colleges. Correlations indicate older institutes are also being benefitted through the scheme.

Most of the projects granted to the institutions in different states are in the Level -II category, i.e., 55% of the total support was given to the Level -II category, followed by the Level -I category (40%) and Level-0 category (5%).

The majority of the institutions that received FIST grants are endowed in terms of the facilities and infrastructures like a library, internet facility for faculty, computerized admission, computational facilities, and placement cells. However, the presence of IPR cells and incubation centres in the institutions is much less.

Most of the PIs are male. Female representation as PIs is lowest in Uttarakhand and West Bengal. Working PIs constitute around 50%; the rest either superannuated or left the position for alternative opportunities.

Impact of the FIST Grants and Associated Issues

The study has distinguished between direct and indirect impact of the FIST grant; direct impact being the projected impact, like new equipment and how it would strengthen the education and research infrastructure; indirect impact, on the other hand, is derived impacts that cannot be directly attributed to the FIST grant but has perceivable contributions to the academic achievements of the grantee departments. Again, direct impacts are reasonably easily identifiable and attributable to the actions (in this case, the mandates of the grants); on the other hand, indirect impacts are the results of many other associated actions, and therefore, anyone attribute cannot be singled out.

Direct Impact of the FIST Grants

The direct impacts of the FIST grant are tangible changes in the infrastructure of the grantee institutions and occurring at the same time and space.

All levels (Level-0, Level-I, Level-II) together the total amount of grant sanctioned during 2000 – 2011 was Rs.961.95 crores of which Southern states had a share of 42.95% followed by E&NE states 18.33% and Central region states 14.15%. North and West have 13.51% and 11.06%, respectively.

Out of 18.33% share of E&NE, West Bengal has a share of 9.87%; along with Odisha and Assam, it is 13.71%. Similarly, among the southern states, out of 42.95%, Tamil Nadu and Karnataka get a share of 31.24%. More striking is the central region, where out of a share of 14.15%, UP takes away 12.84%. For the North Region, out of a total share of 13.51% Punjab and Delhi together share 7%. In the West Region, Maharashtra has a share of 6.33% out of a regional share of 11.06%.

Seen in terms of each state's share in GDP and population, the flow of the FIST grant indicates that push has been given to the institutions from less endowed states like Jharkhand, Himachal Pradesh, Goa, and North-Eastern states, as these states' share in a total number of FIST projects and grant amount received closely match their respective shares in GDP and population. At the same time, states like Tamil Nadu, West Bengal, Karnataka, and Maharashtra, having a higher share of S&T institutes and institutes of national repute in science education and research, received major support.

Out of total expenditure, 87% of FIST grant was spent on procurement of equipment, 5% on computer, networking & internet, 3.2% on equipment repair, 2.5% on a renovation, 1.2% on books, and 1% on other miscellaneous works.

The evaluation of the equipment's utilization and current functional statusshowed that more than 70% of the equipment procured during the last 5 years under FIST assistance are functional. Also, high-cost equipment (>50 lakhs) isin better working condition than the low-cost equipment, as the share of high-cost equipment under annual maintenance contracts (AMC) was much higher than the low-cost ones.

Indirect Impacts

There is overwhelming evidence and responses suggesting highly significant positive changes post FIST. There have been changes in the workplace, capacity building, manpower strength, research output, and associated collaborations. Post FIST grant, there has been a considerable improvement in the volume of research. Paper publication in high impact factor journals and citations of the papers increased significantly, so have been faculties receiving national and international awards. However, the patenting and commercialization of technology have not accelerated much. More than 42% of grantees reported a significant change in motivation for innovation.

- Though post-FIST, universities did not gain much in terms of manpower. However, there has been a significant rise in student intake capacity at the graduate and postgraduate courses and research (MPhil and Ph.D.). Also, there has been a substantial increase in the pass percentage of the students, including competitive examinations.

Post FIST grant, there has been a considerable improvement in the volume of research. There is a sort of unanimity that paper publication and quality of publication after the FIST grant improved. Paper publication in high impact factor journals and citations of the papers increased significantly, so has been faculties receiving national and international awards. However, patents and commercialization of technology have not accelerated much. There is an improvement, post FIST, in research publications and collaboration. More than 42% of grantees reported a significant change in motivation for innovation. Though universities did not gain much in terms of manpower post FIST, there has been a considerable rise in student intake capacity. Student intakes in graduate and post-graduate courses and research (M.Phil. and Ph.D.) have shown a significant increase, and the pass percentage of the students' post FIST has also increased substantially.

While the general perception on the impact of FIST is a significant improvement in research outcome, simplification of the procurement process, and increase in internal capacity of equipment maintenance; there are issues like administrative support from the institutions, delay in the release of funds, and inadequate trained technical manpower, etc., that require more attention. There are grey areas like financial support for AMC and more financial autonomy to Principal Investigators. These areas require to be addressed for improvement in the impact of the FIST program.

A bibliometric study provides full support to the above observation. The study shows that, as it is expected, till 2003 (3 years after the introduction of FIST), there were only two papers acknowledging FIST, and the number went up to 7289 by 2020. It is indicative of the fact that FIST was an effective catalyzer in S&T research in the country.

Attributes of the Impacts

The **Direct** and **Indirect Impacts** have been further elaborated in terms of certain selective attributes at the state, institution, and Principal Investigator (PIs) levels.

Evaluating **Direct Impact**- The correlation coefficients indicate towards some sort of hypothesis that some grantee departments are not equipped enough (sort of motivational or leadership issues) for deriving the best out of the grants. Also, it appeared that equipment is in better upkeep condition and better utilized in younger institutions. Also, it has been seen that PIs in senior positions help improvement in the working environment.

Evaluating **Indirect Impact**- On the academic achievements of the faculty of the grantee departments, it has been seen that a higher share in a number of FIST project and FIST fund and also

with higher % of working status of the equipment result to inhigher academic achievements. At the institution level, facilities available show negative correlation with academic achievements. It suggests that academic leadership is important for deriving benefits from the S&T infrastructure. This is somewhat reflected at the PI level where it is seen that the middle-level leadership of associate professors are highly positively correlated with academic achievements.

Lack of funds for AMC turned out as a major issue. This issue did come up on many occasions during visits and discussions with the PIs and the faculty of various institutes. Inadequate space and also lack of technical manpower (both faculty and technical staff) are the other woes.

Success Stories

Ten stories, two from each region, corroborate some of the observations made above. The leadership of the PIs in particular, and initiatives of the faculties, in general, has been the main stay of the successful implementation of the projects. It is leadership again that motivated wider utilization of the equipment by students and researchers. And such endeavours are reflected in research output, recognitions, and collaborations. Furthermore, most of the success stories indicate that administrative support within the Institutions has been crucial both for implementing the project and extending the utilization of the same within and beyond the department and institution.

Recommendations and Policy Imperatives

Efficacy of the FIST Programme

1. The FIST support has demonstrated a very positive impact on the working environment, academic and research output of recipient departments and institutions across the country in the S&T sector and strongly calls for continuity of the FIST scheme.

2. Due to this program, less endowed regions and institutions have benefited immensely, which has created expectations for support to more institutions from remote and lesser endowed areas. A policy initiative to address these issues by the Department is earnestly required.

3. The number of privately-owned higher education institutions has grown rapidly over the last decade but hasa negligible presence in the FIST grant list. This aspect requires to be looked into.

4. The scope of the Level-0 grant should focus on the uplift of Postgraduate research and training infrastructure rather than teaching.

Deriving the best out of the programme

5. Hiring trained technical staff to operate the equipment purchased under the FIST grant has been a serious problem in many cases. The department should seek clear information on such requirements and include the cost incurred in hiring a trained operator in the total grant.

6. Provision for annual maintenance (AMC) of major equipment during its expected lifetime and provision for import duty and other overhead expenses, especially in the case of imported equipment, where felt necessary.

7. Permission may be granted for external usage of these facilities for MSMEs and other private users to facilitate revenue generation, which may be used to maintain and upkeep the facilities.

8. Create/Maintain an online centralized MIS on FIST grants and its associated activities in DST for effective management of the programme and impart timely requisite policy thrust towards strengthening, providing better access and optimum utilization of S&T infrastructure in the country as it is done through ISTEM.

Administrative Issues

9. To ensure speedy and smooth implementation of the project, Co-ordinators should be provided more financial autonomy with proper responsibility. A guideline should be evolved by DST consulting some financial experts.

10. The change of Project Co-ordinator due to superannuation, promotion, rotation or migration, etc., or any other change should immediately be informed to DST-FIST Division for further action and updating on the website.

11. To ensure effective monitoring, proper assessment of impact, and mid-term corrections in the program, there should be a provision in the grant for periodic evaluation of impact and adequacy of FIST support.

12. Reduction in the time lag between sanctioned and purchase of equipment is required. The reason forthe delay in procurement of equipment should be investigated separately, and remedial measures should be taken wherever possible. A detailed guideline for the procurement process should be prepared with an objective to achieve transparent and speedy procurement and installation of equipment.

Confidential: Only for research and assessment Qre No. ☐☐☐☐ updated: Jan 28, 2019

Department of Science and Technology
Ministry of Science and Technology
Government of India
New Delhi

Project on

Evaluation of Impact of DST-FIST Program

PURPOSE AND CONSENT:
We are visiting your organization on behalf of Department of Science and Technology, Govt. of India.The aim of this exercise is to collect information pertaining to DST-FIST program provided for strengthening S&T infrastructure facilities to your organization. The findings of this study will be utilized by DST for further planning and improvement of the scheme.

An introductory letter has been issued by DST for this purpose and I am happy to present the same for your consideration. This information will remain confidential and will be used only for research and development purpose by DST, Government of India.

..... Signature of survey field Investigator	..... Signature of Respondent
..... Name of survey field Investigator	..... Name of Respondent

IDENTIFICATION	
Principal of the college/Head of the Department/Project Coordinator	
Name:	Designation:
Gender (M-1/F-2):	Cell No:
Age (Yrs):	Email:

FIST SUPPORT SUMMARY	
Project Code:	Duration of support:
Amount sanctioned:	Amount Utilized:
Survey Field Investigators Details	
Name:	Investigator Code:
Start Date:	End Date:
Signature of survey field Investigator	

Information and instructions about questionnaire

i. This question aims to evaluate the Impact of DST-FIST Program. The first page contains identification of respondent, interviewer and FIST project. The subsequent questionnaire has been divided into following nine sections. Each section is devoted to specific areas and questions within the sections are mostly structured, however some questions are open ended.

1. General Information
2. Infrastructure and equipment
3. Impact on working environment
4. Impact on volume and quality of academic program
5. Impact on volume and quality of research
6. Awards and recognitions
7. Capacity building and other contributions
8. Best practices
9. Overall impact of DST-FIST program.

ii. Primary respondent for this questionnaire may be Principal of college, Head of the Department or Project Coordinator of corresponding FIST assistance. In the absence of above, the present person in-charge of project or Head of Department/Institution may be contacted and appropriate respondent may be decided in consultation with above authorities.

iii. The details of interviewer, starting and ending time of interview should clearly be recorded. In cases were respondentis busy and cannot spare time to provide full information in one go, the interview could split the interview in more than one session as per convenience of the respondent. However, the interviewer should complete the task withinthe time frame allotted for that unit.

iv. In case of any difficulty during the field operation activity, survey field investigator may contact the corresponding regional coordinators and regional coordinators may contact the following:

Dr. A.N Rai
Sc-G, Advisor
CHORD-NSTMIS Division,
Department of Science & Technology,
Technology Bhavan,
New Delhi-110016
Phone:011-26590267
Email:anrai@nic.in

Prof. C.M.Pandey
Chief Coordinator
Department of Biostatistics
and Health Informatics,
Sanjay Gandhi Postgraduate
Institute of Medical Sciences,
Raebareli Road, Lucknow-226014
Phone:9450097977
Email:cmpandeylko@yahoo.com

SECTION 1: GENERAL INFORMATION:

(about your College/Department/School/Centre receiving FIST grant)

S. No.	Descriptions	Please write or tick in the box as applicable
1.1	Region Name and Code	Code: ☐
1.2	Name of University/Institute/College*	
1.2a	*Affiliating University in case of college	
1.3	Address for correspondence	
1.4	State	
About Department		
1.5	Name of the Dept./School/ Centre	
1.6	Year of establishment of Department/School/Centre	☐☐☐☐
1.7	Address for correspondence	
1.8	Year of commencement of PG program in the department (yyyy)	☐☐☐☐ Not Applicable = 8888 Not Available = 9999
1.9	Year of commencement of Ph.D. program in the department (yyyy)	☐☐☐☐ Not Applicable = 8888 Not Available = 9999
1.10	No. of FIST Grant Received	☐☐
1.11	Details of other FIST Grant received by the department	1. Year…….Amount…….. 2. Year…….Amount…….. 3. Year…….Amount……..
1.12	Academic status: Central/State/Private	Central Government Institution ☐ State Government Institution ☐ Autonomous Institution ☐ Deemed University ☐ Constituent College. ☐ Private Institution ☐
1.13	Financial Status of Organization	Central Govt. ☐ State Govt. ☐ OthersSpecify…… ☐

About FIST project		
1.14	Title of the FIST Project (Same as 1.5)	
1.15	Project Code	☐☐☐☐☐☐☐☐
1.16	Project level (Please √)	L0 L1 L2
1.17	Year of Sanctionof FIST GRANT (yyyy) as per sanction order	☐☐☐☐
1.18	Total amount sanctioned under FIST (in Rs. lakhs) as per sanction order	☐☐☐☐ ☐☐
1.19	Total amount received (in Rs. Lakh)	☐☐☐☐☐☐☐☐
1.20	Number of Installment	☐☐
About Principal/ HOD/ Project Coordinator		
1.21	Name of Project Coordinator at the time of first FIST GRANT	
1.22	Current status of Project Coordinator	Working ☐ Superannuated ☐ Join other Inst. ☐ Any other ☐
1.23	Designation of Project Coordinator (N.A. if project closed)	
1.24	Telephone with STD code of Project Coordinator	☐☐☐☐☐☐☐☐☐☐
1.25	Fax with STD code of Project Coordinator	☐☐☐☐☐☐☐☐☐☐
1.26	Email ID of Project Coordinator	
1.27	Website of College/Dept./School/Centre	
About infrastructure		
1.28	Do you have departmental library?	Yes ☐ No ☐
1.29	Do you have internet facility for? A. All faculty/ Scientist B. Research students/ staff C. Library D. Office/Administration	Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐
1.30	Is your admission computerized	Yes ☐ No ☐

1.31	Is your examination system computerized	Yes ☐ No ☐
1.32	Do you have computational facilities	Yes ☐ No ☐
1.33	Do you have separate Biological research Labs	Yes ☐ No ☐ NA ☐
1.34	Do you have separate Chemical research Labs	Yes ☐ No ☐ NA ☐
1.35	Do you have separate Physical research Labs	Yes ☐ No ☐ NA ☐
1.36	Do you have any other Labs (specify)	
1.37	How many class room / Lecture theatre do you have in the College/Dept./School/Centre	☐☐☐ Not Applicable = 888 Not Available = 999
1.38	How many smart class rooms / Lecture theatre in the College/Dept./School/Centre	☐☐ Not Applicable = 88 Not Available = 99
1.39	Does your organization have placement cell?	Yes ☐ No ☐
1.40	Does your organization have IPR Cell	Yes ☐ No ☐
1.41	Does your organization have Incubation Center	Yes ☐ No ☐
1.42	Do you have Lab safety guidelines	Yes ☐ No ☐

SECTION 2: INFRASTRUCTURE AND EQUIPMENT CREATED UNDER FIST

S. No.	Descriptions	Amount(in Rs)
2.1	Procurement of equipment	
2.2	Procurement of Library books	
2.3	Establishment of Internet and communication facility	
2.4	Renovation of labs	
2.5	Air conditioning of working space	
2.6	Repair and maintenance of existing equipment	
2.7	Any other works	

2.8Procurement of Equipment*

S. No.	Name of Equipment	Date of purchase	Date of installation	Cost in Rs.	Current Status	
					Working	Non-working
1					☐	☐
2					☐	☐
3					☐	☐
4					☐	☐
5					☐	☐
6					☐	☐

*Note: Add separate sheet if needed

2.9 Utilization of Equipment*

S. No.	Name of Equipment	No. of Internal User/week	No. of External User/week	Percent Utilized	Funds generated	AMC	
						Yes	No
1						☐	☐
2						☐	☐
3						☐	☐
4						☐	☐
5						☐	☐
6						☐	☐

*Note: Add separate sheet if needed

SECTION 3: IMPACT ON WORKING ENVIRONMENT

Kindly give your candid opinion on the following points on a five point scale. You may choose one of the five options.

Please grade the following items in your College /Dept./School/ Centre		After DST– FISTSupport				
		Decrease	Can't say	Nochange	Improved	Sig. improved
3.1	Cleanliness	O	O	O	O	O
3.2	Room temperature, Light and ventilation.	O	O	O	O	O
3.3	Sufficient Working Space	O	O	O	O	O
3.4	Communication: Internet, Telephone, etc.	O	O	O	O	O
3.5	Personnel Development Opportunities	O	O	O	O	O
3.6	Administrative and Office Support	O	O	O	O	O
3.7	Motivation for innovation	O	O	O	O	O

3.8. Please mention three important factors which contributed towards improvement of the working environment of your College/Department/School/Centre due to DST-FIST support.

1. ……

2. ……

3. ……

3.9. Mention three important impediments of DST-FIST support that prevented your College/Department/School/Centre in improving the working environment .

1. ……

2. ……

3. ……

SECTION 4: IMPACT ON VOLUME AND QUALITY OF ACADEMIC PROGRAM

It is presumed that DST-FIST program might have impacted the academic programs in terms of quantity and quality.

VOLUME OF MANPOWER			
S.No.	**Provide the number of man power**	**Before FIST**	**After FIST**
4.1	How many faculty were/are working in your College/Dept/School/Centre? a. Lecturer / Assistant Professor b. Associate Professor/ Reader c. Professor	□□ □□ □□	□□ □□ □□
4.2	How many DST sponsored Scientist/ research professional were/are working in your College/Dept/School/Centre? a. Scientists b. Other research staff	□□ □□	□□ □□
4.3	How many Tech/Admin staffs are/were working in your College/Dept/School/Centre? a. Technical Staff b. Administrative Staff	□□ □□	□□ □□

Number of sanctioned strength in various courses in the College/Dept/ School / Centre.		**Before DST– FIST Support**	**After DST– FIST Support**
4.4	Graduation	□□□□	□□□□
	Post-graduation	□□□□	□□□□
	M.Phil.	□□□□	□□□□
	Ph.D.	□□□□	□□□□
	PG Diploma	□□□□	□□□□
4.5	**Number of students being admitted in your College/Dept/ School / Centre t**		
	Graduation	□□□□	□□□□
	Post-graduation	□□□□	□□□□
	M.Phil.	□□□□	□□□□
	Ph.D.	□□□□	□□□□
	PG Diploma	□□□□	□□□□

4.6	**Number of students passing out in the following courses offered by your College/Dept/ School / Centre?**		
	Graduation	☐☐☐☐	☐☐☐☐
	Post-graduation	☐☐☐☐	☐☐☐☐
	M.Phil.	☐☐☐☐	☐☐☐☐
	Ph.D.	☐☐☐☐	☐☐☐☐
	PG Diploma	☐☐☐☐	☐☐☐☐
4.7	**Number of students secured grade A or First Div. marksin following examinations. In your College/Dept/ School / Centre**		
	Graduation	☐☐☐☐	☐☐☐☐
	Post-graduation	☐☐☐☐	☐☐☐☐
	M.Phil.	☐☐☐☐	☐☐☐☐
	Ph.D.	☐☐☐☐	☐☐☐☐
	PG Diploma	☐☐☐☐	☐☐☐☐
4.8	**Number of students qualified the following examination from the your College/Dept/ School / Centre**		
	NET/ SLET	☐☐☐☐	☐☐☐☐
	GATE	☐☐☐☐	☐☐☐☐
	Others	☐☐☐☐	☐☐☐☐
4.9	Number of Short term training for scientist up gradation	☐☐☐☐	☐☐☐☐

SECTION 5: IMPACT ON VOLUME AND QUALITY OF RESEARCH

S. No.	Number of research publication from your College/Dept./School/Centre.	Before FIST	After FIST
5.1	a. Books b. Books Chapters c. Original articles d. Review articles e. Case reports / Editorial Notes f. Articles in Conference Proceedings g. Paper presentation In Conference h. Monographs i. Any other	☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐	☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐

Grade the following items on five point scale		After DST– FISTSupport				
		Decrease	Can't say	No change	Increase	Sig. increase
5.2	Trend of Intramural grant received (excluding FIST)	O	O	O	O	O
5.3	Trend of Extramural grant received (excluding FIST)	O	O	O	O	O
5.4	Trend in patents filed by your organization.	O	O	O	O	O
5.5	Commercialization of technology by your organization	O	O	O	O	O
5.6	Product and process develop by your organization.	O	O	O	O	O
Quality of Research						
5.7	Papers published in SCI/SCIE Journals.	O	O	O	O	O
5.8	Trend in Impact Factor of Published articles.	O	O	O	O	O
5.9	Trend in average citation index of published articles.	O	O	O	O	O
5.10	Consultancy	O	O	O	O	O
5.11	Extension work/interaction with industries?	O	O	O	O	O

SECTION 6: AWARDS AND RECOGNITIONS

S. No.	Items	Before FIST	After FIST
6.1*	Kindly provide us the information about Awards received by faculty/ scientists/ scholars of the Department/ Centre / Lab a. International Awards b. National Awards	□□ □□	□□ □□
6.2*	Kindly provide us the information about recognition received by faculty/ scientists/ scholars of the Department/ Centre / Lab a. International Recognition b. National Recognition	□□ □□	□□ □□
6.3*	Kindly provide us the information about fellowships received by faculty/ scientists/ scholars of the Department/ Centre / Lab a. International Fellowship b. National Fellowship	□□ □□	□□ □□
6.4*	Provide information about collaborations established by your department a. International Collaboration b. National Collaboration	□□ □□	□□ □□
6.5 *	Provide information about any academic certification a. International Collaboration b. National Collaboration	□□ □□	□□ □□
6.6*	Faculty exchange program a. International Collaboration b. National Collaboration	□□ □□	□□ □□

***Write details of award, recognition, fellowship and collaborations on a separate sheet.**

SECTION 7: CAPACITY BUILDING AND OTHER CONTRIBUTIONS

S. No.	Kindly provide number of the activities of capacity building and knowledge sharing by your organization	Before FIST	After FIST
7.1	a. National Seminar/ Conferences b. International Seminar/ Conferences c. Workshop d. Number of short term training for scientist up-gradation e. Faculty Development Program f. Management Development Program g. Up gradation of technical staff h. Others	□□ □□ □□ □□ □□ □□ □□ □□	□□ □□ □□ □□ □□ □□ □□ □□

SECTION 8: BEST PRACTICES

S.No.	Processes, Procurement, Managerial Practices and Constrains
Procurement of equipment	
8.1	Are you satisfied with procurement process and time.(Yes-1/No-2) ☐
8.1a	What are the positive points?
	1..... **2**..... **3**.....
8.1b	What were the constraints you faced?
	1..... **2**..... **3**.....
8.1c	Suggestion and better practices if any
	1..... **2**..... **3**.....
Utilization of infrastructure and Services provided to users	
8.2	Are you satisfied with Utilization of infrastructure and Services provided to users? (Yes-1/No-2) ☐
8.2a	What are the positive points?
	1..... **2**..... **3**.....
8.2b	What were the constraints you faced?
	1..... **2**..... **3**.....

8.2c	Suggestion and better practices if any
	1..... **2**..... **3**.....
Maintenance of infrastructure	
8.3	Are you satisfied withMaintenance of infrastructure? (Yes-1/No-2) ☐
8.3a	What are the positive points?
	1..... **2**..... **3**.....
8.3b	What were the constraints you faced?
	1..... **2**..... **3**.....
8.3c	Suggestion and better practices if any
	1..... **2**..... **3**.....
Utilization of funds	
8.4	Are you satisfied with utilization of funds? (Yes-1/No-2) ☐
8.4a	What are the positive points?
	1..... **2**..... **3**.....
8.4b	What were the constraints you faced?
	1..... **2**..... **3**.....

8.4c	Suggestion and better practices if any
	1..... **2**..... **3**.....
Administrative support	
8.5	Are you satisfied with Administrative support? (Yes-1/No-2) ☐
8.5a	What are the positive points?
	1..... **2**..... **3**.....
8.5b	What were the constraints you faced?
	1..... **2**..... **3**.....
8.5c	Suggestion and better practices if any
	1..... **2**..... **3**.....
Policy imperatives	
8.6	Suggest policy imperative for strengthening of the FIST scheme
	1..... **2**..... **3**.....

SECTION 9: OVERALL IMPACT OF DST-FIST PROGRAM

Now we would like to ask you to summarize the overall impact of DST-FIST assistance on various domains of your functioning and output etc.ona 5-point scale. You may choose one of the five options. If you feel that there is a need to give any special remarks please give it separately.

Grade the following items on a five point scale after the DST FIST support to your College/Dept./School/Centre		After DST– FIST				
		Decrease	Can't say	No change	Increase	Sig. increase
9.1	Students Intake	O	O	O	O	O
9.2	Students passed out	O	O	O	O	O
9.3	Students NET/GATE etc. Results	O	O	O	O	O
9.4	Content of the Syllabus	O	O	O	O	O
9.5	Introduction of New PG Program , if any	O	O	O	O	O
9.6	Students' placement	O	O	O	O	O
9.7	Enrolment of Research Students	O	O	O	O	O
9.8	Number of Ph.D. Awarded	O	O	O	O	O
9.9	Faculty positions (sanctioned)	O	O	O	O	O
9.10	Faculty positions (filled)	O	O	O	O	O
9.11	Awards, Visiting assignments, PDF assignments	O	O	O	O	O
9.12	Volume of Research Publications by Faculty/Scientists	O	O	O	O	O
9.13	Quality of Research Publications by Faculty/Scientists	O	O	O	O	O
9.14	Extra mural grant received	O	O	O	O	O
9.15	Computational and Major Equipment Facilities in the Department	O	O	O	O	O
9.16	Departmental Library Facilities	O	O	O	O	O
9.17	Accreditation level by the NAAC/NBA/UGC/MCI peer review team	O	O	O	O	O
9.18	Academic reputation and visibility	O	O	O	O	O
9.19	Community/ outreach program	O	O	O	O	O
9.20	Attracting talent to organization	O	O	O	O	O
9.21	Visitors from abroad / reputed institute	O	O	O	O	O
9.22	Quality of Teaching	O	O	O	O	O
9.23	Research Environment	O	O	O	O	O

9.24 Would you like to give any suggestion for improvement in the science and technology of this country with special reference to the efforts being made by the Department of Science and Technology?

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-----Thanks for your cooperation----