



सत्यमेव जयते

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**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**

### **Southern Region**

**January 2021**

**Implemented by,**

**JSS Academy of Technical Education, Bengaluru, Karnataka**

## Acknowledgement

We wish to express our particular thanks to academic institutions and colleges across South India for their coordination and support provided in the process of data collection. We are very grateful to the entire faculty, experts and others for dedicating their valuable time.

We take this opportunity to express a deep sense of pranams to **His Holiness Jagadguru Sri Shivarathri Deshikendra Mahaswamiji, JSSMVP, Mysore** for his support and blessings.

We would like to express our sincere gratitude to **Department of Science & Technology, New Delhi, Government of India** and its officials for their involvement and valuable inputs during the study. We also like to convey our sincere thanks to Project Advisory committee of NSTMIS scheme for their support during this study.

Special thanks to **Dr. Parveen Arora, Head (CHORD)** for his proactive support and guidance during the entire process.

We express our gratitude towards **Dr. A. N. Rai, Scientist G, NSTMIS** for his kind co-operation and encouragement, which help us in completion of this project.

We are also grateful to **Mr. S.S Kohli, Head (FIST)** for his guidance and encouragement throughout the entire process.

We would like to express sincere gratitude for the support from **Dr. C. M. Pandey & Dr. Anup Kumar of Central Coordination Unit** for their guidance and support in the study.

Also, we extend our sincere thanks to all the regional PI's, **Dr. J Juneja, Dr. Pradosh Nath, Prof. Rajesh Singh and Prof. Uttam Singh** for their valuable inputs with respect to various dimensions during this study.

I also take this opportunity to express a deep sense of gratitude to **Dr. C.G. Betsurmath, Executive Secretary, JSS Mahavidyapeetha, Dr. C Ranganathaiah, Technical Director (A&A), JSS Institutions, Dr. Mrityunjaya V Latte, Principal, JSS Academy of Technical Education, Bangalore** and **Dr. M Vijay Kumar, HOD, IE&M Department** for their cordial support for successful completion of project.

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## RECOMMENDATIONS

The DST FIST support and its outcomes were highly appreciated and acknowledged by all the grantee institutions across the southern region.

- Details of infrastructure and equipment facilities created along with the expert profile can be made available in respective institutional websites as well as on the DST-FIST portal. Such initiatives will improve the institution to collaborate with other organizations and promote collaborative activities for mutual development. This can enhance the utility of the equipment and revenue.
- Certain states have received a lesser number of research grants, which is a matter of concern, and in those states awareness about the DST-FIST scheme needs to be initiated.
- From the survey results, it is observed that most of the grant recipients are geographically located in urban areas. Hence, measures can be taken to avoid regional imbalance.
- It has been observed that there are repetitive infrastructures in the cost range of 1 crore and above established under DST-FIST grants, such as XRD, SEM, NMR, PIV etc., which could be avoided in the future by creating centralized facilities or with appropriate measures.
- Acknowledgment of DST-FIST in research publications, in filing patents and other related activities can be made mandatory. This will help the policy makers to track the impact of research areas and outcomes.
- It has been observed across the FIST-supported institutions that there is a shortage of technical staff and non-availability of funds for maintenance of facilities under FIST grants. In this regard, a provision can be considered under the FIST scheme to address the above concern, or there should be some binding on DST-FIST institutions to maintain and provide necessary infrastructure and manpower to operate.
- Timely release of funds will help in effective utilization and minimize the constraints faced.
- After the completion of projects, periodic review and updating of research outcomes of the facilities created under FIST support needs to be monitored. In this direction, DST can insist FIST recipients to submit the progress made online. The academic sector is expected to expand in the coming years; it is certain that S&T infrastructure will also witness significant expansion. In this regard, the significant growth in S&T investment needs to be continuously monitored and necessary to measure its performance.
- New emerging domain areas need to be considered for support.

## EXECUTIVE SUMMARY

India, in its 73 years of independence India has made impressive progress in the area of science and technology and in other sector. In the disruptive technology era education at all levels has been expanded, and the number of colleges and universities has increased several-fold after the independence. In India Department of Science and Technology (DST) was established in 1971 with the objective of promoting new areas of science and technology across the country. The DST is the nodal department for organizing, coordinating and promoting S & T activities in the country. In order to strengthen the science and technology sector and to enhance the effectiveness and availability of knowledge base in academic sector a new scheme was launched during 2000-2001 called Funds for improvement of Science and Technology (FIST). The scheme emphasizes on strengthening and imparting quality of higher education and conducting research in emerging fields of S&T.

Under the FIST scheme, from 2000-2011 for the southern Indian states namely Karnataka, Tamil Nadu, Kerala, Andhra Pradesh, Telangana, Pondicherry, Andaman and Nicobar, 581 FIST projects has been sanctioned with a grant amount of Rs 41318 lakhs which accounts to 42.95% of sanctioned amount in national level and 42.75 % of national projects are awarded to southern region.

With respect to amount sanctioned to southern region, a total of 30674.9 lakhs of rupees has been spent on the equipment which accounts to the 42.50 % of national grant spent on equipment.

With an insight of finding the impact and success of the DST-FIST program and to find out its reach, it is important to evaluate the impact of FIST scheme for great interest on S&T activities in academic sector. In this connection a regional level survey has been carried out as a part of National level survey to evaluate the impact of DST-FIST program, with the objective

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 to 2011.
2. To identify the best practices in terms of procedure, processes and, managerial practices among recipient organization and DST.
3. To suggest policy imperatives for strengthening the scheme.

The 581 projects were sanctioned during 2000-2011 in southern region were contacted with a specially designed questionnaire to evaluate the following research outcomes i.e., Infrastructure facilities and Equipment, Work environment, Quality of academic program, Quality of research, Awards and recognitions and International/ National collaboration. The analysis of the information collected through the survey, reveals that DST FIST is able to contribute towards the growth of S&T infrastructure development in the southern region. A total of 2620 equipment were procured and effectively utilized by both internal and external users for academic and research activities. Apart from this, a good infrastructural facility is also developed because of the DST FIST funding especially internet facilities, establishment of IPR cell, incubation centres and computation facilities and this resulted in improved working environment, improved communication, personal development opportunities and motivation for innovation among the faculty and researchers. There is a significant improvement in the research outcomes like number of research articles published, patents awarded and international collaborations etc.. DST FIST program is also instrumental in capacity building at the institutional level and able to contribute and empower all the stake holders involved in academics and researches. The infrastructure and equipment facilities created with the aid of DST-FIST funds across seven different states of southern region prove to be a good initiative to empower and nurture S&T activities and able to deliver the results.

## KEY FINDINGS

### Background of FIST

- The total amount sanctioned under FIST during year 2000-2011 was Rs 124533lakhs.
- FIST has provided 1602 grants during the year 2000-2011
- Funding is given at Level-0, Level-1 and Level-2. Level1 and Level2 were started in the year 2000 and Level-0 was started in the year 2009.
- The upper limit for assistance to Level-0 grant was Rs50 lakh and it was revised to 100 lakhs in year 2010. This grant is not specific to any subject area and is usually provided to colleges.
- The upper limit for Level-1 grant was Rs 100 lakhs and it was revised to 300 lakhs in year2006.
- The upper limit for Level-2 grant was Rs 200 lakhs and was revised to 1000 lakhs in year 2006.
- Level-1 and Level-2 grants are area specific and cover Engineering and Technology, Chemical, Physical, Mathematical, Earth and Life Sciences.

### Who were supported?

- In southern region, a total of 590 DST-FIST projects were sanctioned for the period 2000-2011 of total cost Rs. 413.18 crores implemented by 159 institutions of 7 states of Southern India.
- The state government institutions have received highest number of FIST grants.
- Majority of the projects distributed are in L1 level (374 projects), followed by L2 Level (163 projects) and L0 Level (44 projects) of which 90% of the grants was effectively utilized.
- Out of seven states in southern region, Tamil Nadu and Karnataka have received 39.8% and 32.9 % of total amount of funds sanctioned respectively

### Major support for Equipment &Infrastructure

- 89.52% of grants was used for procurement of equipment and for creating various other infrastructural facilities.
- 79.8% of equipment procured under grants were functional at the time of study and only 21.13% (231) of working equipment have AMC.

- Average gap between sanction year and purchase year is 1 year and 6 months.
- 76.48 % of equipment were installed within 4 months from procurement date.
- Out of 2620 equipment, 1700 equipment were optimally utilized (76-100%).

### **Impact on working environment and academics**

- 83% of grantee institutions reported significant improvement in working environment.
- 33.6% responses perceived that research publication and collaboration in the department has been a significant factor for the improvement of working environment.
- 31.9% responses perceived that Delay in Funds release and lack of annual maintenance grants are obstacles for improving the working environment.
- 26.5% improvement in volume of manpower was observed. There is a significant increase in volume of manpower in private institutions which accounted to 76% compared to central and state government institutions, autonomous institutions, deemed university and constituent colleges.
- An increase in the academic staff (lecturer/Assistant professor) by 34.5%, research staff by 136.1%, technical staff by 20.7% and administrative staff by 11.2%.
- An increase of 31.9% was observed in admission rate of which 29% increase in UG and PG programmes and 63.7% increase in Ph.D programs across southern region.
- Overall improvement in pass percentage is increased by 4%.
- Success rate in qualifying in national examinations after FIST implementation is increased by 272.4%.
- Overall improvement in students securing Grade A or First Division in various courses before FIST was 59.8% and after FIST is 61.5%.
- 152% change is evident from the overall activities of capacity building in 509 departments across southern region.
- The quality and volume of awards and recognition by faculty/scientist before and after FIST implementation was increased by 186.3%.



### **Impact on research output**

- The overall rate of research publication of original articles increased by 51.3%.
- Improvement in extramural and intramural grants was reported by 55.8% and 51.1% respectively.
- Trend in improvement of impact factor was reported by 54.4%.
- Improvement in citation index was reported by 56.4%.
- Positive trend was observed in commercialisation of technology (27.1%), consultancy activities (50.9%) and product and process development (38.5%).
- The overall increase in fellowship, awards, recognitions 186%.

### **Satisfaction level and way forward**

- 98% of the respondents were satisfied with utilization of infrastructure and 25.2% of respondents appreciated the ease of procurement process
- With respect to utilization of funds, 40.1% of the respondents appreciated the FIST support for development of infrastructure and 44.3% appreciated the good administrative support.

#### **Positive points:**

- Respondents expressed improvement in quality of research and work environment.
- Respondents appreciated the ease of procurement process
- Respondents appreciated centralization of research infrastructure and academic facility.

#### **Constraints:**

- Delay in fund release
- Lack of funds for AMC support.
- Lack of trained technical staff
- Lack of financial autonomy to PIs
- Administrative delays for timely completion of projects

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**CHAPTER 1**

**INTRODUCTION, GENESIS OF DST-FIST PROGRAM & NEED OF  
PRESENT STUDY**

CHAPTER 1

INTRODUCTION, GENESIS OF DST-FIST PROGRAM & NEED OF  
PRESENT STUDY

**1.1 Science and Technology policies and genesis of DST-FIST**

Scientific development in Indian subcontinent can be divided into three important periods; the “**Vedic Era**” where the main focus was on *vedic* mathematics, astronomy, astrology and *ayurveda* to gather knowledge and apply for the benefit of people. The next era of development in science was “**Colonial Period**” inspired by the development taking place in western world. The achievements of India during this era could be credited to the great Indian scientists such as **Dr JC Bose, Dr PC Ray, Dr SN Bose, Dr CV Raman** and many more. They worked to expand the scope of both theoretical and experimental science in India, with the goal of making it more accessible to their fellow Indians. The establishment of the Bose Institute in Calcutta in 1917 is such an example. Subsequently several scientific bodies like National Academy of Sciences, Indian Academy of Sciences and The Indian National Science Academy were formed by scientific groups to share ideas, exchange scientific knowledge and promote the development of science and technology in the country. These organizations also served as strong network and linkage between scientist and institutions outside the country.

The third era of Science and Technology (S&T) started after gaining independence in 1947, India sought to rapidly expand its science and technology programs, seeking to promote scientific and technical education. There were several important milestones which were achieved by the Government of India in its pursuit to make India a technologically self-sufficient nation. In the period immediately following independence, the Department of Atomic Energy was established under the leadership of Dr Homi Jehangir Bhabha. This program enabled India to prepare for the onset of the nuclear age. In the field of technical and scientific education the establishment of the Indian Institutes of Technology provided a means for the spread of technical education to Indian citizens. Other important institutions such as the Defence Research and Development Organisation (DRDO) and the Indian Space Research Organisation (ISRO) were also established to further the ideas of scientific and technological advancement. However, there were many other sectors of scientific study which were not under the scope of these existing organisations. To bring effective change in these sectors, the **Department of Science and Technology was established in May, 1971**, with the purpose of acting as a nodal agency for the organisation, coordination and promotion of scientific and technological activities in the country.

Studies suggest 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 S&T are perceived as complements to effective economic policies, not as substitutes. (Rosenberg;1990)<sup>1</sup>.

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 also some European countries emerging as knowledge and technology hub, and innovation superpower.

Unlike Europe, science education and research in pre-independence India remained largely loosely connected with the production system or economic priorities. The first ever government policy, in this regard, has been enunciated in the Scientific Policy Resolution (SPR), 1958. This policy emphasised on building suitable infrastructure for science education and practice of science. In 1960's, witnessed establishment of several institutions of national importance for science education and R&D. The SPR 1958, however, had 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.

Gradually it was realised that, it is technology that rules the roost, and science education and R&D do not smoothly flow to technology and to the production system. It was felt that a policy with special focus on technology generation priorities is needed. The Technology Policy Statement (TPS) 1983, therefore, laid emphasis on strengthening of indigenous technology base addressing the vulnerability of technology dependence and also developing capabilities in the emerging areas like information technology, electronics and bio-technology. That was the time when globalisation coupled with economic liberalisation was becoming the new world economic order. The year 1991 saw major shift in Indian economic policies through liberalisation of Indian economy. This made the policy of technology self-reliance (the guiding principle of TPS 1983) dormant. Nevertheless, these policies spearheaded the initiatives for building valuable infrastructure for S&T education and research. Globalisation, 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. In recent past, scientific community had expressed great concern about the lack of infrastructure facilities for imparting good quality of higher education and

conducting research in emerging fields of science and engineering in our country. Considering the status of S&T sector in the universities and related academic institutions that were in dire need for strengthening the existing S&T infrastructure support with adequate funding and associated flexibility, program like FIST has become necessary to extend infrastructure support to higher technical and medical educational institutions to develop it at national and international level.

It was envisaged to upgrade the departments requiring further strengthening of their infrastructure to enhance their visibility both nationally and internationally. The very first concrete initiative in this regard has been launched in the year 2000 as DST-FIST (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 infrastructure in universities and institutions of higher education. The duration of support for each project was for a period of 5 years and was extendable for next 5 years if progress from the first grant was found suitable. It began with selected areas of research in selected institutes and universities of recognised expertise, over the period of execution priority areas, institutes and universities and the size of fund expanded substantially. The investment under FIST programme has crossed Rs. 2000 crores over 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 impact study for the grants received during 2000 -2005 and 2002-2007. The study highlighted substantial impact and gains of the initiative, and thereby substantiated the enhanced activities under the FIST programme. 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 mobilisation of human and physical resources for both investments in 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 number of projects funded and also the volume of funding. Table 1.1 presents the chronological development of the FIST programme over time, along with actual execution of the programme in terms of number of projects, fund invested, over the states and levels of funding. It is to be noted that when the scheme was formally launched in the year 2000 funding used to be done at two levels (L1 and L2) with financial limits of Rs. 100 lakhs and Rs 200 lakhs respectively for both govt. and private organisations. In the year 2006 the limit was extended to Rs 300 lakhs

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(L1) and Rs 1000 lakhs (L2), with a caveat of 50:50 mode for private organisations. In the year 2009 a new Level (L0) was introduced with financial limit of Rs 50 lakhs exclusively for PG colleges, not for any specific department of the college. Subsequently limit was extended to Rs 100 lakhs in 2010 and again to Rs 150 lakhs in 2017. In 2018, a new level named as Level 4 was introduced exclusively for such ‘Departments those have already been supported for two cycles at Level 2 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 or Govt. aided organization) only for high quality research.

**Table 1.1: Milestones of FIST**

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 1: up to Rs 100.0 lakh Level 2: up to Rs 200.0 lakh	
2006	Upper limits were revised: Level 1: up to Rs 300.0 lakh Level 2: up to Rs 1000.0 lakh	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 mode (i.e. 50% by Govt. and 50% by the Private organization) for only research purpose.
2008	Impact study was conducted	Based on Input the program was revised
2009	FIST support revised to 3 levels with financial limits: Level 0: up to Rs 50.0 lakh Level 1: up to Rs 300.0 lakh Level 2: up to Rs 1000.0 lakh	Introduction of Level ‘0’ support exclusively for PG Colleges. The unit of support was College as whole rather than individual Departments of the College.
2010	FIST support quantum was revised with financial limits: Level 0: up to Rs 100.0 lakh Level 1: up to Rs 300.0 lakh Level 2: up to Rs 1000.0 lakh	Upper limit of support for the PG Colleges at Level ‘0’ was revised to Rs 100.0 lakh from Rs 50.0 lakh.
2017	FIST support quantum was revised with financial limits: Level 0: up to Rs 150.0 lakh Level 1: up to Rs 300.0 lakh Level 2: up to Rs 1000.0 lakh	Upper limit of support for the PG Colleges at Level ‘0’ was revised to Rs 150.0 lakh from Rs 100.0 lakh.
2018	FIST support revised to 4 levels with financial limits: Level 0: up to Rs 150.0 lakh Level 1: up to Rs 300.0 lakh Level 2: up to Rs 1000.0 lakh Level 4: up to Rs 2000.0 lakh	Introduction of Level ‘3’ support exclusively for such Departments those which have already been supported for 2 cycles at Level 2 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 lakh Level 1: up to Rs 300.0 lakh Level 2: up to Rs 1000.0 lakh Level 4: up to Rs 2000.0 lakh	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

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Then there were special FIST packages for states and regions from where there were not many applications for funding. These states and region 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 NEER Special Package is developed for a total estimated cost of Rs 70 crores for five years and that of J&K and Bihar state are about Rs 60 crores and Rs 76 crores respectively for 5-years duration. Table 1.2 presents year-wise extent of FIST grants to institutes, departments along with amount and level of grant sanctioned during each year of the evaluation period 2000-2011. During these years a total of Rs 124533 lakh was provided to 1623 grantees. The number of grant and amount spend were variable during all these years. Out of this investment more than 55% support has been provided Level-2 projects, 40% to Level-1 projects and about 5% to Level -0 projects which was primarily for colleges and was started in 2009.

**Table 1.2: Expansion of the FIST over the years**

Year of Sanction	Number of Grants				Total Sanctioned amount Rs Lakh
	Level - 0	Level - I	Level - II	Total	
2000	0	123	98	221	11239
2002	0	143	88	231	9948
2003	0	140	43	183	8212
2004	0	80	31	111	3999
2005	0	51	30	81	4243
2006	0	74	22	96	11231
2007	0	90	50	140	20474
2008	0	118	40	158	14517
2009	13	45	31	89	9184
2010	30	81	38	149	15621
2011	45	74	45	164	15866
<b>Total</b>	<b>88</b>	<b>1019</b>	<b>516</b>	<b>1623</b>	<b>124533</b>

Except Level-0 grant, the Level-1 and Level- 2 grants were subject specific covering all major areas of science and technology. These two grants were provided to the following areas: (a) Chemical science, (b) Earth sciences, (c) Physical sciences, (d) Mathematical sciences, (e) Life sciences and (f) Engineering & Technology. Looking at subject areas specific support, it was observed that about 32% of funds were given to Engineering and Technology and 25% of funds were given to Life sciences, 16% to Chemical sciences, 13% to Physical sciences, 7.4% to Earth



## Evaluation of Impact of DST-FIST Project- Southern Region

sciences. About 4% of fund was proved to colleges in the form of Level-0 grants. Only 1.7% of funds were given to Mathematical sciences (Table 1.3).

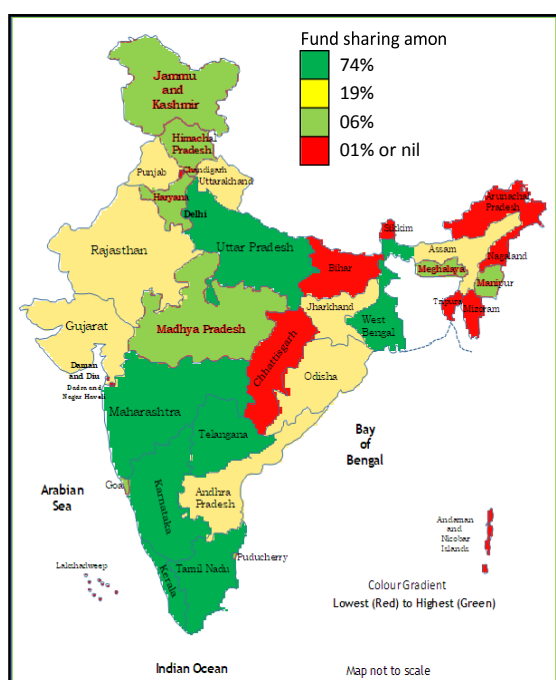
**Table 1.3: Expansion of the FIST over different subject areas**

Subject area	Number of Grants				Total Sanctioned amount Rs Lakh (%)	
	*Level - 0	Level - I	Level - II	Total		
Eng.& Technology	0	175	169	344	39409	(31.65)
Life Sciences	0	387	144	531	31069	(24.95)
Chemical Sciences	0	167	84	251	21004	(16.87)
Physical Sciences	0	130	60	190	16331	(13.11)
Earth Sciences	0	89	40	129	9148	(7.35)
Mathematical Sciences.	0	71	19	90	2060	(1.65)
General (L-0)	88	0	0	88	5512	(4.43)
<b>Total</b>	<b>88</b>	<b>1019</b>	<b>516</b>	<b>1623</b>	<b>124533</b>	<b>(100.00)</b>

**\*Not subject specific, Started in 2009**

The spread of the programme across the country is shown in the map below. It is apparent that states such as Tamil Nadu, Karnataka, Maharashtra, Uttar Pradesh and West Bengal have the institutions that are most active in using the FIST grant, out of total grant provided during 2000-2011, about 74% has gone to institution from the eight states or UTs. The pattern of funding is presented on the map of India.

**Fig 1: Expansion of the FIST across various States in the country**



SL	State /UT	No of Grants	Amount Rs Lakh (%)	SL	State /UT	No of Grants	Amount Rs Lakh (%)
1	Tamil Nadu	259	18262.52	17	Jammu & Kashmir	24	1334.50
2	West Bengal	187	15926.50	18	Haryana	27	1152.00
3	Karnataka	127	15223.30	19	Madhya Pradesh	28	1106.00
4	Uttar Pradesh	119	13864.05	20	Pondicherry	12	976.50
5	Maharashtra	147	10630.50	21	Himachal Pradesh	18	945.00
6	Delhi	71	9679.50	22	Goa	15	804.50
7	Kerala	112	5017.65	23	Meghalaya	11	614.50
8	Punjab	75	4503.50	24	Manipur	10	583.00
<b>Sub total</b>		<b>1097</b>	<b>93107.52 (74.8)</b>	<b>Sub total</b>		<b>145</b>	<b>7516.0(6.0)</b>
9	Telangana	56	4356.00	25	Chhattisgarh	10	354.00
10	Uttara Khand	49	3749.50	26	Mizoram	3	193.00
11	Rajasthan	62	3400.00	27	Tripura	5	122.50
12	Assam	53	3375.50	28	Bihar	4	112.00
13	Gujarat	41	2354.50	29	Arunachal Pradesh	1	110.00
14	Orissa	38	2300.00	30	Nagaland	3	103.00
15	Andhra Pradesh	36	1940.00	31	Andaman & Nicobar	1	84.00
16	Jharkhand	18	1335.00	32	Sikkim	1	20.00
<b>Sub total</b>		<b>353</b>	<b>22810.5 (18.3)</b>	<b>Sub total</b>		<b>28</b>	<b>1098.5(0.9)</b>
<b>Total grants 1623</b>		<b>Grand total Amount sanctioned Rs. 124532.52 lakh</b>					

### 1.2 Other programmes and initiatives of 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 2000-2010 has been declared as the 'decade of innovation'; as recognition to the fact that in the globalized world to remain competitive in the global market the imperative is creation of science led technological advantage. Important action point has been building an innovation ecosystem with 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 instrument and equipment for higher level of R&D. Under Sophisticated Analytical Instrument Facilities (SAIF) eighteen such facilities have been created at different institutes of excellence across the country. The programme is executed through web portal Shared Research Infrastructure for Science, Technology and Innovation (SRISTI), and annually it provides services to nearly 10,000 researchers. On the other hand, Sophisticated Analytical & Technical Help Institute (SATHI) is located in IITs and BHU for providing professionally managed services with efficiency, accessibility and transparency of highest order under one roof to service the demands of industry, start-ups and academia. The draft Scientific Research Infrastructure Sharing Maintenance and Networks (SRIMAN) Policy 2019 is another initiative of the DST that lays the protocol for developing regional ecosystem for the following:

- Procurement and maintenance of equipment and infrastructure for research
- Providing access 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 department such as Department of Bio Technology (DBT) has also initiated infrastructure related programme known as Scientific Infrastructure Access for Harnessing Academia University Research Joint Collaboration (SAHAJ). Under this programme each DBT Autonomous Institute and DBT supported Infrastructure programme will make available its high-end equipment and infrastructure to Research Institutes, Universities, Colleges and start-ups or entrepreneurs<sup>1</sup>.

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<sup>1</sup> For detail see [dbtindia.gov.in](http://dbtindia.gov.in)

<sup>2</sup> For detail see <https://dst.gov.in>

### 1.3 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 have the imperative that strengthening of R&D infrastructure is a continuous process. In the SRIMAN policy statement of DST it is envisaged development of research infrastructure is very expensive and hence it becomes important for a developing country like India to carefully plan for it and develop mechanisms for its efficient use. Research Infrastructure has taken a center stage among developing and developed countries with growing focus on enhancing social and economic value and promoting development based on science and technology. Therefore, development of scientific infrastructure is critical for advancement of nation with ease of access and greater emphasis for their optimal utilization.' These programmes echo the spirit that has been expressed in the Prime Minister's address in the Science Congress. 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 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 centers 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.

The PM went a step further to highlight the issue of maintenance, redundancy, and duplication of expensive equipment. Programs like DBT's SAHAJ, and DST's SRISTI portal for SAIF and SATHI are protocols 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 for revamping their research infrastructure to keep their foothold on the 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 aimed at building 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 interface 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 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. These 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).

### **1.4. Need for the present study**

For execution of the policy of strengthening S&T infrastructure and optimum utilization of the same important issues identified in these policy documents are: (a) identification of the priority areas, (b) sources and extent of funding, (c) utilization of the infrastructure created, and (d) operation, maintenance and management of the facilities. In developing economies, corporate funding of R&D and infrastructure is not rare as it is in the developing countries like India. Nevertheless, these documents recognize the fact that 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 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 to reinvigorate the programme. The above-mentioned issues (a)

identification of the priority areas, (b) sources and extent of funding, (c) utilization of the infrastructure created, and (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.

### 1.5 Review of Literature

Although for a very long time the literature on 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 labor and capital in the GDP, residual was attributed to S&T, which in the Solow model was defined very broadly and also included non-S&T factors.<sup>2</sup> It is to be noted that by the end of 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 mainly econometrics studies brought in two important distinctions in the understanding of S&T and society/economy. First is the distinction between 'impact' and 'output'. More often than not they are used interchangeably. Output is the direct result of science and technology, say a new product introduced in the market. Impact is the effect that this product would have on the society and economy. The studies on gains from S&T focused mainly on the output aspect, whereas studies on 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 be 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. 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

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<sup>2</sup>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).

- Training skilled graduate
- Creating new scientific instrumentation and methodologies
- Forming 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 be carefully designed developing indicators that would refer to gains, both impact and output, as internal to S&T. About the FIST programme, the 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 caliber manpower and strengthen the repository of national intellectual wealth in Science & Technology (S&T) sector, which if channelized properly, may lead to socioeconomic development."

There are only a few studies on the evaluation of outcome of the intervention in the educational and research institutions. Most of the articles talk about principles, guidelines and methodology required for impact evaluation in general. Earle Janice (2013) developed a common guideline and report on behalf of US department of education, with 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 those 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 evaluation of publicly funded research. The report recommended some guideline 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 Co-operation and Development (OECD) Paris (2011) prepared a report for evaluation of Research organization. They presented a framework for evaluation of the research organization and suggested that Peer Review articles published, Citation of the articles and important ideas generated by the organization etc. are the main impact of the research organization.

The expected first order impact of the DST-FIST programme, therefore, is strengthening the competence internal to the S&T sector. When achieved, the second order impact on socio-economic development to follow. The first impact study (2008) Questionnaire part A and B, however, 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 organization. Nath et al (2002) argues the case for creating a 'learning organization'. S&T competence and intellectual wealth generated through R&D activities are human embodied. A 'learning organization' would have appropriate mechanism to hone human embodied knowledge as part of organization knowledge. The impact analysis has to focus on the learning part of the organizational activities.

**CHAPTER 2**

**OBJECTIVES, METHODOLOGY AND EXECUTION OF THE STUDY**



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**2.1 Objectives of the study**

The purpose of this exercise is to collect information pertaining to DST-FIST program providing support for strengthening S&T infrastructure to different organizations since year 2000. DST awarded numbers of grants to Indian universities, institutes and college across India. A huge investment has been made by the Government to improve the volume and quality of output in science and technology sector of this country. In order to further accelerate the research and development work, there is need to understand the problems and challenges faced by different institutions being supported by this fund. It is also important to know how this support has helped the recipients and what the bottlenecks in the implementation of the program and achieving the target? There is need to have a scientific study or evaluation of the program to measure its effectiveness and also to enable program directors to make mid-term corrections in the program. With the above aim, the following objectives were set for the proposed study by the Project Steering committee in consultation with CHORD(NSTMIS) and FIST divisions of DST:

1. To evaluate the impact of DST-FIST program on university departments, canters, colleges and institutes in terms of their academic and research outcome during the years 2000-2016.
2. To identify best practices in terms of procedures, processes and managerial practices among recipient organizations and DST.
3. To suggest policy imperatives for strengthening of the scheme.

**2.2 Target population and sample size**

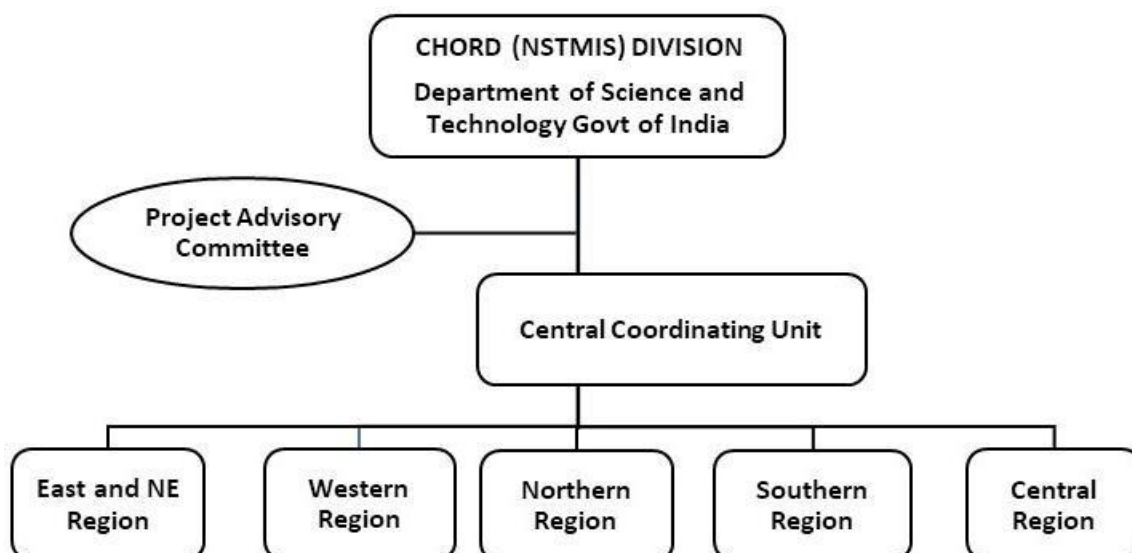
In the light of the objectives and literature review, the methodology should be efficient and specific to measure the impact internal to S&T and the organization. It was found that FIST had provide more than 1600 grants since 2000 that have been completed by year 2016. The normal duration of support under this grant is five years. The grants that have completed the minimum period of five years were considered as completed. The nature and support of each project was specific to each grant recipient Institution or department and was quite divergent and heterogeneous. Further the organizational practices and human resource endowment of the organization was unique for each case. It was difficult to stratify or account for all such co-variates for evolving any efficient sampling strategy to measure the impact of FIST support over large number of universities and institutions. Under this situation it was felt that any kind of sampling approach may not be efficient to measure the changes due to this input and the

study might miss some relevant outcome. Therefore, it was decided to include all the grant provided under FIST that were completed during 2000-2016. It was realized that the grants provided during 2011 would have completed five years period in 2016 i.e. before the initiation of this study. A database of all studied satisfying the above conditions was obtained from the FIST division of DST. This database consisted of 1623 grants that were completed till 2016 and was taken as target population for a complete enumeration.

With respect to distribution of grants to southern region for the period 2000-2011, the target population was around 547 departments of 165 institutions with 602 grants awarded which accounts to 37.09% of the total grants awarded to institutions across the country.

### 2.3 Organizational Structure and execution of the study

The FIST grant had a pan-India coverage and institutions in all parts of the country were supported, therefore the impact evaluation study was designed in a partner-network mode. For the purpose of implementation, the states and union territories were grouped into five regions; east, west, north, south and central regions. The north-eastern region was clubbed with eastern region. A central coordinating unit was also setup to monitor and oversee the implementation of the study. One Regional Coordinator for each region and a Chief coordinator for Central Coordinating Unit were identified. The organizational structure of this network is presented in Fig 2 below.



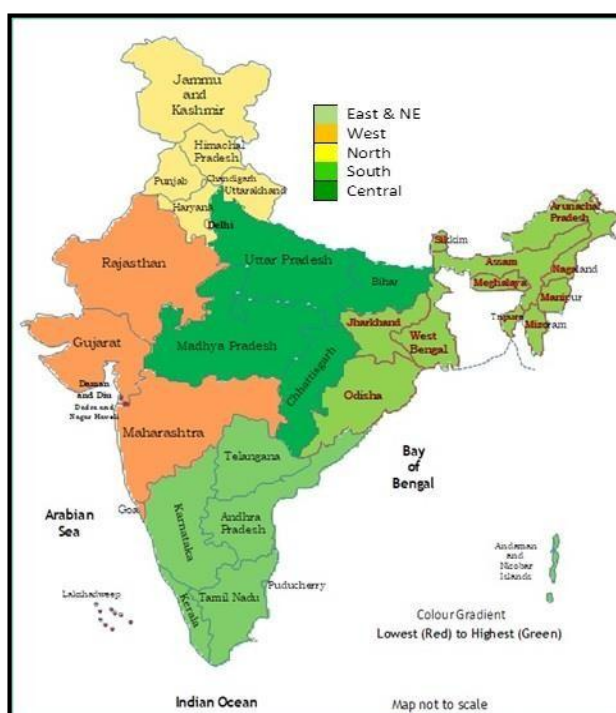
*Fig 2 The operational structure of the study network*

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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 2.1 and geographic coverage is shown in Fig 3 on the map of India.

**Table 2.1 States/UTs allocated to regions Fig 3: Geographic coverage by regions**

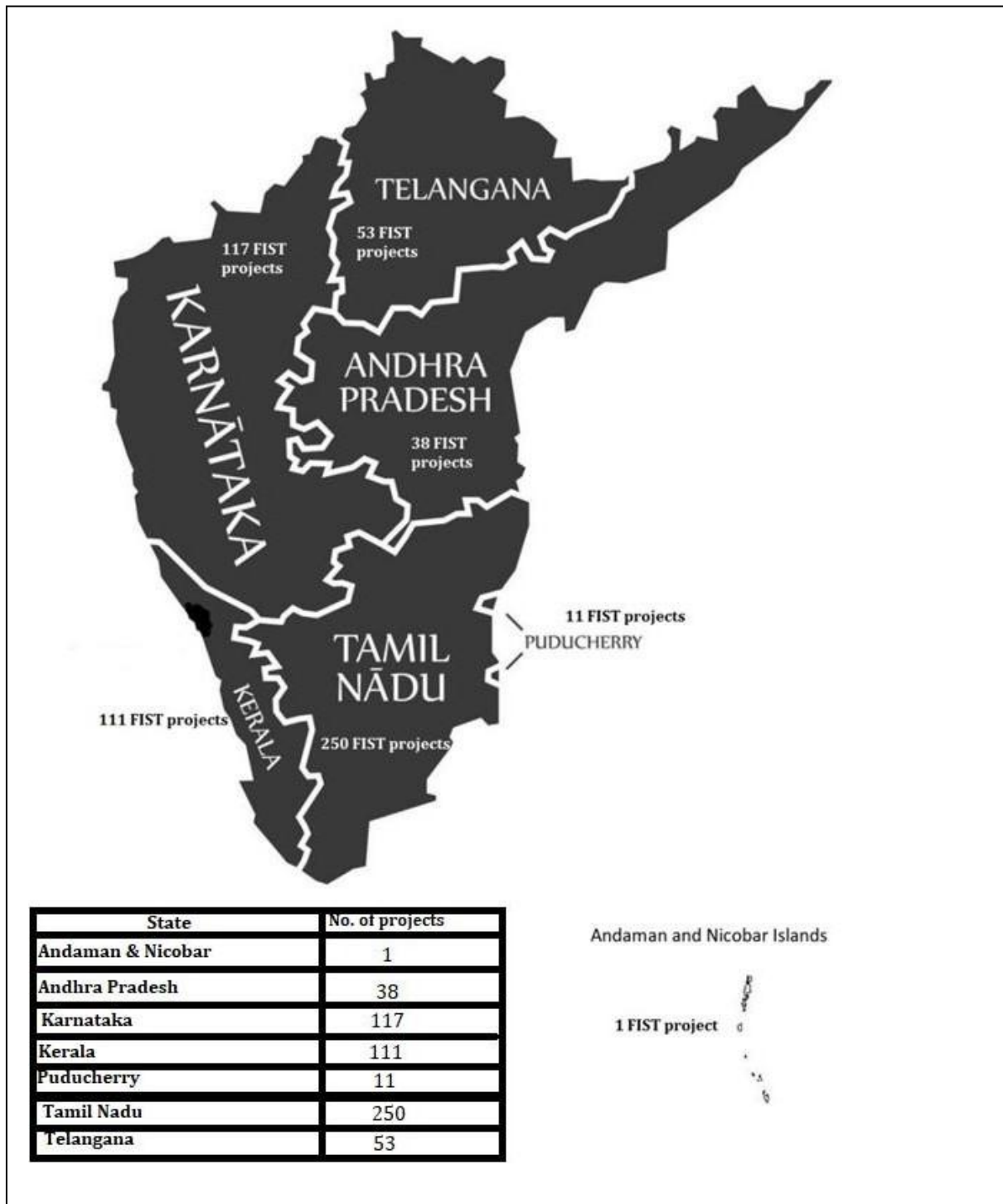
East and NE Region	Western Region
Arunachal Pradesh	Goa
Assam	Gujarat
Jharkhand	Maharashtra
Manipur	Rajasthan
Meghalaya	South
Mizoram	Andaman and Nicobar
Nagaland	Andhra Pradesh
Odisha	Karnataka
Sikkim	Kerala
Tripura	Puducherry
West Bengal	Tamil Nadu
Northern Region	Telangana
Delhi	Central Region
Haryana	Bihar
Himachal Pradesh	Chhattisgarh
Jammu & Kashmir	Madhya Pradesh
Punjab	Uttar Pradesh
Uttarakhand	



The basic information of each institution funded under FIST program during 2000-2011 was provided by FIST division of DST. A total of 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 summarized in table 2.2 below. However, after proper evaluation essential basic data was available for 1602 project and these were included in the study for further evaluation.

Enlarged section of Southern Region Map:

Fig 4 : Distribution of DST-FIST projects across different states in southern region of India



In southern region, funds has been allotted to the institutions of Tamil Nadu, Karnataka, Kerala, Karnataka, Andhra Pradesh, Telangana, Pondicherry, Andaman and Nicobar Islands. A sum of 602 grants/projects were sanctioned to various institutions/departments of South India. These

602 projects were of various project levels and subject domain distributed to enhance the science and technology in the institutions.

**Table 2.2 Allocation of units to various study regions for evaluation**

Region	Institutions	Departments	Unit* allocated
E&NE	69	290	331
West	87	237	265
North	51	237	264
South	165	547	602
Central	53	145	161
<b>Total</b>	<b>425</b>	<b>1456</b>	<b>1623</b>
<i>*A FIST grant is considered as unit.</i>			

As per the norms of the FIST program, the grants were provided at three levels (L-0, L-1 & L-2). 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.

### 2.4 Measurement of Impact

Impact evaluation is an assessment of how the intervention under evaluation affects the outcome(s). Whether these effects of intervention are intended or unintended? The proper analysis of impact due to any intervention requires the level of outcomes in the absence of the intervention as well as post intervention. The assessor should also have an idea about the time required to see observable effect after intervention. Results of Impact evaluation may provide the information on change due to intervention, **lesson-learning** and **accountability** as well. The impact evaluation is commonly useful for the following situations:

- Interventions having solid evidence of impact in the given context
- Pilot programs which are due for substantial scale-up
- Innovative schemes with uncertain outcomes

Before designing any impact evaluation, we should identify the key factors and outcome measures for evaluation and also look for appropriate comparison group. The comparison group is preferably different from intervention population or the baseline measurements of intervention group itself are taken for comparison. In certain situations, the comparison group is created using principles of propensity scores. In the present study none of these were available. As an alternative we followed the approach of baseline measurement and collected baseline information retrospectively for all the items identified for impact measurement. These

items belonged to various aspects such as changes in working environment, infrastructure, academic output, capacity building, volume and quality of research, patients and products developed, awards and recognition received by the grant recipients. Details of items are available in respective sections of the data collection tool. The information on each item was collected for a period five years **before** the FIST funding and was taken as baseline level. The information on the same item was obtained for a period five years **after** the FIST assistance and was taken as post intervention level. More specifically; If  $X_i$  was the baseline measurement of an item for grant recipient and  $Y_i$  was the post intervention level of the same item for the same grant recipient.

The impact on that item was defined as

$$\text{Impact} = \frac{\sum_i^N x_i - \sum_i^N y_i}{N} \text{ for } i = 1, 2, \dots, N$$

Where  $N$  is the number of grantee departments or institutions participated in the impact study. This presents change per department in the item. This was repeated for each item under study. However, if the item was measured in terms of percentage of as a perception on Likert scale the difference in percentage was taken as change the item. The item wise changes were triangulated and contextualized to document the causal chain from inputs to outcomes.

### 2.5 Development of data collection tools and pilot testing

A questionnaire for data collection has been developed by the Central Coordinating Unit in consultation with national expert group (DST) and all Regional Coordinators following a series of meetings and discussions. The major issues considered for development of questionnaire are presented in Table 2.3. After a rigorous and iterative exercise, a draft questionnaire was evolved. It consisted of nine sections each section aims to collect information on specific aspects of grant to measure the impact of FIST support. Section-1 covers the general information like unique identification number, name and address of PI and Institution, amount and year of sanction, characteristics of recipient department, institution and principal investigator and infrastructure available before the FIST assistance etc. Section-2 was devoted to infrastructure and equipment created under FIST assistance. The focus of section-3 was to measure the impact on working environment. Impact on volume and quality of manpower was captured in section-4, section-5 was devoted to impact on volume and quality of research produced. Sections 6 and 7 were devoted to measure the impact on awards, recognition received by the departments and impact on capacity building and knowledge sharing

respectively. Sections 8 and 9 were focused on open ended suggestions for improvement, impediment of the program and overall impact of FIST input respectively. The data collection tool had 133 major questions to capture the information on all possible aspects of FIST. The draft questionnaire was produced in paper and digital format (for online data collection) and was given to each Regional Coordinator for field testing. A pilot-testing of data collection instruments was carried out by each region to check the ordering of questions, feasibility and adoptability of the questionnaire. Based on the inputs from pilot testing some minor modification were made and data collection instrument was finalized. The final questionnaire is placed at Annexure-I.

The questionnaire designed for the purpose of the study incorporated the following dimensions and issues broadly in the line of the understanding derived from the literature review. The key areas considered for development of questionnaire are presented in table 2.3 below:

**Table 2.3: Issues to be focused in the study**

<b>Focus areas</b>	<b>Issues for consideration</b>
<b>Advancement in knowledge</b>	Specialties, Theories, Methodologies, Facts, and Models
<b>Research Activities</b>	Contribution to research, Type of research, Inter-sectoral, Interdisciplinary, International including collaboration
<b>Training of researchers</b>	Research competence, Related competence
<b>Technology</b>	Product and process, Services, Know how
<b>Recognition</b>	Credibility, Visibility, Prizes, Awards
<b>Impact on Curricula</b>	New courses, New Training programme, Pedagogical tools
<b>New human Resources</b>	Added for the project, Career opportunities
<b>Learning Organization</b>	Project team, Project output, Attrition and retention of HR

## **2.6 Training of field investigators**

Each participating region recruited the required project staff including field investigators. The guideline prerequisites for engagement of such staff was provided by DST. A training manual for data collection was developed by Central Coordinating Unit and was shared with all the participating regions. This was aimed to have uniformity in understanding the purpose of various item included in the questionnaire and how the questions will be put up to respondents and response will be recorded. The training of field investigators was organized

by each region and all the items of data collection instrument were explained to them. The investigators were given supervised data collection training and assessed in nearby institutions in each region. Investigators found satisfactory were sent to carry out actual information collection.

### **Training of field investigators of Southern region:**

The training program to field investigators in southern region was carried out by providing the guide sheet for collecting the information in the prescribed questionnaire. The field investigators were subjected to field training during the pilot study and was effectively guided and trained to the needs of the project.

Some of the measures taken in the training process are as follows:

1. Established call centers to train field investigators in contacting educational institutions.
2. Training in the rational approach to assimilate profile of the organization, contact details of the authorities etc.
3. A detailed guide was circulated and familiarized about the contents of the questionnaire and the required data to be retrieved from the FIST supported departments/institutions.

### **2.7 Field operation and data collection**

The field investigators visited each FIST beneficiary institutions. Information was collected through personal interviews, review of office records and documents, and acquiring photographs of the facilities developed under FIST program. Each investigator was provided printed version (hard copy) of questionnaire and basic information of the grant obtained from DST records. An attempt was made to update the email ID and phone number of PI of each grant. Principal investigators/ Heads of Departments or Institutions were contacted and consent for a visit by field investigator to collect the necessary information was reserved. An advance copy of questionnaire was sent to PIs through mail with a request to review and get ready with records and information needed before the visit of field investigator. The field investigators visited the allocated units with the hard copy of questionnaire and gathered information by personal interaction with the Head of Department or any allocated faculty member of the department. Due to quantum of information required, they took some time to gather the information and task was not completed in single visit and despite this



arrangement. In such cases revisits were made to complete the information collection. In general, primary respondent will be the Principal Investigator of the FIST assistance. In case of absence of PI, present person in charge or Head of the department/ Institution may be contacted and appropriate respondent may be consulted with above authority. Each field investigator was provided a unique code number set by CCU. The details of the interviewer along with his/her code, starting and ending time of interview was recorded on each questionnaire. An authority letter was issued by DST. This letter was sent to the grant recipients PIs and copy was given to each field investigator to present at the time of interview. In case of any difficulty the investigators were advised to contact corresponding Regional Coordinator or Chief Coordinator or Advisor NSTMIS at DST. An online monitoring system was developed by CCU and status of field work was regularly updated by each region using this system.

### 2.8 Data processing and analysis

**Preparation of FIST grant database:** DST provided the basic information on all FIST grants completed during the year 2000-2016 in word format (.doc). This was converted into a structured database that contained 1623 records and 17 fields like project code (file no), name and address of the Institution, department, details of Principal Investigator, level, amount, year of sanction of grant and expenditure equipment and other such items etc. This basic database was converted into SPSS and Excel formats for further use.

**Online status tracking of data collection:** An online monitoring system was developed to track the data collection done by each region. A common structure for data entry was also prepared in SPSS and Excel format and was provided to all regions for uniform data preparation. Three structured files, one for main information and two files for equipment procurement and functional status were used. The detailed description of these data files are given in Annexure-II. Every region was asked to upload the data in these formats. The progress of each region was monitored on weekly basis by CCU and the summary was prepared and presented in the review meetings.

**Data quality assurance and Inconsistency check:** The data submitted by each region was combined in a single database. Exhaustive data cleaning exercise was carried out for inconsistency, missing and out of range data etc. Exploratory data analysis was also carried out for error detection. An error detection process was put in place to clean the data. An algorithm containing 64 checks was developed and applied to each record and record wise error listing

was produced. The description of the errors was listed in the sheets and error codes were mentioned against each record in error listing of corresponding data set. These error lists were shared with each regional coordinator for correction. The process was repeated on revised data sets received from the regions until it was error free.

**Text Analytics:** Section 8 of the data collection tool used 19 open ended questions that resulted into unstructured text responses. This included a large amount of unstructured data (~27000 items and ~79000 statements). It was decided to use text mining and Natural Language Processing (NLP) techniques to translate this large volume of unstructured data into quantitative data. So that we may visualize the trends and patterns and discover the insights. The text data was converted into structured data with the help of metadata prepared for each question. Region wise tables were generated and shared with all regional coordinators for inclusion in the regional reports.

**Tabulation plan and analysis:** A tabulation plan was evolved by CCU and a common set of dummy tables was prepared for each region that shared with all stake holders during review meetings. Some special tables were also evolved for National Report. Tables were critically reviewed and finalized following an iterative process and inputs from all concerned. The tabulation plan also considered the chapter plan of the regional and national report. After freezing the tables, chapter wise tables were generated for each region and CCU. The tables were re-examined for errors or inconsistencies and provided to each region. Advanced statistical software and data mining tools such as SPSS, XLSTAT, Python and R programming language were used for the analysis and visualization.

### **2.9 Responsibilities of stake holders and time frame**

During the evolution of network proposal, it was important to understand how to share the responsibilities and work as a well-coordinated team. In consultation with project steering committee and DST, all project coordinators agreed to the following major responsibilities. In addition to these responsibilities they agreed to take up any other task as per the need of the project or as advised by DST from time to time.

The major responsibilities of each stake holder as mentioned below:

***Responsibilities of Central Coordinating Unit:***

- i. Development and testing of Questionnaire and Instruction manual for data collection.
- ii. Overall monitoring and supervision of project and submission of quarterly progress report to DST.
- iii. To design database structure, evolve data analysis plan, preparation of tables and report formats
- iv. Overall compilation of data, carry out exploratory analysis for validity and reliability checks.
- v. Final data analysis, writing and submission of National report to DST.
- vi. Presentation of findings to Project Steering Committee

***Responsibilities of Regional Coordinators***

- vii. Recruitment of staff and field investigators.
- viii. Establish close coordination with central coordinating unit.
- ix. Planning and execution of data collection in the respective region according to the methodology approved in the project.
- x. Submitting data to DST and CCU after data cleaning, reliability and validation analysis.
- xi. Supervision and monitoring of data collection in respective region.
- xii. Submission of regional reports to DST in a uniform format provided by CCU.

**Reference period and time frame of the study:** The FIST grants provided during year 2000-2011 were included in the study. The usual period of grant was five years and all these grants were expected to be completed by 2016. The information on items for impact evaluation was asked for periods 'Before FIST' and 'After FIST'. These periods typically refer to a 5-year period before the sanction of grant and a 5-year period after the sanction of the grant and was specific to each grant keeping the year of sanction in the centre.

The initial duration to complete the study was agreed for 18 months from the date of issue of final sanction order by DST and availability of funds. Time schedule to carry out different activities was allocated in such a way so that all targets are achieved within 18 months. Table 2.4 represents the time frame specific to each activity of the study.

**Table 2.4: Time frame for the study**

<b>Reno.</b>	<b>Time</b>	<b>Activity</b>
1.	6 months	Questionnaires development, Expert group meeting, Staff selection, Purchase of equipment's and development of online data collection tool, 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 Regional Coordinators.
2.	9 months	Data collection by the field investigators, Random monitoring of data collection and its quality, by principle investigators/co investigators and officials of DST on random basis.
3	3 months	Data entry, Data cleaning, Development of data analysis protocol, Tabulation plan, Data analysis, Report writing and dissemination.

**2.10 Challenges in Data Collection and Non-Response**

- 1) Since the study was conducted in 2018-19, and information on FIST grants provided in 2000 onwards was needed. Further the pre-FIST assessment was referring to the status of various activities during 1995-2000, 1996-2001..and so on. This was major time gap between the study period and reference period as a result, respondents were finding it difficult to provide reliable information and suggestions pertaining to implementation of the grant, performance and output of their department or institution
- 2) Most of the initial PIs were either superannuated or had moved to other places, the current respondents not being the actual PI, had no first experience of handling the FIST grant and also were facing the problems in locating the old records related to the grant.
- 3) It was also found that during this period some departments were bifurcated in two or more parts and it was difficult to locate such recipients and get desired information. In some cases, the grant receiving institutions or departments were renamed, relocated or merged with other organization.
- 4) The questionnaire was centric to grant recipient PI and department and, had no scope to include input from other stakeholders such as faculty, scientists or students from the department.
- 5) The study included grants provided during 2000-2011 and completed by 2016. These two cut-off years sometimes created confusion among field investigators and respondents.
- 6) In some cases, the respondents were very busy persons and it was very difficult to contact them or get their appointment an time for interview. Because of their other

commitments they were not able to provide full information in one session an several sessions were conducted by field investigators to complete the questionnaire.

- 7) During the data collection period some institutions were closed on account of long vacations (E.g.: long Durga Puja vacation in east and north-east region) or institutions were engaged in admission or examination process that impacted the field operation schedule.
- 8) Several interpersonal conflicts between incoming and outgoing principal investigators of these grant were also experienced, this posed serious impact on tracing of documents and data collection and also resulted into nonresponse or non-cooperation.

### 2.11 Summary

**To sum up, the salient features of southern region are as follows:**

- The DST-FIST programme launched in the year 2000 with a budget of 75 crores to complement and foster growth of science and technology in India.
- The investment under FIST programme has crossed Rs 2000 crores over last two decades.
- In the year 2001, there was no FIST support to any of the institutions.
- A maximum amount of Rs. 7614.6 lakhs was sanctioned to southern region in the year 2007.
- State Tamil Nadu has the highest number of FIST projects ( 250 projects) and has received a total amount of Rs 16440.8 lakhs of rupees which is the highest compared to other states of southern region
- Project level “L0” started in the year 2009 to support college as a whole.
- Rupees 21185.9 lakhs (Highest) are sanctioned to projects under level L2 in southern region.

**CHAPTER 3**  
**CHARACTERISTICS OF FIST GRANT AND GRANT RECIPIENTS**

**CHAPTER 3****CHARACTERISTICS OF FIST GRANT AND GRANT RECIPIENTS**

A serious concern has been expressed in various platforms by academic sector across the country, about lack of infrastructure facilities for imparting good quality higher education and conducting advanced research when compared with the developed countries. The universities and other higher educational institutions have made impact on the quality of teaching and research through their own efforts and also with the help of funding agencies, but this was very minimal when compared to the S&T infrastructure in developed countries. With the changing technological development, there is a need for selective strengthening of their infrastructure especially for post-graduate education and research in emerging interdisciplinary and core areas. It has become a necessity to strengthen/extend such infrastructural support to other higher science, technical and medical institutions. The department of science and technology, GOI under FIST scheme, it supported various academic institutions to strengthen the science and technology infrastructure across the country.

The support for five (5) years to any PG College or a department / Centre / School of any University or academic Institute is considered for augmentation of post-graduate teaching and research facilities in four areas i.e., Basic Equipment, Networking & Computational Facilities, Research Infrastructure and Maintenance of equipment. It operates in three Levels and quantum of grants is limited with respect to L0, L1 and L2 levels (Courtesy: DST FIST WEBSITE) as mentioned in the table 1.1.

**3.1 Project Statistics of Southern Region**

The information on number of units visited for data collection, untraceable/funds returned and non- responsive units in southern region are tabulated in table 3.1.

**Table 3.1: Project Statistics of Southern Region**

<b>SL. No.</b>	<b>Region</b>	<b>Net Units allocated</b>	<b>Untraceable/ funds returned (%)</b>	<b>Units Completed (%)</b>	<b>Could not be visited (%)</b>	<b>Non response (%)</b>
<b>1</b>	<b>South</b>	609	<b>20 (3.28%)</b>	<b>581 (95.40%)</b>	<b>0 (0%)</b>	<b>8 (1.31%)</b>

The table 3.1 depicts the project statistics of southern region. A total of 609 projects



## Evaluation of Impact of DST-FIST Project- Southern Region

are awarded to various institutions/departments in southern region under DST-FIST scheme. Out of 609 project details, about 581 (95.40%) projects details was successfully collected, 20 project details (3.28%) was untraceable/ funds returned back to DST-FIST and only 8 project information (1.31%) was unable to collect, as the respondents was non cooperative.

At national level total numbers of DST-FIST projects are 1602, out of which, southern region accounts to 36.82 % (590) of total projects and only 3.29% of respondents of DST-FIST project from southern region were non cooperative.

### 3.2 Distribution of grants and total disbursed amount across various institutions in southern region

**Table 3.2: Distribution of DST-FIST Grants/Projects at various type of Institution across South Indian States.**

State	No. of Universities /institutes /college	No. of Dept./school /center	No. of Projects (%)	Total Cost (in lakhs)(%)
Andaman & Nicobar	1	1	1(0.2)	80.0(0.2)
Andhra Pradesh	7	33	38(6.5)	1966.9(4.8)
Karnataka	27	98	117(20.1)	13609.6(32.9)
Kerala	46	103	111(19.1)	4811.7(11.6)
Puducherry	2	9	11(1.9)	886.9(2.1)
Tamil Nadu	66	222	250(43.0)	16440.8(39.8)
Telangana	10	43	53(9.1)	3522.3(8.5)
<b>Total</b>	<b>159</b>	<b>509</b>	<b>581</b>	<b>41318.0</b>

Note: State of Andhra Pradesh was partitioned into Andhra Pradesh and Telangana during 2014. Since the study period is from 2000-2011, during this period, total number of institutions in Andhra Pradesh are 17 institutions (91 FIST projects). However, database provided by DST had segregated institutions as Telangana and Andhra Pradesh. Therefore, project completion report was also prepared as per the database provided by DST. Hence institutions of Andhra Pradesh were divided into Andhra Pradesh and Telangana for discussion and analysis.

## Evaluation of Impact of DST-FIST Project- Southern Region

The table 3.2 presents the distribution of DST-FIST grants/projects across various departments of different institutions in southern region along with total sanctioned amount. It is evident that, the state Tamil Nadu has received majority of the DST-FIST grants (250 projects) distributed across 222 departments of 66 institutions with a total sanctioned amount of Rs. 16440.8 lakhs. This is followed by Karnataka state with 117 projects distributed across 98 departments of 27 institutions and state Kerala with 111 projects distributed across 103 departments of 46 institutions. From this it is clearly evident that, the level of awareness about DST-FIST program across Tamil Nadu state seems to be high and able to use the DST-FIST funding for the improvement of S&T across the state.

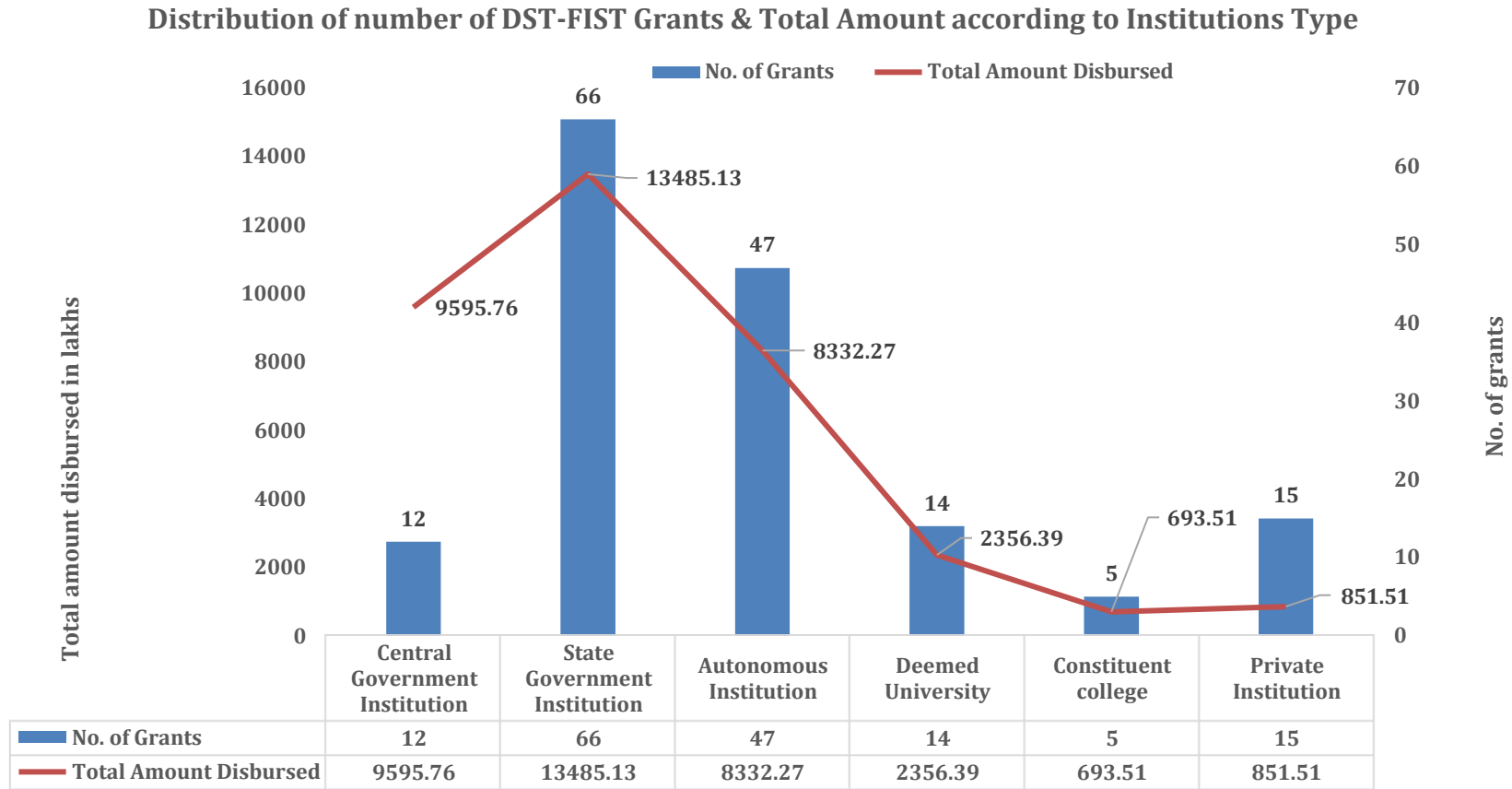
**Table 3.3: Average number of projects and amount sanctioned per year across seven states of southern region.**

State	Total projects N(%)	Average projects/ year	Average amount sanctioned/ year
Andaman & Nicobar	1(0.2)	1	80
Andhra Pradesh	38(6.5)	3	178.8
Karnataka	117(20.1)	11	1237.2
Kerala	111(19.1)	10	437.4
Puducherry	11(1.9)	1	80.6
Tamil Nadu	250(43.0)	23	1494.6
Telangana	53(9.1)	5	320.2

The above table depicts the average number of projects and amount sanctioned per year across seven states of southern region. It can be inferred that, state Tamil Nadu tops the table with an average of 23 projects per year and Rs. 1494.6 lakhs of sanctioned amount per year. State Kerala and Karnataka are close to 10 projects per year and Rs. 437.4 lakhs and Rs. 1237.2 lakhs of sanctioned amount per year respectively. From this, it can be concluded that, states Tamil Nadu, Karnataka and Kerala are constantly applying for DST-FIST grants in order to improve the S&T infrastructure in the institutions.

### 3.3 Distribution of Grants and total disbursed amount based on type of institutions across southern region

The institutions are classified into Central Government Institution, State Government Institution, Autonomous Institution, Deemed University, Constituent college and Private Institution respectively. The Fig 5 below presents distribution of grants and total disbursed amount to different types of institutions in southern region.



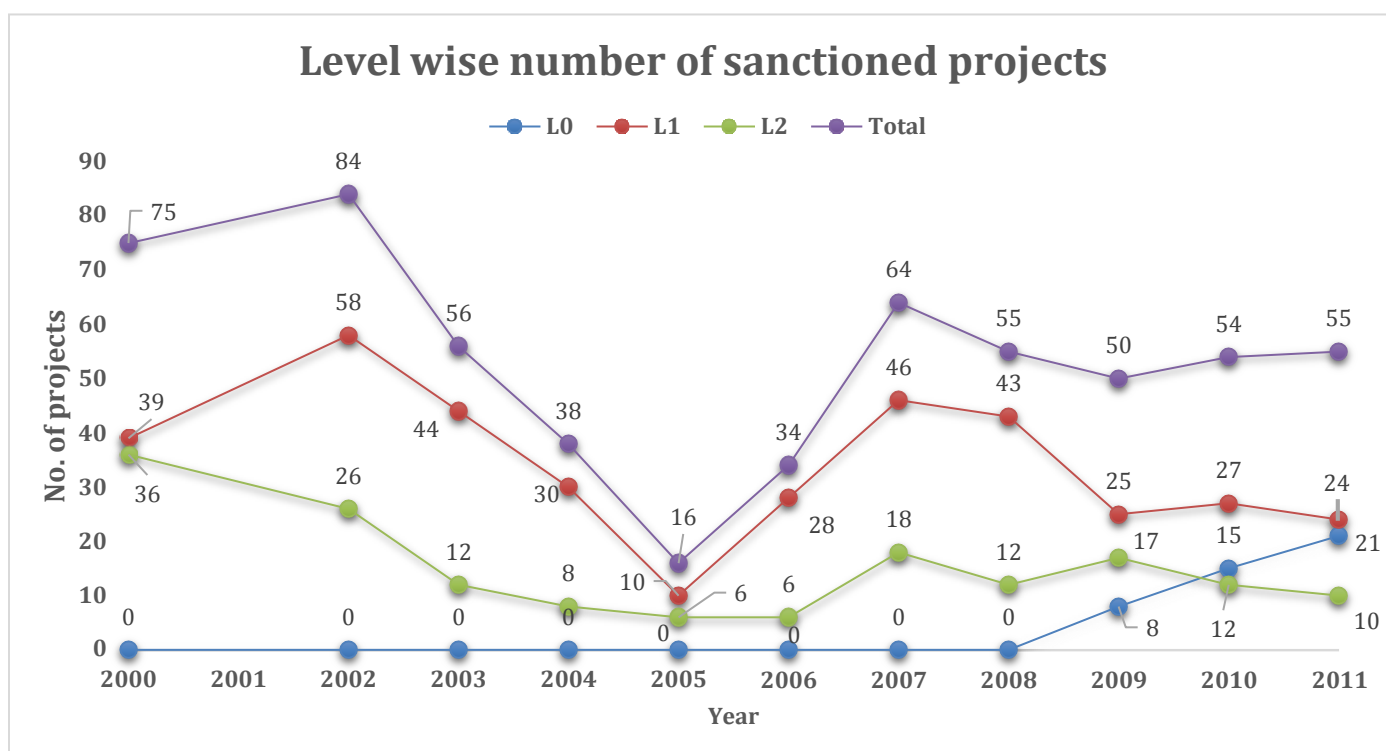
**Fig 5: Distribution of number of DST-FIST Grants & Total Amount according to Institutions Type across Southern Region**

**\*Out of 581 units there are 159 institutions which received the grants in lakhs.**

The Fig 5 depicts the distribution of grants across various types of institutions along with total disbursed amount. It is evident from the table that, the state government institutions have received highest number of FIST grants (66 institutions accounting to 13485.13 lakhs of rupees), followed by autonomous institutions (47) accounting to 8332.27 lakhs of rupees, private institution (15) accounting to 851.51 lakhs of rupees, deemed university (14) with 2356.39 lakhs of rupees, central government (12) with 9595.76 lakhs of rupees and lastly constituent colleges (5) with 693.51 lakhs of rupees. It is interesting to note that, although the FIST projects for central government institutions are less, but fund sanctioned is significantly high (9595.76 lakhs of rupees), which accounts to be. 27.7% and only 2.4% of the was given to private institutions.

### 3.4 Distribution of sanctioned grants/projects during 2000-2011 based on project levels

The FIST grants were sanctioned in three levels namely L0, L1 and L2, to support science and infrastructure development. The objective of three levels are- L0 is meant for colleges having PG departments, L1 is for improving teaching and research quality, L2 is for creating state of art equipment and laboratories. The information of distribution of various level from 2000-2011 is given in the Fig 6.



**Fig 6: Level wise no. of sanctioned projects over the period 2000-2011**

**Note: L0 started in the year 2009 onwards.**

The Fig 6 indicates that, majority of the projects distributed are in L1 level (374 projects), followed by L2 Level (163 projects) and L0 Level (44 projects). It is evident that, only 16 projects were awarded in the year 2005 in L1 and L2 projects. For the year 2002, a maximum of 84 projects was awarded to various institutions / departments across southern region. Followed by, 75 projects in the year 2000, 64 projects in the year 2007 and an average of 55 projects per year from the period 2008-2011.

**3.5 State wise distribution of grants/project based on project levels.**

The distribution of various grants/projects based on project levels across southern state is presented in the table 3.4.

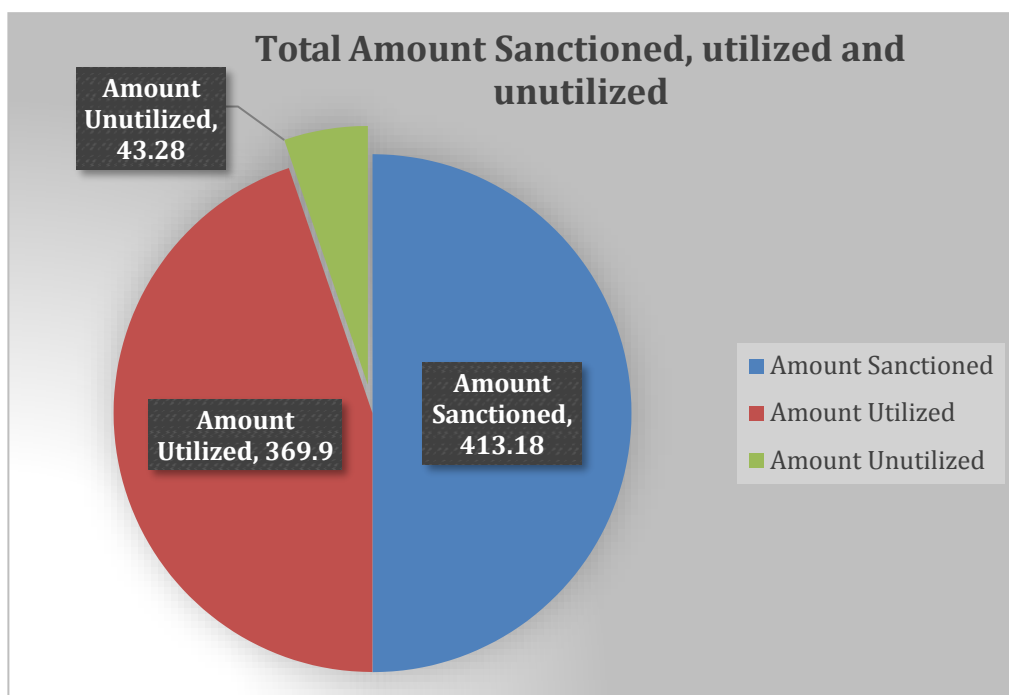
**Table 3.4: Distribution of projects based on Levels of project across southern states**

State	Level wise no. of grants			
	L0	L1	L2	Total (%)
Andaman and Nicobar	0	1	0	1(0.2)
Andhra Pradesh	0	29	9	38(6.5)
Karnataka	4	63	50	117(20.1)
Kerala	19	79	13	111(19.1)
Puducherry	0	7	4	11(1.9)
Tamil Nadu	20	159	71	250(43.0)
Telangana	1	36	16	53(9.1)
<b>Total</b>	<b>44</b> <b>(7.57%)</b>	<b>374</b> <b>(64.37%)</b>	<b>163</b> <b>(28.05%)</b>	<b>581</b>

From the table 3.4, it could be inferred that, majority of the projects/grants sanctioned were L1 type (374 nos.) followed by L2 (163 nos.) and L0 (44 nos.) It is evident from the table that, Tamil Nadu state has received 159, L1 projects, 71, L2 projects and 20, L0 projects accounting to 43 % of total projects sanctioned to southern region during the period 2000-2011. This is followed by Karnataka state which has 63 L1 projects, 50 L2 projects and 4 L0 projects accounting for 20.1% of total sanctioned projects to Southern region during the period 2000-2011.

### 3.6 Amount Sanctioned, and extent of unutilized

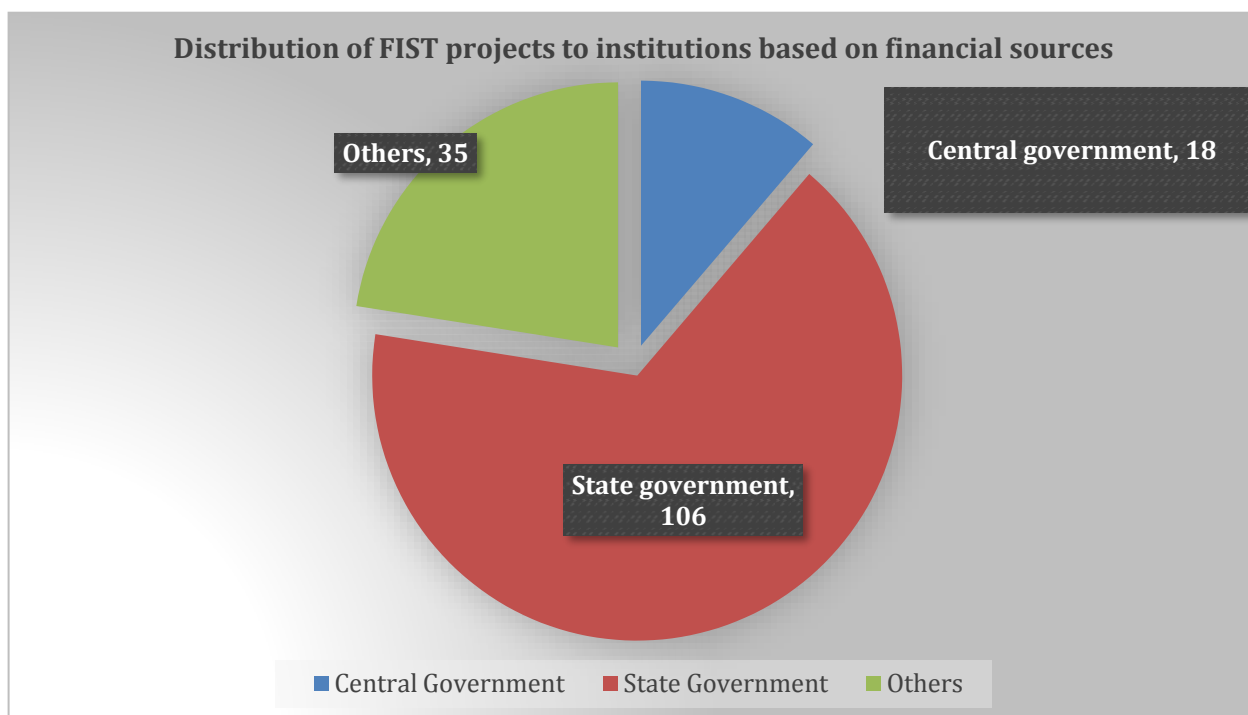
For the 581 projects allotted to southern region, the amount sanctioned, utilized and unutilized for various institutions during 2000-2011 is presented in below Fig 7.



**Fig 7: Total Amount Sanctioned, utilized and unutilized (Crores in rupees)** From the Fig 7, it is evident that, a total amount of 413.18 crores of rupees was sanctioned for the development of science and technology infrastructure in institutions across southern region. For the surveyed period, out of 413.18 crores, 369.9 crores of rupees was effectively utilized and 43.28 crores of rupees, which accounted for 10% of the sanctioned amount was unutilized. This clearly indicates that, the grant recipient institutions have effectively utilized the funds for development of S&T infrastructure in their respective institutions. This also includes 50% contribution from private institution.

### 3.7 Categorization of University/College/Institute based on financial support

Based on sources of financial support, educational institutions were categorized into three types namely, central, state and others as shown in the Fig 8 below.

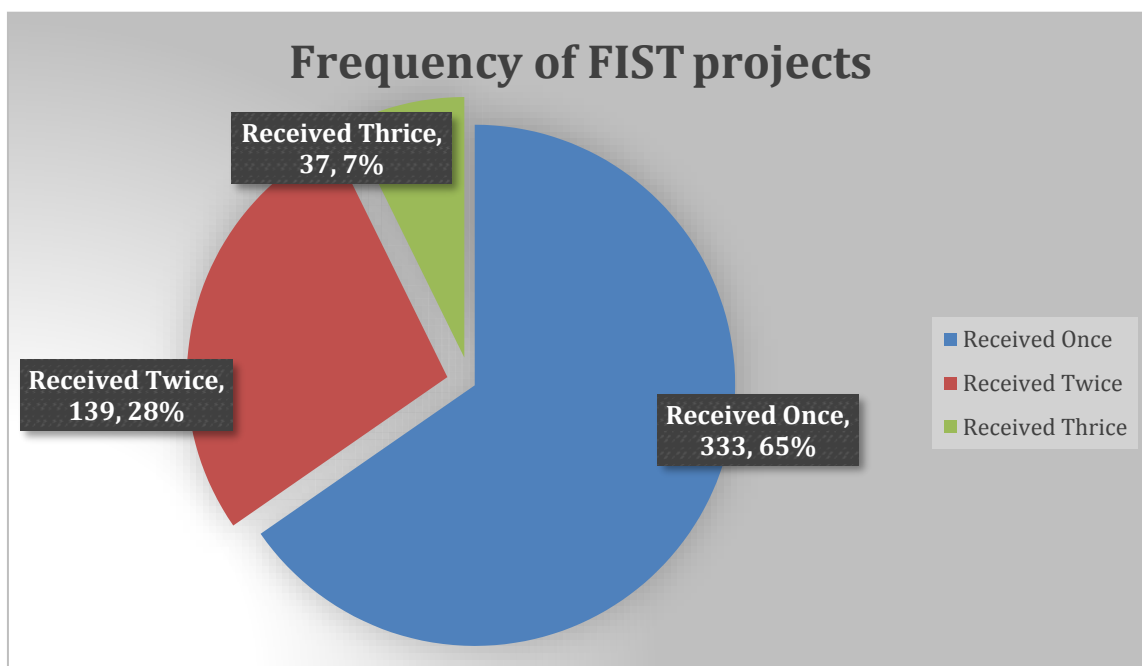


**Fig 8: Distribution of FIST support based on financial support**

From the Fig 8 it is evident that 66.6 % (106 nos.) of the institutions are established and supported by state government, followed by 22.0% (35 nos.) of institutions supported by others sources and 11.3% (18 nos.) of institutions are supported by central government. This clearly indicates that, majority of the institutions of DST-FIST support across southern region are established and supported by state government.

### **3.8 Frequency of FIST grants received by departments/schools/centers**

Many Institutions/Departments across southern region have received the FIST grants and continued to submit proposals seeking for further grants for S&T infrastructure improvement in respective institutions. The Fig 9 below provides the details about the frequency of receipt of FIST grants by the Institutions/Departments across southern region.

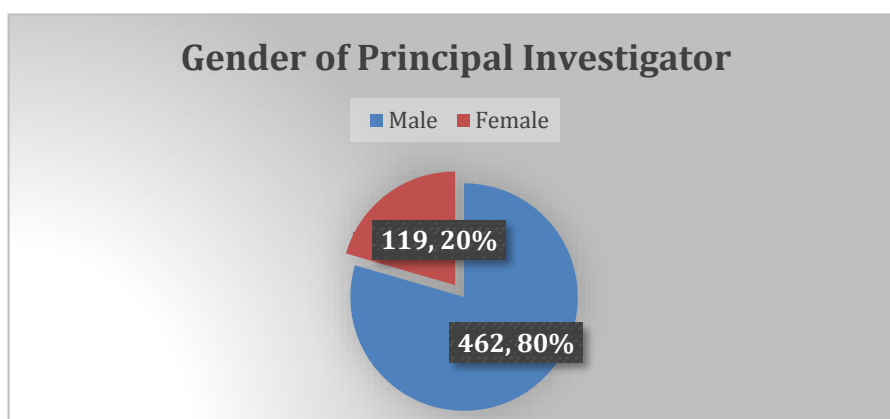


**Fig 9: Frequency of FIST grants received by departments/schools/centers**

From the Fig 9, it is evident that, out of 509 FIST supported departments, 37 departments have received the grants for “Three” times, followed by 139 departments receiving the FIST grants “Twice” and 333 departments have received the FIST grants “Once”.

### 3.9 Gender of Project Investigator (PI)

The gender of PI refers to the person who was in charge of the project during the execution. The proportion of gender of PI across various institutions in southern region is presented in the Fig 10 below.



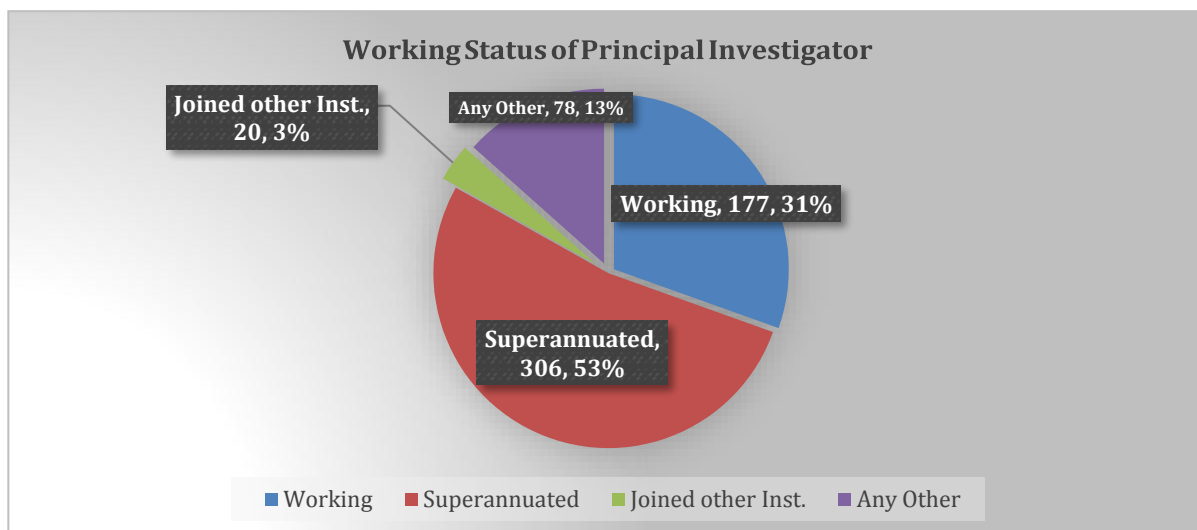
**Fig 10: Gender of Principal Investigator**

From the Fig 10, it is evident that, 79.51 % of the PIs were Male and 20.49 % of them were Females.



### 3.10 Working Status of Project Investigator (PI)

The working status of project investigator are categorized into working, superannuated, joined other institutions and any other and same is represented in the Fig 11.

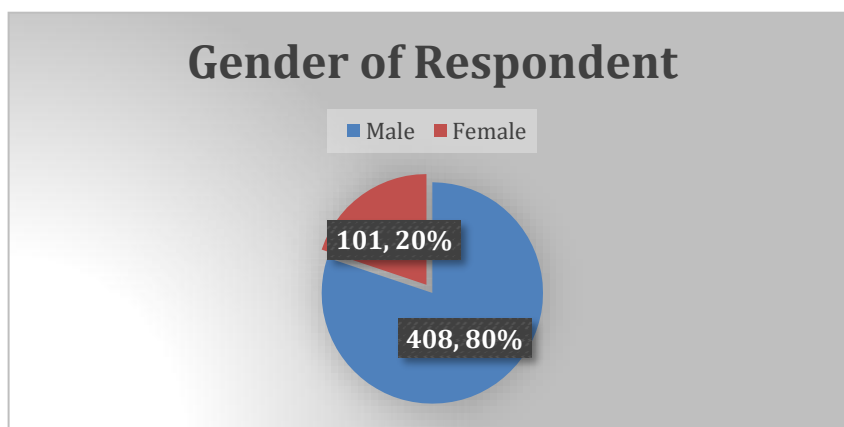


**Fig 11: Working status of PIs**

From the Fig 11, it is evident that, out of 581 projects, the working status of 306 (52.7%) project investigators is superannuated, 177(30.5%) are still in service and 20 (3.4%) of them have joined other institution. The remaining 78 (13.4%) PIs are categorized under any other option. This clearly indicates that, majority of the PIs are retired and only 30% of them are still in service. It is evident from the table that, only 20 PIs have joined other institutions which clearly indicates the organizational commitment of PIs with their respective institutions is high.

### 3.11 Gender of Respondent

The gender of respondent refers to the person who responded to the survey questionnaire in various institutions across southern region and the same is presented below.



**Figure 12: Gender of respondent**

From the figure 12, it is evident that, 80% of the respondents were Male and 20% of them were Females. They are either head of the department or department FIST coordinator.

### 3.12 State wise distribution of working status of PI

The State wise distribution of working status of PI in southern region is presented in the table 3.5.

**Table 3.5: State-wise working status of PI.**

State	Working (%)	Superannuated (%)	Joined other Inst. (%)	Any other (%)	Total (%)
Andaman and Nicobar	1(0.6)	0(0.0)	0(0.0)	0(0.0)	1(0.2)
Andhra Pradesh	15(8.5)	19(6.2)	2(10.0)	2(2.6)	38(6.5)
Karnataka	39(22.0)	65(21.2)	2(10.0)	11(14.1)	117(20.1)
Kerala	23(13.0)	67(21.9)	7(35.5)	14(17.1)	111(19.1)
Puducherry	7(4.0)	3(1.0)	0(0.0)	1(1.1)	11(1.9)
Tamil Nadu	82(46.3)	111(36.3)	8(40.0)	49(62.6)	250(43.0)
Telangana	10(5.6)	41(13.4)	1(5.5)	1(1.3)	53(9.1)
<b>Total</b>	<b>177</b>	<b>306</b>	<b>20</b>	<b>78</b>	<b>581</b>

From the table 3.5, it is evident that, in the state of Tamil Nadu, 111 PIs are superannuated, 82 are working, 8 of them joined other institutions and 49 are categorized under any other. Further it can be inferred that, out of 581 projects allotted to southern region, only 197 PIs are still working.

## Evaluation of Impact of DST-FIST Project- Southern Region

### 3.13 Distribution of sanctioned and received grants based on project levels during the year 2000-2011

The details about the year wise distribution of sanctioned and received grants to various institutions in southern region based on project levels L0, L1 and L2 are presented in the table 3.6.

**Table 3.6: Distribution of sanctioned and received amount based on project level for the period 2000-2011.**

Year	L-0			L-I			L-II			Total				
	Sanctioned	Received	Difference	Sanctioned	Received	Difference	Sanctioned	Received	Difference	Sanctioned	Received	% Received	Difference	
2000	N.A.	N.A.	-	1081.4	960.9	120.5	3112.6	2950.6	162	4194	3911.4	93.3	282.6	
2002	N.A.	N.A.	-	1794.9	1626.7	168.2	1570.3	1443.4	126.9	3365.2	3070.1	91.2	295.1	
2003	N.A.	N.A.	-	1397.8	1198.3	199.5	1827.5	1690.9	136.6	3225.3	2889.2	89.6	336.1	
2004	N.A.	N.A.	-	968.6	817.9	150.7	351	287.1	63.9	1319.6	1105	83.7	214.6	
2005	N.A.	N.A.	-	806	706.1	99.9	407	377.1	29.9	1213	1083.2	89.3	129.8	
2006	N.A.	N.A.	-	1909.6	1620.4	289.2	359	315.5	43.5	2268.6	1935.9	85.3	332.7	
2007	N.A.	N.A.	-	2352.7	1845.1	507.6	5261.9	4570.1	691.8	7614.6	6415.1	84.2	1199.5	
2008	N.A.	N.A.	-	2508.5	2016.4	492.1	973.5	859.4	114.1	3482	2875.8	82.6	606.2	
2009	372.4	313	59.4	1271.5	1008.3	263.2	3389.1	2984.3	404.8	5033	4305.5	85.5	727.5	
2010	841.8	748	93.8	1753.7	1382.3	371.4	2599.5	1997.5	602	5194.9	4127.8	79.5	1067.1	
2011	1440.8	1185.5	255.3	1632.7	1242	390.7	1334.5	1168.2	166.3	4407.9	3595.7	81.6	812.2	
Total	2654.9	2246.5	408.5	17477	14424	3053	21186	18644	2542	41318	35315	85.5	6003.4	
<b>Average difference in L0 project</b>			<b>136.1</b>	<b>Average difference in L1 project</b>			<b>277.5</b>	<b>Average difference in L2 project</b>			<b>231</b>	<b>Total average difference</b>		<b>545.7</b>

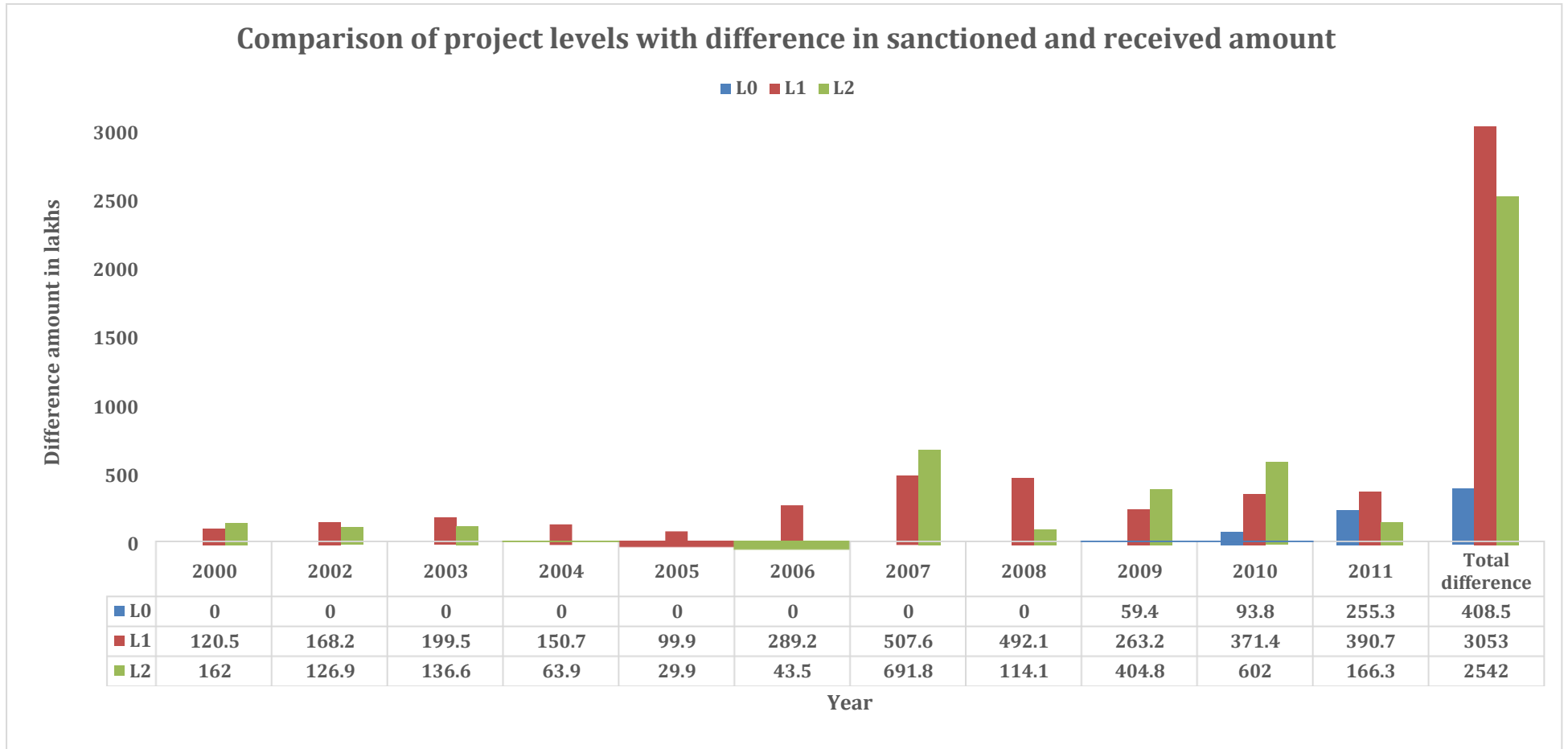
From the table 3.6, it is evident that, a total of Rs. 41318 lakh was sanctioned and Rs. 35314.6 lakhs (85.5%) received across various institutions/departments in southern region. A total amount of Rs 6003 lakhs was not received by institutions in southern region which accounts to 14.5% of the total sanctioned amount. Majority (Rs. 7614.6 lakhs sanctioned amount and Rs. 6415.1 lakhs received amount) of the funds was sanctioned and received during the year 2007. From the table it is clear that, 85.5 % was the received amount during the period 2000-2011 for southern region. With respect to sanctioned and received amount, a major difference was found during the year 2007 which accounted to Rs. 1199.5 lakhs. Likewise based on project levels, the difference in sanctioned and received amount was high during the year 2011 (Rs. 255.3 lakhs) for L0 project, Rs. 507.6 lakhs and Rs. 691.8 lakhs for L1 and L2 projects respectively during the year 2007.

The average difference in sanctioned amount and received amount with respect to L1 project and L2 project is Rs. 277.5 lakhs and Rs. 231 lakhs which accounts to 9.08% of the total difference amount in sanctioned and received grants of L1 project and L2 project respectively.

The average difference in sanctioned and received amount with respect to L0 project is Rs. 136.1 lakhs which accounts to 33.31% of the total difference amount in sanctioned and received grants of L0 project.

The total average difference in sanctioned and received amount respect to all three project level is Rs. 545.7 lakhs which accounts to 9% of the total difference amount in sanctioned and received grants.

## Evaluation of Impact of DST-FIST Project- Southern Region



**Fig 13: Comparison of project levels with respect to difference in sanctioned and received amount**

### 3.14 Distribution of sanctioned amount based on project levels across the Southern region

The details of distribution of sanctioned amount based on project levels across different southern states are listed in the table 3.7.

**Table 3.7:- Level wise distribution of sanctioned amount in southern region states.**

States	Level wise sanctioned amount in Lakhs of rupees			
	L0	L1	L2	Total Amt. in Lakhs of rupees (%)
<b>Andaman and Nicobar</b>	Nil	80.0	Nil	80.0(0.2)
<b>Andhra Pradesh</b>	Nil	1581.8	385.1	1966.9(4.8)
<b>Karnataka</b>	263.5	3216.0	10130.1	13609.6(32.9)
<b>Kerala</b>	1100.9	2865.3	845.5	4811.7(11.6)
<b>Puducherry</b>	Nil	379.4	507.5	886.9(2.1)
<b>Tamil Nadu</b>	1202.0	7486.2	7752.6	16440.8(39.8)
<b>Telangana</b>	88.5	1868.7	1565.2	3522.3(8.5)
<b>Total</b>	<b>2654.9</b>	<b>17477.2</b>	<b>21185.9</b>	<b>41318.0</b>

From the table 3.7, it is evident that, out of 581 projects sanctioned across southern region, Tamil Nadu and Karnataka state have received 39.8% and 32.9 % of total amount of funds. This is followed Kerala (11.6 %), Telangana (8.5%), Andhra Pradesh (4.8%), Puducherry (2.1%) and Andaman (0.2%).

#### Level wise average sanctioned amount / year in southern region states

**Table 3.8: Level wise average sanctioned amount / year for the period 2000-2011**

States	Level wise average sanctioned amount/year (Rs. in lakhs)			Average total amount sanctioned
	L0	L1	L2	
<b>Andaman and Nicobar</b>	0	80	0	80
<b>Andhra Pradesh</b>	0	158.18	38.51	196.69
<b>Karnataka</b>	87.8	292.36	920.92	1301.08
<b>Kerala</b>	367.0	260.48	76.86	704.34
<b>Puducherry</b>	0	54.2	72.50	126.7
<b>Tamil Nadu</b>	400.7	680.56	704.78	1786.04
<b>Telangana</b>	29.5	186.67	156.52	372.69

## **Evaluation of Impact of DST-FIST Project- Southern Region**

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The above table depicts the level wise average sanctioned amount per year in southern states. The state Tamil Nadu tops the table in Level 0 and Level 1 with respect to average sanctioned amount per year i.e. Rs. 400.7 lakhs and Rs. 680.56 lakhs per year. With respect to average sanctioned amount per year, state Karnataka leads with an average sanctioned amount of Rs. 920.92 lakhs per year. It can be concluded that, more amount of funds are sanctioned to state Karnataka for L2 projects, whereas for state Tamil Nadu it is with respect to L0 and L1 projects.

### 3.15 Summary

**To sum up, the salient features are as follows:**

- In southern region, a total of 590 DST-FIST projects were studied, which accounts for 36.82% of the total DST-FIST projects sanctioned from the year 2000-2011 in India and these projects were implemented by 159 institutions of 7 states of Southern India which accounts to be Rs. 413.18 crores (42.95 % of total amount sanctioned for the period in India).
- The state government institutions have received highest number of FIST grants, 66 institutions accounting to 13485.13 lakhs of rupees.
- Majority of the projects distributed are in L1 level (374 projects), followed by L2 Level (163 projects) and L0 Level (44 projects).
- Out of 413.18 crores of rupees sanctioned, 369.9 crores of rupees was effectively utilized and 43.28 crores of rupees, which accounted for 10% of the sanctioned amount was unutilized.
- 66.6 % (106 nos.) of the institutions received DST-FIST grants are established and supported by state government.
- Tamil Nadu and Karnataka state have received 39.8% and 32.9 % of total amount of funds sanctioned to southern region and, ranks one & two respectively, and they accounts to 17.09% & 14.14 % at the national level respectively.
- With respect to gender of PI, 79.51 % of the PIs were Male and 20.49 % of them were Females.
- The working status of 306 (52.7%) project investigators is superannuated, 177(30.5%) are still in service.
- With respect to gender of respondent, 80% of the respondents were Male and 20% of them were Females.
- In southern region, only 177 PIs are still working which accounts for 30.46 % in southern region and 36.95% at national level.
- The difference in sanctioned and received amount was maximum during the year 2011 (Rs. 255.3 lakhs) for L0 project, Rs. 507.6 lakhs and Rs. 691.8 lakhs for L1 and L2 projects respectively and average difference in amount sanctioned and disbursed is Rs. 1865 lakhs for the surveyed period which accounts for 4.51% of the total sanctioned amount at national level.



**CHAPTER 4**

**INFRASTRUCTURE AND EQUIPMENT CREATED UNDER DST-FIST GRANT**

CHAPTER 4

**INFRASTRUCTURE AND EQUIPMENT CREATED UNDER DST-FIST GRANT**

Across the southern region, in all seven different states, Rs.369.9 crores has been utilized as against sanctioned amount of Rs. 413.18 crores for procurement of 2620 equipment and also for the creating various other infrastructural facilities to promote research and teaching in the sanctioned institutions. The facilities created, will play a pivotal role in improving the quality of teaching and research intensity in those Institutions. The status of infrastructure and equipment facilities created under DST-FIST supports along with the factors like utilization, other issues related to infrastructure is discussed in detail in this chapter.

**4.1 Various Department Level Infrastructural Facilities in FIST Supported Institutions**

The various type of infrastructural facilities available in FIST supported departments / college / centers in southern region is shown in table 4.1.

**Table 4.1: Department Level Infrastructural Facilities in FIST Supported Institutions**

Facilities	No. of response (%)
Department Library	445(87.4)
Internet faculty/Scientist	505(99.2)
Internet students/staff	502(98.6)
Internet Library	482(94.7)
Internet Office/Admin	501(98.4)
Computerized Admission	476(93.5)
Computerized Exam	406(79.8)
Computational facilities	483(94.9)
Biological Research Lab	283(55.6)
Chemical Research Lab	304(59.7)
Physical Research Lab	275(54.0)
Lab safety	481(94.5)

**Total no. of department is N=509 and 72 are duplicate.**

From the table 4.1, it can be inferred that, internet facility available for faculty/scientist, staff/students, office/administration and library was predominant compared to other infrastructural facilities which accounted to more than 95%. The other facilities included lab safety (94.5%), computational facility (94.9%), computerized admission (93.5%), establishment of department library (87.4%) and computerization of examinations (79.8%). The exception was among the Biological, Chemical and Physical research laboratories which were domain specific and hence the percentage of this level of facility creations was relatively low in the range of 54-60%.

#### 4.2 Institutional level infrastructural facilities in FIST supported institutions

The Institutional level infrastructural facilities available in the FIST supported institutions includes availability of Placement cell, IPR cell and Incubation center were studied. These are the common facilities across various departments within the institution. The details of institutional level infrastructure facility available in the FIST supported institutions are shown in the table 4.2.

**Table 4.2: Institutional level infrastructural facilities in FIST supported institutions**

**(N=159)**

<b>Facilities</b>	<b>No. of response (%)</b>
Placement cell	152(95.6)
IPR Cell	85(53.5)
Incubation Center	86(54.1)

**\*Total no. of Institutes is N=159**

From the table 4.2, it is evident that, Out of 159 DST-FIST institutions, 152 (95.6 %) institutions have dedicated placement cells to address placement and higher studies related activities. The IPR cell and Incubation center are available only in 50% of institutions, and this indicates need for further emphasis on establishment of IPR and Incubation centers in order to encourage students to take active participation in R&D activities as well as in entrepreneurial development initiatives.

#### 4.2.1 Academic status wise Infrastructural facilities in FIST supported institutions

The academic status of the institutions is categorized as central government, state government, autonomous institutions, deemed university, private institution, and constituent college. The details of availability of various infrastructure among institutions based on academic status are shown in the Fig 14.

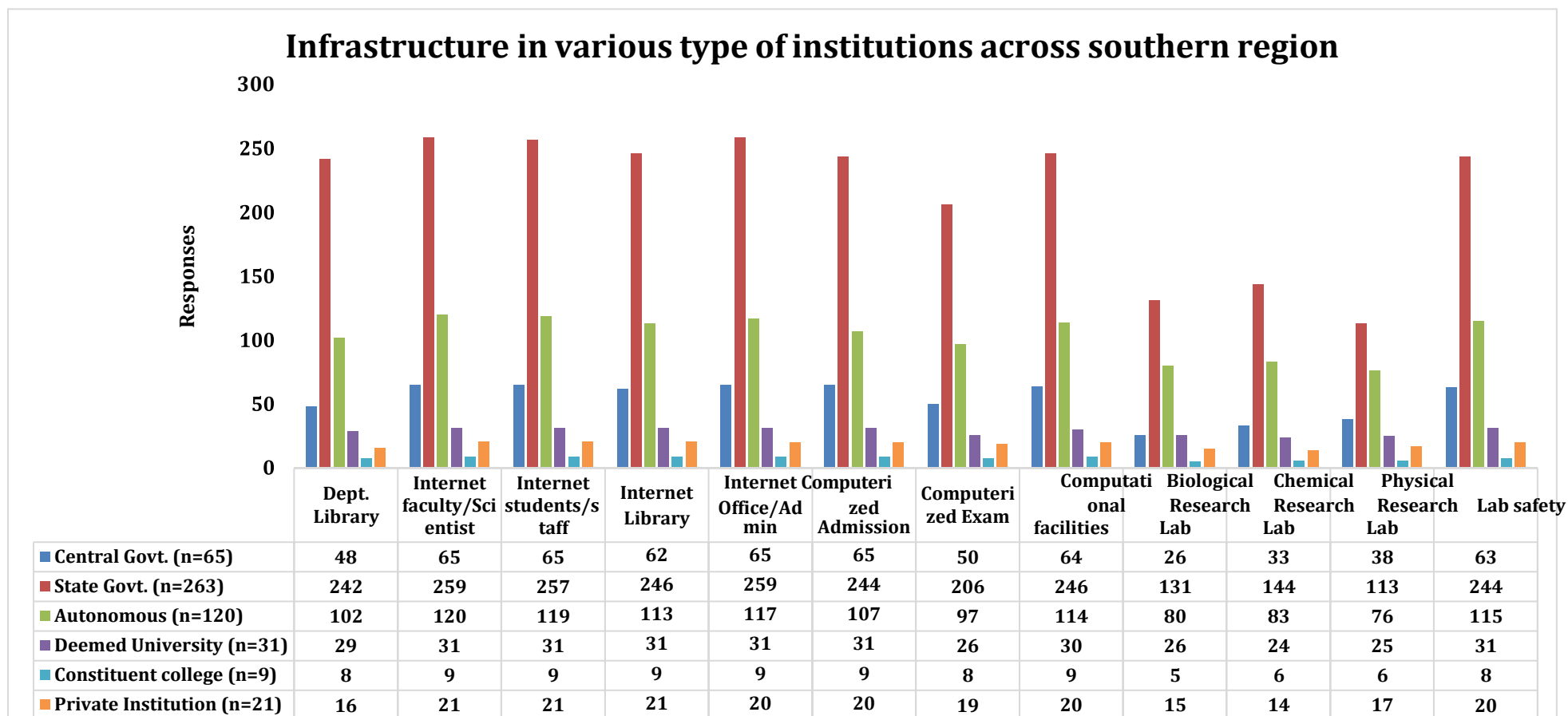


Fig 14: Academic status wise Infrastructural facilities in FIST supported institutions. (N=509)

From the above Fig 14, it is evident that, the availability of infrastructural facilities among state government supported institutions are relatively high compared to other types of institutions. Out of 263 state government supported institutions, almost 90% of the departments are having department library, internet facilities for students/staff/researchers/faculty/admin/library/scientist, computerization of admissions, computational facilities and lab safety, whereas 78% of the departments are having computerized the examination process. With respect to availability of biological, chemical and physical research laboratories, it was only 55% as it is domain specific.

In autonomous, central, deemed university, constituent and private institutions, around 90% of the departments are having department library, internet facilities for students/ staff / researchers/ faculty/admin/library/scientist, computerization of admissions, computational facilities and lab safety, whereas 78% of the departments are having computerized the examination process. With respect to availability of biological, chemical and physical research laboratories, it was only around 55% as it is domain specific.

#### 4.2.2 Institutional level infrastructural facilities based on the academic status

The details of availability of institutional infrastructure at various types of organizations are listed in table 4.3.

**Table 4.3: Institutional level infrastructural facilities based on the academic status**

Facilities	Academic status (Institutions)						Total (%)
	Central Govt. (n=12)	State Govt. (n=66)	Autonomous (n=47)	Deemed University (n=14)	Constituent college (n=5)	Private Institution (n=15)	
Placement cell	12	64	44	13	5	14	152(95.6)
IPR Cell	11	33	19	11	4	7	85(53.5)
Incubation Center	9	34	20	11	2	10	86(54.1)

From the table 4.3, it is evident that, among state government supported institutions, 96% of the institutions has placement cells, whereas the availability of IPR cell and Incubation centers is around 50%.

Likewise, in case of central, deemed university and constituent institutions, the availability of IPR cells is around 90%, whereas the Incubation centers is around 60%. In autonomous institutions, the availability of IPR cells is around 40% and Incubation centers is around 43%.

Further, irrespective of the academic status, all types of institutions need to establish and promote IPR and Incubational activities for the benefits of faculty, students and researchers.

#### 4.2.3 Infrastructural facilities based on financial autonomy of the organization

On the basis of financial autonomy of the organization the institutions were categorized as central, state and other sources. The details of availability of departmental infrastructure in different organizations are shown in the Fig 15 below.

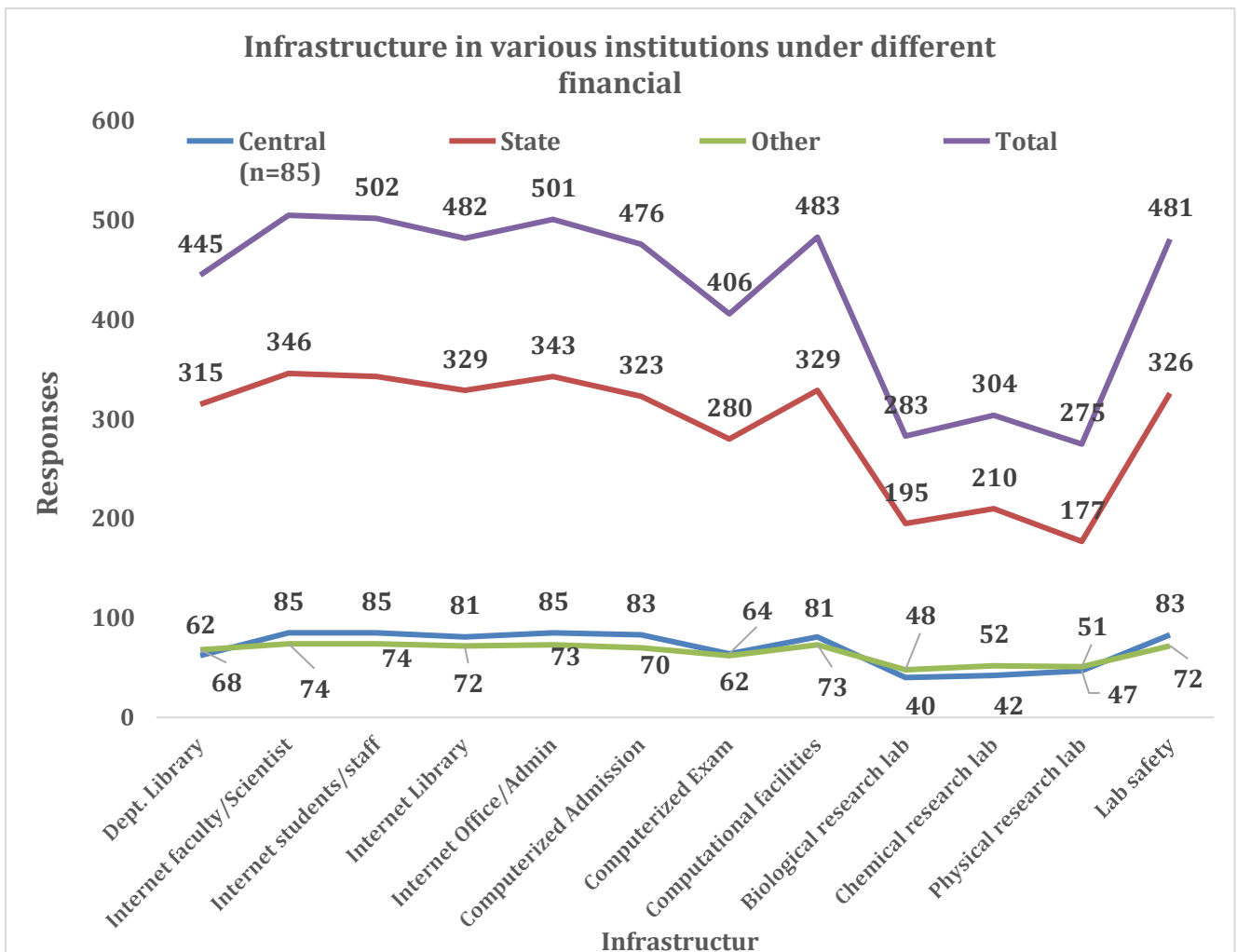


Fig 15: Infrastructural facilities based on financial autonomy of the organization (N=509)

From the Fig it is evident that, the availability of infrastructural facilities among state government institutions are relatively high compared to others.

Out of 350 state government supported institutions, around 315 (90%) departments have department library, internet facilities for students / staff / researchers / faculty / admin/library/scientist, computerization of admissions, computational facilities and lab safety, whereas around 280 (80%) departments have computerized their examination process. With respect to availability of biological, chemical and physical research laboratories, it is between 50-55%.

In central and other financial supported institutions, around 90% of the departments have department internet facilities for students/staff/researchers/faculty/admin/library/scientist, computerization of admissions, computational facilities and lab safety, whereas 78% of the departments have computerized the examination process and 71% in case of department library facility. With respect to availability of biological, chemical and physical research laboratories, it is around 60%.

#### **4.2.4 Institutional level Infrastructural facilities based on the financial autonomy of the organization**

The Placement cell, IPR cell and Incubation centers are the institutional level infrastructure created in various types of institutions on basis on financial autonomy are listed in table 4.4.

**Table 4.4: Institutional level Infrastructural facilities based on the financial autonomy of the organization (N=159)**

Facilities	Organization Wise			
	Central(n=18)	State(n=104)	Other(n=37)	Total (%)
<b>Placement cell</b>	16	101	35	152(95.6)
<b>IPR Cell</b>	15	46	24	85(53.5)
<b>Incubation Center</b>	11	49	26	86(54.1)

From the table 4.4, it is evident that, among state government supported institutions, 97% of the institutions has placement cells, whereas the availability of IPR cell and Incubation centers is around 45%.

Likewise, in case of central, the availability of placement cell is around 90% and IPR cell is around 83% and 61% is of Incubation center.

In case of others, the availability of placement cell is around 95%, IPR cell is around 65% and 70% is of Incubation center.

#### 4.2.5 Infrastructural facilities based on project levels in FIST supported institutions.

The details of availability of departmental infrastructural facilities based on project level namely, L0, L1 and L2 is shown in the table 4.5.

**Table 4.5: Infrastructural facilities based on project levels in FIST supported institutions (N=509)**

Facilities	Level Wise			
	L0(n=43)	L1(n=337)	L2(n=129)	Total (%)
Department Library	41 (95.3)	295 (87.5)	109 (84.5)	445(87.4)
Internet faculty/Scientist	42 (97.7)	334 (99.1)	129 (100)	505(99.2)
Internet students/staff	42 (97.7)	332 (98.5)	128 (99.2)	502(98.6)
Internet Library	43 (100)	316 (93.8)	123 (95.3)	482(94.7)
Internet Office/Admin	42 (97.7)	330 (97.9)	129 (100)	501(98.4)
Computerized Admission	40 (93)	313 (92.9)	123 (95.3)	476(93.5)
Computerized Exam	36 (83.7)	262 (77.7)	108 (83.7)	406(79.8)
Computational facilities	43 (100)	319 (94.7)	121 (93.8)	483(94.9)
Research Labs_ Biology	35 (81.4)	189 (56.1)	59 (45.7)	283(55.6)
Research Labs_ Chemistry	33 (76.7)	206 (61.1)	65 (50.4)	304(59.7)
Research Labs_ Physics	31 (72.1)	190 (56.4)	54 (41.9)	275(54.0)
Lab safety	43 (100)	312 (92.6)	126 (97.7)	481(94.5)

From the table 4.5, it is evident that, 66% of the projects allotted were of L1 type, 25.4% of L2 type, and 8.6% are of L0 type. It is evident that, the availability of infrastructural facilities among L1 projects are relatively high compared to others. Out of 337 L1 projects, almost 90% of the departments have internet facilities for students / staff / researchers / faculty /admin/library/scientist, computerization of admissions, computational facilities and lab safety, whereas with respect to department library it is 88% and computerization of examination process is 77%. The availability of biological, chemical and physical research laboratories, it is between 55-60%.



With respect to project level L2 and L0, around 95% of the departments have internet facilities for students / staff / researchers / faculty / admin/ library/scientist, computerization of admissions, computational facilities and lab safety, whereas with respect to department library it is 85% and computerization of examination process is 84%. The availability of biological, chemical and physical research laboratories, is between 45-50%.

**4.2.6 Institutional level Infrastructural facilities based on project levels**

The availability of Placement cell, IPR cell and Incubation center at institutional level with respect to project levels L0, L1 and L2 is shown in the table 4.6.

**Table 4.6: Institutional level Infrastructural facilities based on project levels (N=159)**

Facilities	Level Wise			
	L0(n=25)	L1(n=115)	L2(n=19)	Total(%)
Placement cell	25 (100)	110 (95.7)	17 (89.5)	152(95.6)
IPR Cell	10 (40)	62 (53.9)	13 (68.4)	85(53.5)
Incubation Center	12 (48)	64 (55.7)	10 (52.6)	86(54.1)

From the table 4.6, it is evident that, with respect to L1 projects, availability of placement cell is around 96%, IPR cell is 54% and Incubation center is 56%. Likewise, in case of L0 project, the availability of placement cell is 100% (25), IPR cell is 40%(10) and Incubation center is 27%(48). In L2 projects, the availability of placement cell is 90% (17), IPR cell is 68% (13) and Incubation center is 53% (52.6).

**4.2.7 State wise distribution of Infrastructural facilities in FIST supported institutions**

The details of availability of institutional infrastructure across six different states of southern region are listed in table 4.7.

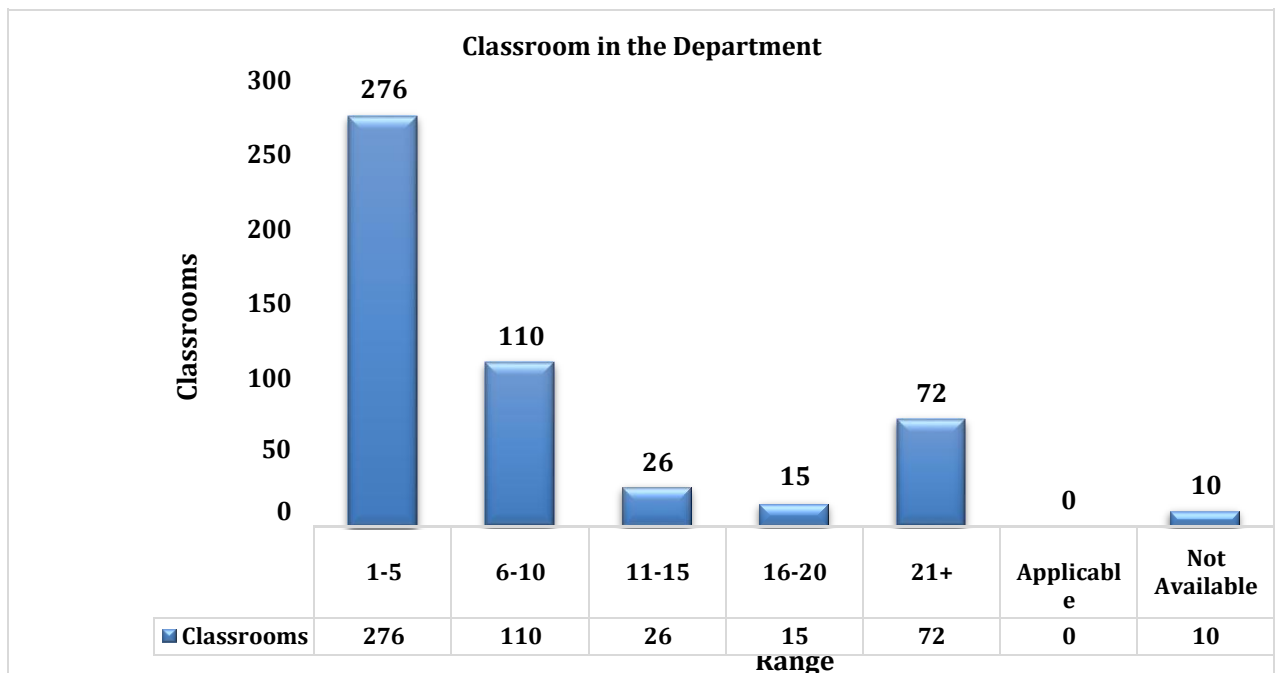
**Table 4.7: State wise distribution of Infrastructural facilities in FIST supported institutions (N=159)**

Facilities	State							
	Andaman & Nicobar (n=1)	Andhra Pradesh (n=7)	Karnataka (n=27)	Kerala (n=46)	Puducherry (n=2)	Tamil Nadu (n=66)	Telangana (n=10)	Total (%)
Placement cell	1	6	25	44	1	65	10	152(95.6)
IPR Cell	1	3	16	22	2	36	5	85(53.5)
Incubation Center	1	4	18	16	1	40	6	86(54.1)

From the table 4.7, it can be inferred that, establishment of placement cell in all the southern states is around 95% and above. With respect to IPR cell, in Karnataka and Tamil Nadu it is around 55%, whereas in case of Telangana it is around 50%, Andaman and Puducherry is 100%, 48% in Kerala and 43% in Andhra Pradesh. Likewise, with respect to Incubation center establishment, Andaman and Puducherry is 100%, Andhra Pradesh is 57%, Karnataka is 67%, Kerala is 35%, Tamil Nadu and Telangana it is 61% and 60 % respectively.

**4.3 Availability of classrooms in DST-FIST supported department/institutions.**

The number of classrooms in FIST supported institutions are classified into 7 different categories as shown in the Fig 16.



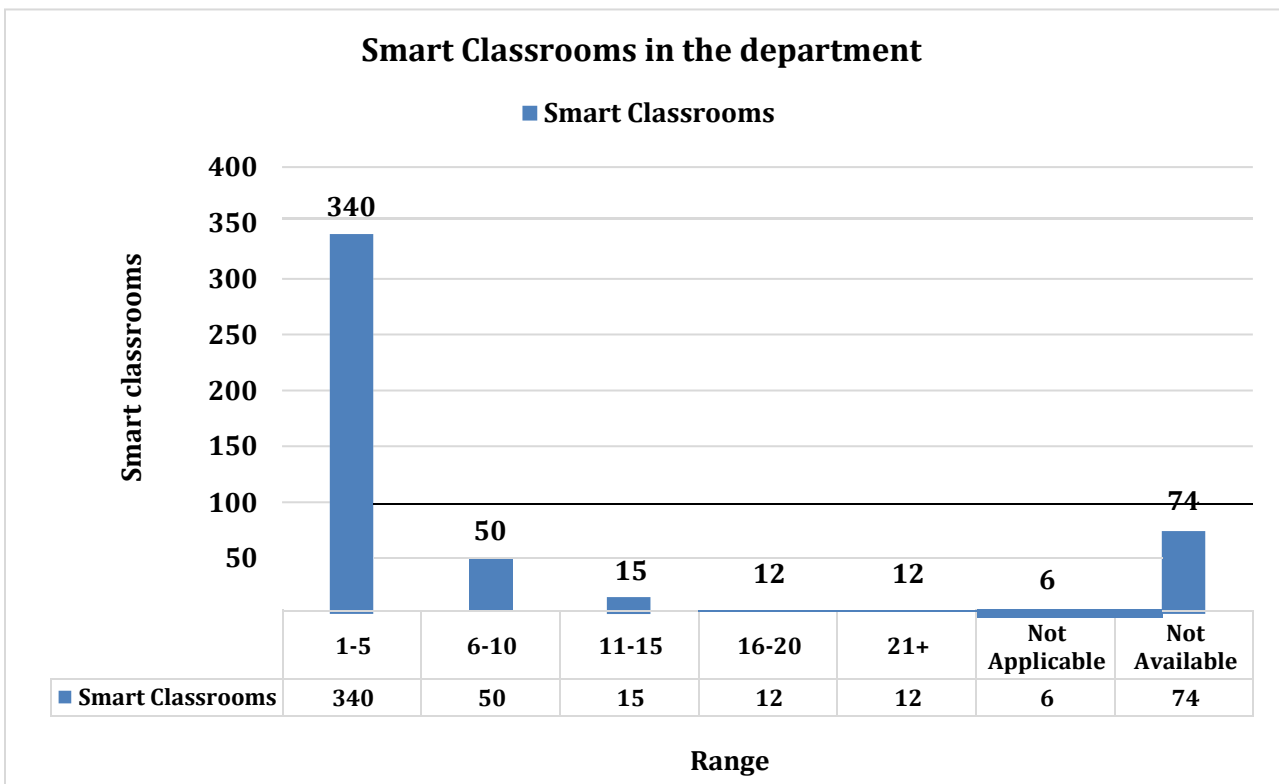
**Fig 16: Availability of classrooms in FIST supported department/institutions**

**Note: \*There are 499 departments where number of class rooms are distributed.**

From the Fig 16, it can be inferred that, out of 509 departments, 276 (54.22%) departments have classrooms in the range of 1-5, followed by 110 (21.61%) departments in the range of 5-10, 72 (14.1%) departments in the range of 21+, followed by 26 (5.1%) departments in the range of 11-15 and 15 (3%) departments are having classrooms within a range of 16-20.

**4.4 Availability of smart classrooms in DST-FIST supported department/institutions.**

The number of smart classrooms in FIST supported institutions are classified into 7 different categories as shown in the Fig 17.



**Fig 17: Availability of smart classrooms in FIST supported department/institutions**

**Note: \* There are 429 departments where number of smart class room distributed.**

From the Fig 17, it can be inferred that, out of 509 departments, 340(66.8%) departments have smart classrooms in the range of 1-5, followed by 50 (9.8%) departments in the range of 5-10, 15(2.9%) departments in the range of 11-15 and 12(2.4%) departments in the range of 16-20 and 21+.

#### 4.4.1 Availability of Classrooms based on academic status of institution

The availability of classrooms based on academic status of institution are listed in table 4.8

**Table 4.8: Availability of Classrooms based on academic status of institution (N=499)**

Range	Academic status						Total (%)
	Central Government Institution	State Government Institution	Autonomous Institution	Deemed University	Constituent college	Private Institution	
1-5	36(56.2)	167(65.0)	51(44.0)	7(22.6)	5(55.6)	10(47.6)	276 (55.3)
6-10	18(28.1)	49(19.1)	34(29.3)	3(9.7)	2(22.2)	4(19.0)	110 (22.0)
11-15	6(9.4)	9(3.5)	6(5.2)	3(9.7)	0(0.0)	2(9.5)	26 (5.2)
16-20	3(4.7)	4(1.6)	1(0.9)	7(22.6)	0(0.0)	0(0.0)	15 (3.0)
More than 21	1(1.6)	28(10.9)	24(20.7)	11(35.5)	2(22.2)	5(23.8)	72 (14.4)
<b>Total</b>	<b>64</b>	<b>257</b>	<b>116</b>	<b>31</b>	<b>9</b>	<b>21</b>	<b>499</b>

From the table 4.8, it is evident that, the availability of classrooms in state government supported institutions are 257 in numbers, followed by 116 numbers of Autonomous institution, 64 numbers of central government institution, 31 numbers of deemed university, 21 numbers of private institutions and 9 numbers of constituent colleges.

On an average the classrooms in the range of 1-5 numbers accounted to 55.3% across different types of institutions. Similarly, the classrooms in the range of 6-10 numbers accounting to 22%, more than 21 classrooms accounted to 14.4%, 11-15 classrooms accounted to 5.2% and 16-20 classrooms accounted to 3%.

#### 4.4.2 Availability of Smart Classrooms based on academic status of institution

The availability of smart classrooms based on academic status of institution are listed in table 4.9.

**Table 4.9: Availability of Smart Classrooms based on academic status of institution (N=429)**

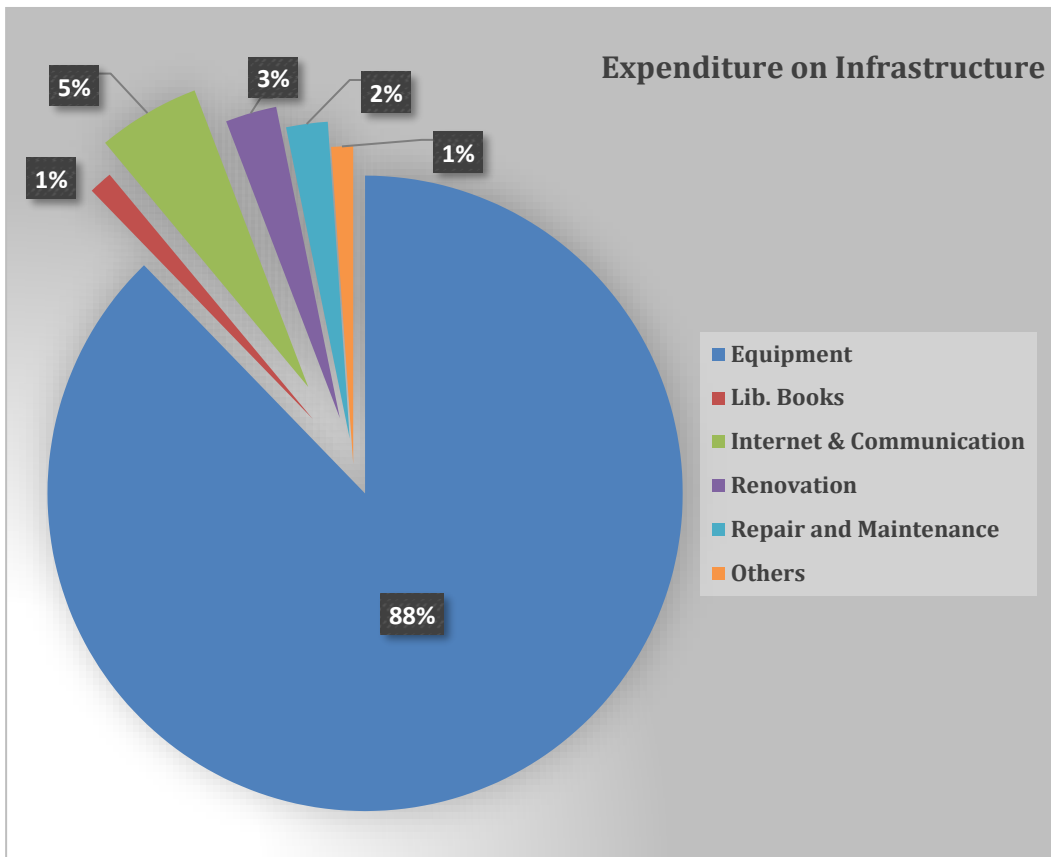
Range	Academic status						Total (%)
	Central Government Institution (%)	State Government Institution (%)	Autonomous Institution (%)	Deemed University (%)	Constituent college (%)	Private Institution (%)	
1-5	43(82.7)	180(82.9)	82(80.4)	13(44.8)	6(75.0)	16(80.0)	340(79.3)
6-10	8(15.4)	24(11.1)	7(6.9)	6(20.7)	2(25.0)	3(15.0)	50(11.7)
11-15	0(0.0)	3(1.4)	5(4.9)	6(20.7)	0(0.0)	0(0.0)	15(3.5)
16-20	1(1.9)	8(3.7)	1(1.0)	2(6.9)	0(0.0)	0(0.0)	12(2.8)
More than 21	0(0.0)	2(0.9)	7(6.9)	2(6.9)	0(0.0)	1(5.0)	12(2.8)
<b>Total</b>	<b>52</b>	<b>217</b>	<b>102</b>	<b>29</b>	<b>8</b>	<b>20</b>	<b>429</b>

From the table 4.9, it is evident that, the availability of smart classrooms in state government supported institutions are 217 numbers, followed by 102 numbers in Autonomous institution, 52 numbers in central government institution, 29 numbers in deemed university, 20 numbers in private institutions and 8 numbers in constituent colleges.

On an average the smart classrooms in the range of 1-5 numbers accounted to 79.3% across different types of institutions. Similarly, the smart classrooms in the range of 6-10 numbers accounting to 11.7 %, 11-15 numbers of smart classrooms accounted to 3.5% and more than 21 and 16-20 numbers of smart classrooms accounted to 2.8% each respectively.

#### 4.5 Expenditure on Infrastructure created under FIST

The expenditure on infrastructure is categorized into various divisional heads such as Equipment, Library books, Internet and communication, Renovation of labs, Air conditioning, Repair and Maintenance and other expenditure. The total expenditure under each divisional heads are shown in the Fig 18.



**Fig 18: Expenditure on Infrastructure created under FIST**

From the Fig 18, it can be inferred that, out of Rs. 35080.8 lakhs, Rs. 30674.9 lakhs (87.4%) was spent solely on procurement of equipment, followed by Rs. 1818.3 lakhs (5.2%) on establishment of Internet and communication facilities in the various departments / institutions, where the DST- FIST project has been implemented.

**4.6 Status of equipment procured under DST-FIST support.**

The current status of the equipment procured under DST-FIST grant across various institutions in southern region is listed in the table 4.10.

**Table 4.10: Current Status of Equipment procured under FIST**

Year of Equipment Purchased	No. of Items Purchased N	Status	
		Working N (%)	Non-Working N(%)
<b>2000-2004</b>	434	259(59.7)	175(40.3)
<b>2005-2009</b>	892	675(75.7)	217(24.3)
<b>2010-2014</b>	1050	949(90.4)	101(9.6)
<b>2015-2019</b>	112	105(93.8)	7(6.3)
<b>Missing values</b>	132	103(78.0)	29(22.0)
<b>Total</b>	<b>2620</b>	<b>2091(79.8)</b>	<b>529(20.2)</b>

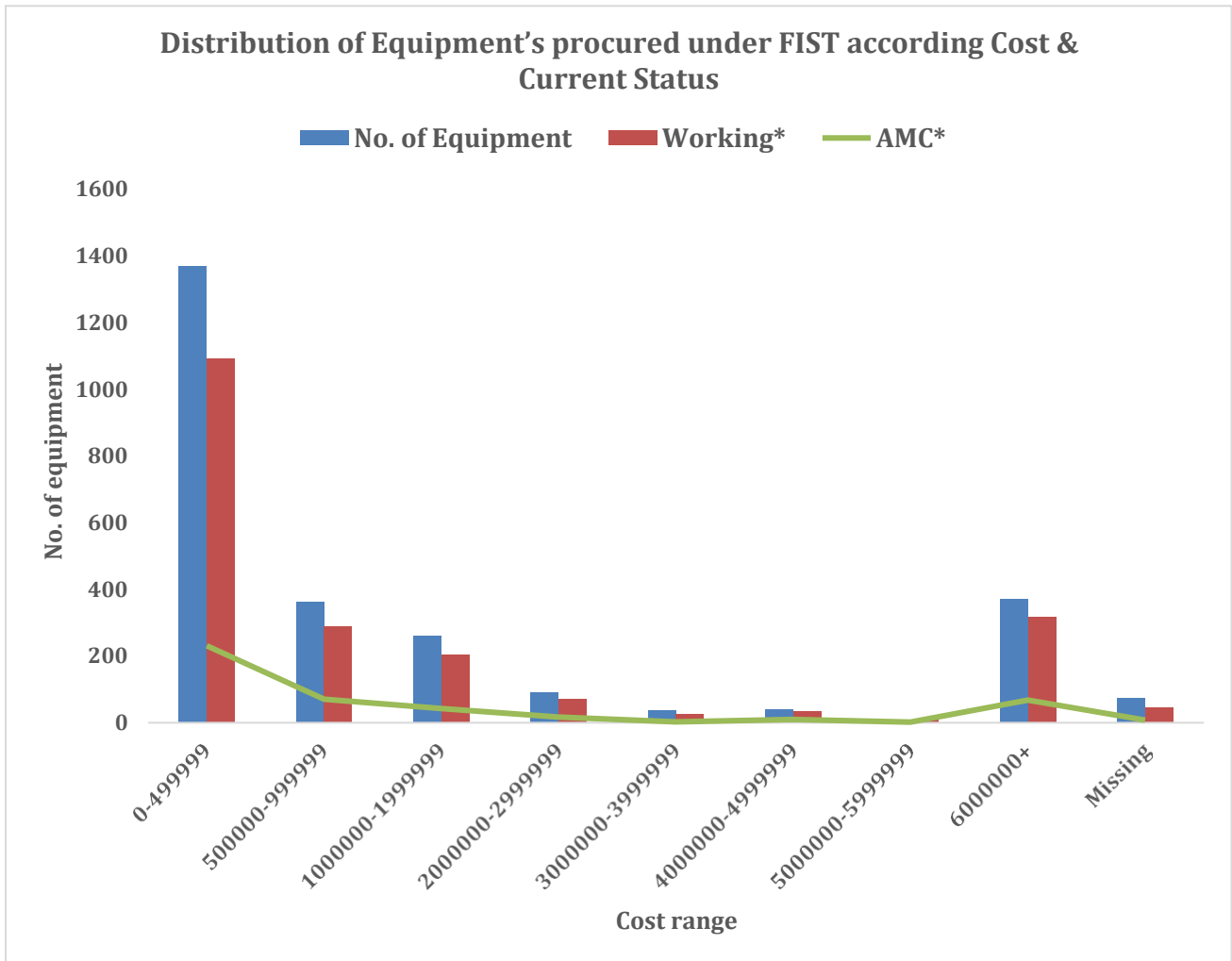
**Note:** \*Working + Non-Working (2091+529) = 2620, \* Total No. of Equipment = 2620

From the table 4.10, it can be inferred that, out of 2620 equipment procured under DST FIST grants, 2091 (79.8%) equipment is in working condition, 529 (20.2%) equipment is non-working.

It is evident from the table that, during the period 2010-2019, maximum of (1062) equipment were purchased and 90% (1045 equipment) of them are working, only 60% (259) of the equipment purchased during 2000-2004 are working and rest 40% (175) of them are not working. This may be due to lack of annual maintenance budget, improper maintenance and non-availability of technical staff and also be due to obsolescence of technology. Likewise, 75.7% (675) of the equipment purchased during 2005- 2009 are working and rest 24.3% (217) are not working.

#### 4.7 Cost wise distribution of equipment and its current status

The cost wise distribution of equipment and its current status based on 9 classification of cost of equipment are shown in the Fig 19.



**Fig 19: Cost wise distribution of equipment and its current status**

From the Fig 19, it can be inferred that, out of 2620 equipment procured under DST FIST grants, 2091 equipment are working and only 453 equipment of them have AMC.

- It is evident that, 52.3% (1371) of the equipment are procured under FIST grant are in the cost range of 0-499999 rupees, out of which 79.72% (1093) of equipment are still working and only 21.13% (231) of working equipment have AMC.
- 13.9% (364) of the equipment are in cost range of 500000-999999 rupees, out of which 79.39% (289) are working and only 24.56% (71) of working equipment have AMC.
- 10% (261) of the equipment are in cost range of 1000000-1999999 rupees, out of which 78.16% (204) are working and only 21.07% (43) of working equipment have AMC.
- 3.4% (90) of the equipment are in cost range of 2000000-2999999 rupees, out of which 80%



(72) are working and only 23.61% (17) of working equipment have AMC.

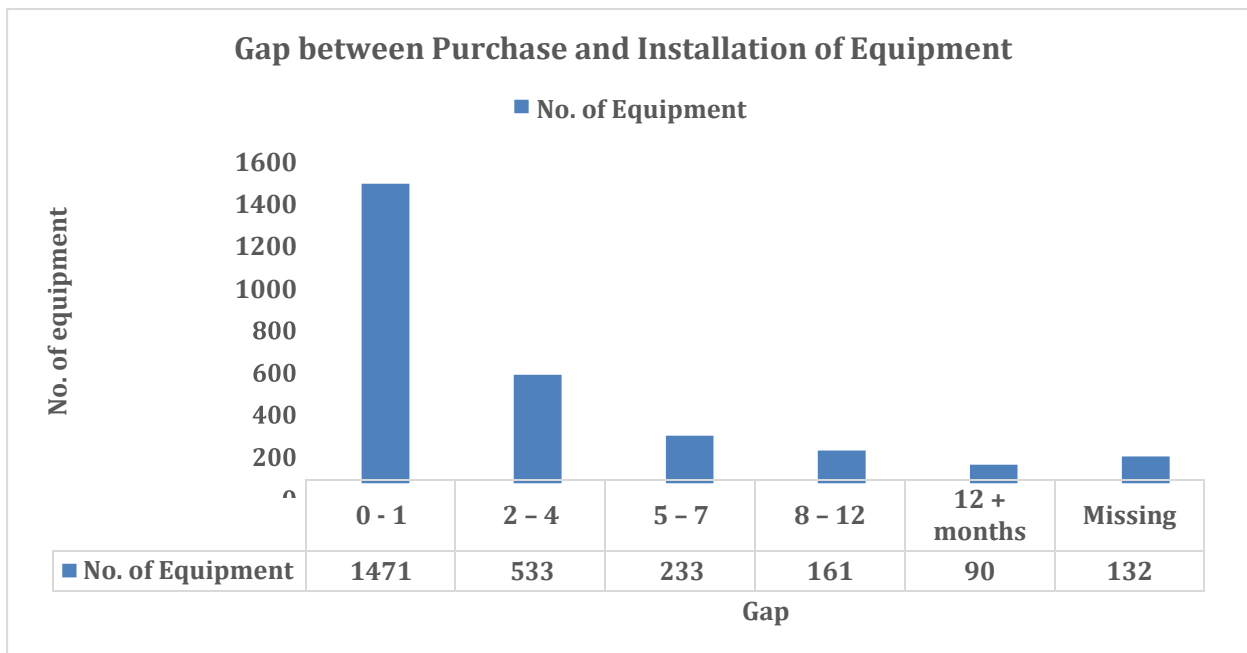
- 1.4% (37) of the equipment are in cost range of 3000000-3999999 rupees, out of which 73% (27) are working and only 11.11% (3) of working equipment have AMC.
- 1.6% (41) of the equipment are in cost range of 4000000-4999999 rupees, out of which 83% (34) are working and only 29.41% (10) of working equipment have AMC.
- 0.4% (10) of the equipment are in cost range of 5000000-5999999 rupees, out of which 90% (9) are working and only 22.22% (2) of working equipment have AMC.
- 14.2% (372) of the equipment are in cost range of 6000000+ rupees, out of which 86% (319) are working and only 21.31% (68) of working equipment have AMC.

\*Working + Non-Working (2091 + 529) = 2620

\*AMC(Yes) + AMC(No) + AMC(Missing) (453+ 2124 + 43) = 2620

#### 4.8 Gap between Purchase and Installation of Equipment

The gap between purchase and installation of equipment are classified into 6 different categories as shown in the Fig 20.



**Fig 20: Gap between Purchase and Installation of Equipment**

It is evident from the Fig 20 that, out of 2620 equipment procured under FIST grant in southern region, 1471(56.1%) equipment are installed within a timeframe of less than 1 month, followed by 533 (20.3%) equipment installed within a timeframe of 2-4 months, 233 (8.9%) equipment installed within a timeframe of 5-7 months, 161(6.1%) equipment installed within a timeframe of 8-12 months and 90 (3.4%) equipment installed within a timeframe of more than 12 months.

From the above, it is evident that 76.48 % of equipment are installed within 4 months of purchase date.

**4.9 Average gap between year of sanction and purchase of equipment**

The average gap between year of sanction and purchase of equipment is tabulated in the table 4.11.

**Table 4.11: Average gap between year of sanction and purchase of equipment**

Sl. No.	Region	Total no. of equipment	Data available	Missing	Average Gap in years (between sanction year and purchase year)
1	South	2620	2486	134	1.55

From table 4.11, it is evident that, average gap between sanction year and purchase year across various institutions of southern region is 1 year and 6 months.

**4.10 Utilization of equipment**

Utilization of equipment by internal and external users is depicted in the table 4.12.

**Table 4.12: Utilization of Equipment procured under FIST**

No. of Users per week	Internal	External
	No. of Equip. (%)	No. of Equip. (%)
<b>0 - 4</b>	450(17.2)	1266(48.3)
<b>5 - 9</b>	351(13.4)	164(6.3)
<b>10 - 14</b>	308(11.8)	155(5.9)
<b>14+</b>	1068(40.8)	158(6)
<b>Missing</b>	443(16.9)	877(33.5)
<b>Total</b>	<b>2620</b>	<b>2620</b>

From the table 4.12, it can be inferred that, of the 2620 equipment, 1068 (40.8%) equipment was utilized by more than 14+ internal users per week, followed by 450 (17.2%) equipment were utilized by 0-4 internal users per week, 351 (13.4%) equipment were utilized by 5-9 internal users per week and 308(11.8%) equipment were utilized by 10-14 internal users per week.

Of the 2620 equipment, 1266 (48.3%) equipment were utilized by a maximum of 4 external users per week, 164 (6.3%) equipment were utilized by 5-9 external users per week, 158 (6%) equipment were utilized by 14+ external users per week and 155 (5.9%) equipment were utilized by 10-14 external users per week.

**4.11 Percent Utilization of Equipment**

The percentage utilization of equipment is classified into 5 categories and the same is depicted in table 4.13.

**Table 4.13: Percent Utilization of Equipment**

<b>Purchase Year</b>	<b>No. of Equipment</b>	<b>≤25 Percent</b>	<b>26-50 Percent</b>	<b>51-75 Percent</b>	<b>76-100 Percent</b>	<b>Missing (% Utilization)</b>
<b>2000-2003</b>	296	14	15	17	203	47
<b>2004-2007</b>	616	20	26	39	458	73
<b>2008-2011</b>	822	26	59	101	539	97
<b>2012-2015</b>	709	60	57	114	385	93
<b>2016-2019</b>	45	3	3	9	23	7
<b>Missing</b>	132	6	8	7	92	19
<b>Total</b>	<b>2620</b>	<b>129</b>	<b>168</b>	<b>287</b>	<b>1700</b>	<b>336</b>

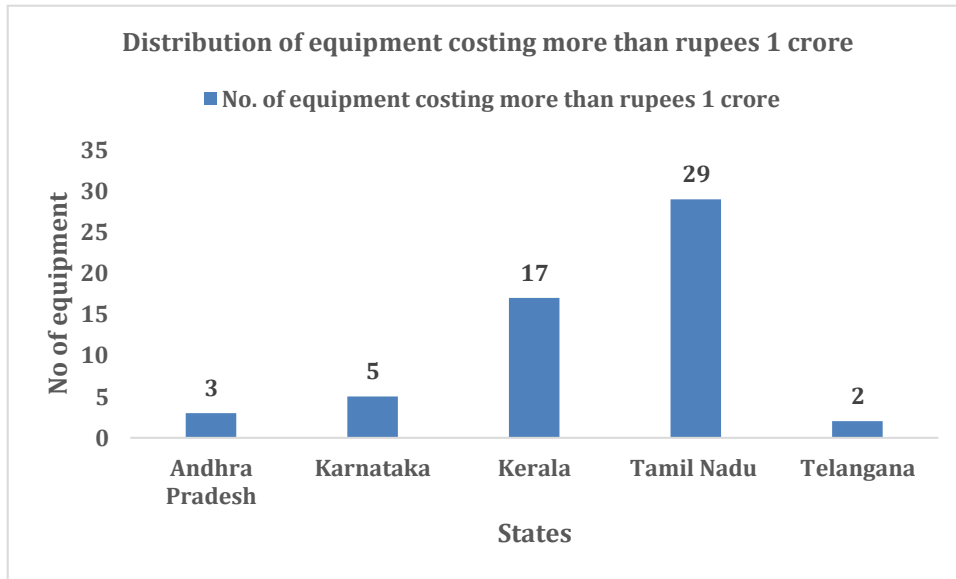
**\*132 equipment utilization details are not available.**

From the table 4.13, it is evident that, out of 2620 equipment, 129 equipment were utilized less than 25%, 168 equipment were utilized between 26-50 %, 287 equipment were utilized between 51-75%, 1700 equipment were utilized between 76-100%.

It is evident that, 822 equipment were procured in the period 2008-2011 and 65.57% (539) of them were utilized between 76-100%, followed by 616 equipment in the period 2004-2007 and 74.35% (458) of them were utilized between 76-100%, 709 equipment in the period 2012-2015 and 62.5% (385) of them were utilized between 76-100%, 296 equipment in the period 2000-2003 and 68.58% (203) of them were utilized between 76-100% and 45 equipment in the period 2016- 2019 and 51.11% (23) of them were utilized between 76-100%. The period 2008-2015 has the highest number of equipment procured and maximum utilization within a range of 76-100% percent utilization.

#### 4.12 Distribution of equipment costing more than Rs. 1 crore

The below Fig 21 represents the distribution of number of equipment costing more than Rs. 1 crore procured under FIST scheme in various states of southern region purchased during 2000-2011.



**Fig 21: Distribution of equipment costing more than rupees 1 crore**

From the Fig 21, it can be inferred that, a total of 56 equipment procured under DST FIST grants are in the range of Rs 1 crore and above. Such facilities are utilized by internal as well as external users to carry out research in their specific domains. The facilities created under DST-FIST support has been a boon for various institutions to carry out quality research leading towards national and international collaborations by enabling the institutions to enhance the reputation and image of the department/institution.

It is evident that, state Tamil Nadu has the highest number (29 equipment) of equipment procured under FIST scheme costing more than Rs 1 crore. Followed by state Kerala has 17 equipment costing more than Rs 1 crore. As the investments made on such sophisticated equipment are relatively high, a special care and regular maintenance need to be ensured.

#### 4.13 Current Status of Equipment across Southern Region

Out of 56 equipment costing above Rs 1 crore, 41 (73.2 %) were in working condition and 15 (26.8%) of them are in non- working condition as shown in the table 4.14.

**Table 4.14: Current Status of Equipment**

S. No.	Status	Numbers	Percentage
1	Working	41	73.2
2	Not Working	15	26.8
<b>Total</b>		<b>56</b>	<b>100</b>

Considering the investments made on such sophisticated devices or equipment, it is necessary to take some measures by periodic repair and maintenance.

#### 4.14 Most Repeated Equipment and Its Frequency in Southern States of India

There are 56 equipment above Rs. 1 crore, there are certain equipment that have been frequently procured by different institutions/departments across south India. The table 4.15 provides the details of the same.

**Table 4.15: Most Repeated Equipment**

State	Equipment	Frequency
Kerala	X Ray Diffractometer (XRD)	2
Tamil Nadu	Scanning Electron Microscope (SEM)	5
	Nuclear Magnetic Resonance (NMR)	5
	X Ray Diffractometer (XRD)	4
	Particle Image Velocimetry system (PIV system)	3

From the table 4.15, it is indicative that, the equipment XRD in Kerala state costing Rs. 2,54,72,229 is available in two institutions (Mahatma Gandhi college and CMS college Kottayam). The distance between two institutions is just 70kms.

In the state of Tamil Nadu, there are 5 numbers of SEM (Rs. 1,52,55,989) and NMR(Rs. 1,50,00,000), 4 numbers of XRD (Rs. 1,38,11,841) and 3 numbers of PIV system (Rs. 1,33,73,490) are procured. However, the above equipment are also available in lower range of investment. The overall availability of XRD, SEM and NMR in the southern region in as follows:

**Table 4.16: List of XRD, SEM, NMR and PIV System Equipment less than 1 Crore**

<b>State</b>	<b>Equipment</b>	<b>Frequency</b>
<b>Andhra Pradesh</b>	Nuclear Magnetic Resonance	1
<b>Kerala</b>	Particle Image Velocimetry system	1
<b>Karnataka</b>	X Ray Diffractometer	1
<b>Tamil Nadu</b>	Scanning Electron Microscope	11
	Nuclear Magnetic Resonance	2
	X Ray Diffractometer	22
	Particle Image Velocimetry system	3
<b>Telangana</b>	X Ray Diffractometer	1
	Particle Image Velocimetry system	1

From the table 4.16, it can be inferred that, in the state of Tamil Nadu there are around twenty two XRDs, eleven SEM, two NMR and three PIV systems are available which are below Rs 1 crore.

One XRD in Karnataka, one PIV system in Kerala, one NMR in Andhra Pradesh and one number of XRD and PIV system in Telangana state which are also below Rs. 1 crore.

#### 4.15 Summary

**To sum up, the salient features are as follows:**

- Rs.369.9 crores has been utilized for procurement of 2620 equipment and also for the creating various other infrastructural facilities, which is about 89.52% of sanctioned amount.
- Availability of internet facility for faculty/scientist, staff/students, office/administration and library was predominant compared to other infrastructural facilities which accounted to more than 95%.
- Out of 159 institutions, 152 (95.6 %) DST-FIST institutions have dedicated placement cells to address placement and higher studies related activities.
- The availability of Biological, Chemical and Physical research laboratories are relatively low (54-60%) as they are domain specific.
- Out of 509 departments, 276 (54.22%) departments have classrooms in the range of 1-5, followed by 110 (21.61%) departments in the range of 5-10.
- 340(66.8%) departments have smart classrooms in the range of 1-5 and 50 (9.8%) departments have smart classrooms in the range of 5-10.
- Rs. 30674.9 lakhs (87.4%) was spent solely on procurement of equipment, followed by Rs. 1818.3 lakhs (5.2%) on establishment of Internet and communication facilities in the various departments/institutions.
- Out of 2620 equipment procured under DST FIST grants, 2091 (79.8%) equipment is in working condition, 529 (20.2%) equipment is non-working.
- 52.3% (1371) of the equipment are procured under FIST grant are in the cost range of 0-499999 rupees, out of which 79.72% (1093) of equipment are still working and only 21.13% (231) of working equipment have AMC.
- 76.48 % of equipment are installed within 4 months of purchase date.
- Average gap between sanction year and purchase year across various institutions of southern region is 1 year and 6 months, which needs to be reduced
- Out of 2620 equipment, 1068 (40.8%) equipment was utilized by more than 14+ users/ week, followed by 450 (17.2%) equipment were utilized by 0-4 users / week.
- 1266 (48.3%) equipment were utilized by a maximum of 4 external users per week.
- Out of 2620 equipment, 1700 equipment were utilized between 76-100%.
- A total of 56 equipment procured under DST FIST grants are in the range of Rs 1 crore and above.
- X Ray Diffractometer, Scanning Electron Microscope, Nuclear Magnetic Resonance and Particle Image Velocimetry system are the most repeated equipment in southern region.

## CHAPTER 5

### IMPACT ON WORKING ENVIRONMENT, CAPACITY BUILDING & COLLABORATION



CHAPTER 5

IMPACT ON WORKING ENVIRONMENT, CAPACITY BUILDING & COLLABORATION

Funds sanctioned under various levels of DST-FIST grant were well utilized by various institutions for S&T infrastructure development. Better infrastructure will definitely help in enhancing the working environment & collaboration of the institution across various institutions in the country. This also gives positive impact on research environment of organization and helps to improve research intensity. In this chapter, DST- FIST funding impact on working environment, capacity building & collaboration activities are discussed.

5.1 Impact on Working Environment

A good working facility creates conducive environment for positive thinking and development. Infrastructure should be designed in such a way that it would help the various stakeholders in reducing the work related stresses and enhances their efficiency levels. DST-FIST funds are directly or indirectly helped various beneficiaries to improve cleanliness, ventilation, effective work space, communication facilities, office support & motivation for innovation. The table 5.1 represents the impact of DST-FIST support on the working environment across various departments/schools/centers in southern region.

Table 5.1: Impact on Working Environment after DST-FIST support at Department level

Factors influencing work environment	Responses				
	Decrease N (%)	Can't say N (%)	No change N (%)	Improved N (%)	Significantly Improved N (%)
Cleanliness	1(0.2)	22(4.3)	59(11.6)	318(62.5)	109(21.4)
Room Temperature, Light & Ventilation	0(0.0)	17(3.3)	107(21.0)	261(51.3)	124(24.4)
Sufficient Working Space	4(0.8)	12(2.4)	122(24.0)	231(45.4)	140(27.5)
Communication: Internet, Telephone, etc.	0(0.0)	11(2.2)	52(10.2)	228(44.8)	218(42.8)
Personnel Development Opportunities	0(0.0)	9(1.8)	22(4.3)	293(57.6)	185(36.3)
Administrative and Office Support	3(0.6)	15(2.9)	123(24.2)	260(51.1)	108(21.2)
Motivation for innovation	0(0.0)	6(1.2)	16(3.1)	261(51.3)	226(44.4)

From the table 5.1, it can be inferred that, majority of the 509 respondents perceived that the DST-FIST support has substantially helped them to improve the overall working environment at department levels.

With respect to cleanliness 62.5% of respondents expressed as “improved” and 21.4% claimed it to be “Significantly improved”, Room Temperature Light & Ventilation, 51.3% of respondents expressed as “improved” and 24.4% claimed it to be “Significantly improved”, Sufficient Working Space, 45.4% of respondents expressed as “improved” and 27.5% claimed it to be “Significantly improved”, Communication: Internet, Telephone 44.8% of respondents expressed as “improved” and 42.8% claimed it to be “Significantly improved”, Personnel Development Opportunities, 57.6% of respondents expressed as “improved” and 36.3% claimed it to be “Significantly improved”, Administrative and Office Support, 51.1% of respondents expressed as “improved” and 21.2% claimed it to be “Significantly improved” and Motivation for innovation, 51.3% of respondents expressed as “improved” and 44.4% claimed it to be “Significantly improved”.

From this it can be concluded that, with respect to work environment factors most of the responses expressed their opinion that it was improved and significantly improved to a greater extent.

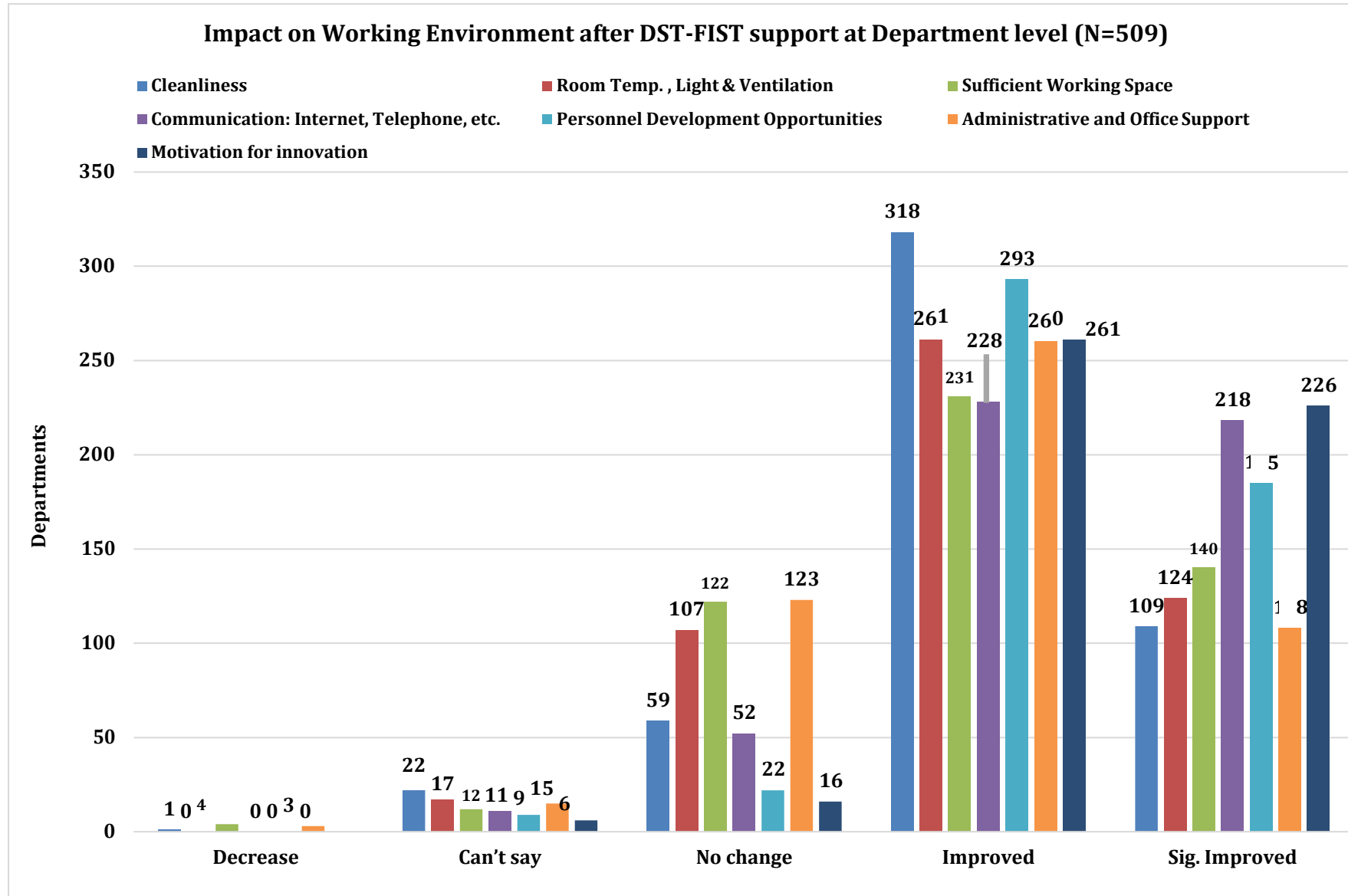


Fig 22: Impact on Working Environment

To evaluate the impact on working environment, factors like cleanliness, temperature, light & ventilation at work place, communication facilities, personal development opportunities, administrative support and motivation for innovation were considered and nearly 83% of departments gave their opinion as improved and significantly improved for all the factors. This indicates that the DST-FIST funds had also helped the organizations in improving their working environment.

## **5.2 Capacity Building and other Contributions**

To evaluate impact of funds on capacity building of manpower in institute, relevant information pertaining to faculty like, attending National & International seminars, conferences, workshops, short term training program, faculty development program and management development program had been collected before and after DST FIST funding. The table 5.2 represents the impact of DST-FIST grants on the capacity building of the departments.

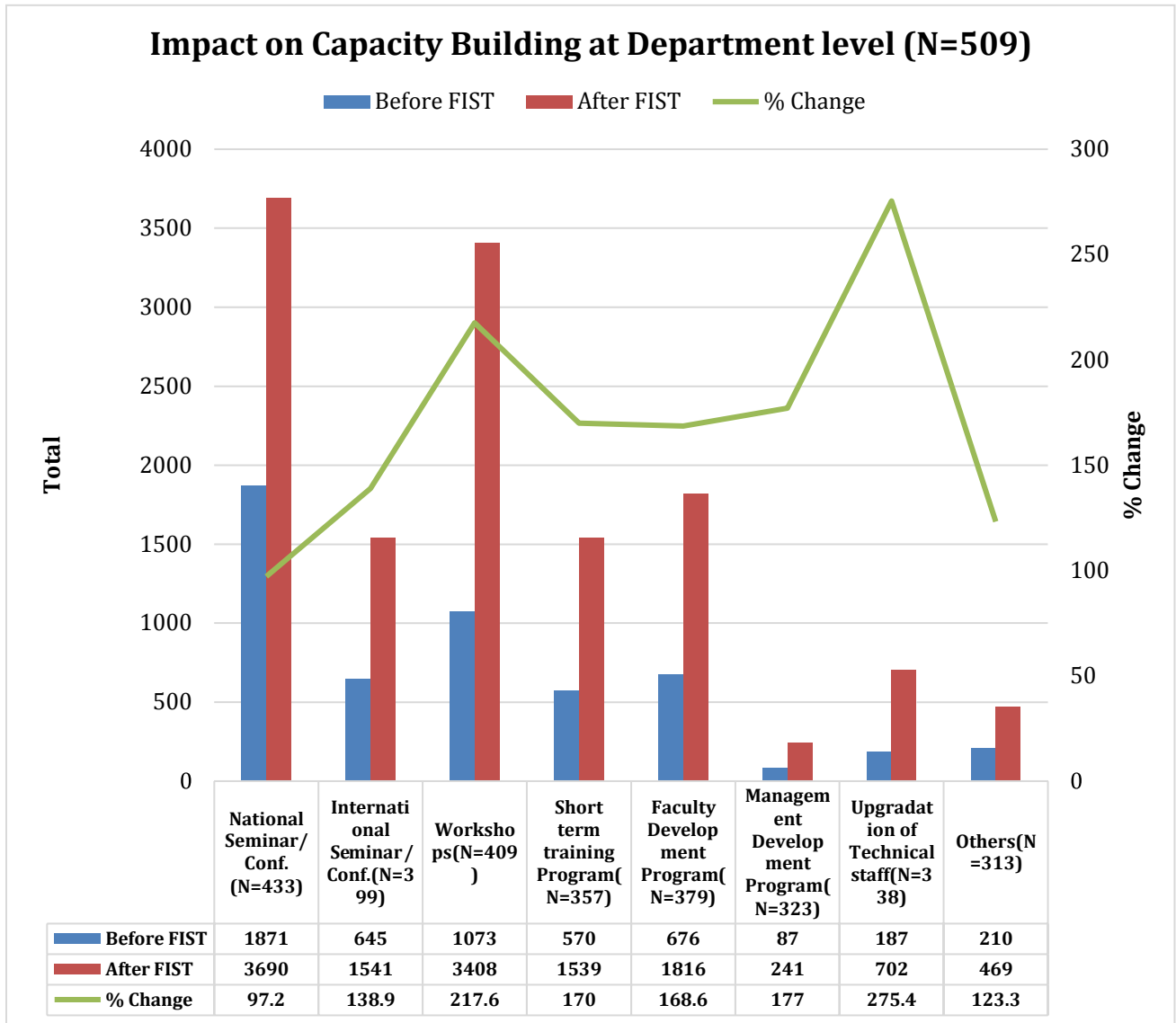
**Table 5.2: Impact on Capacity Building at Department**

<b>Activities</b>	<b>Before FIST</b>	<b>After FIST</b>	<b>% Change</b>
National Seminar/ Conference (N=433)	1871	3690	97.2
International Seminar/ Conference (N=399)	645	1541	138.9
Workshops (N=409)	1073	3408	217.6
Short term training program (N=357)	570	1539	170.0
Faculty Development Program (N=379)	676	1816	168.6
Management Development Program (N=323)	87	241	177.0
Upgradation of Technical staff (N=338)	187	702	275.4
Others (N=313)	210	469	123.3
<b>Total</b>	<b>5319</b>	<b>13406</b>	<b>152.0</b>

From the table 5.2, it can be inferred that, 152 % change is evident from the overall activities of capacity building in 509 departments across southern region. The activities in the capacity building increased to 13406 (after FIST) from 5319 (before FIST).

Considering all the activities, Upgradation of technical staff (275.4 % change), Workshops (217.6 % change), Faculty development program (168.6 % change) and Short term training program (170.0 % change) activities have been significantly improved after the support of FIST scheme. Activities such as National seminar (97.2 % change), International seminar (138.9 %change) and Management development program (177 % change) have been moderately

improved after the support of DST-FIST grants.



**Fig 23: Impact on Capacity Building**

To find the impact on capacity building, factors like number of National & International seminars, conferences, number of workshops, number of short term training program, Faculty development program, and management development programs attended/conducted by faculty/institution before FIST funding and after FIST funding were gathered. Data indicates the significant increase in all the factors.

### 5.3 Improvement on the Working Environment due to FIST support

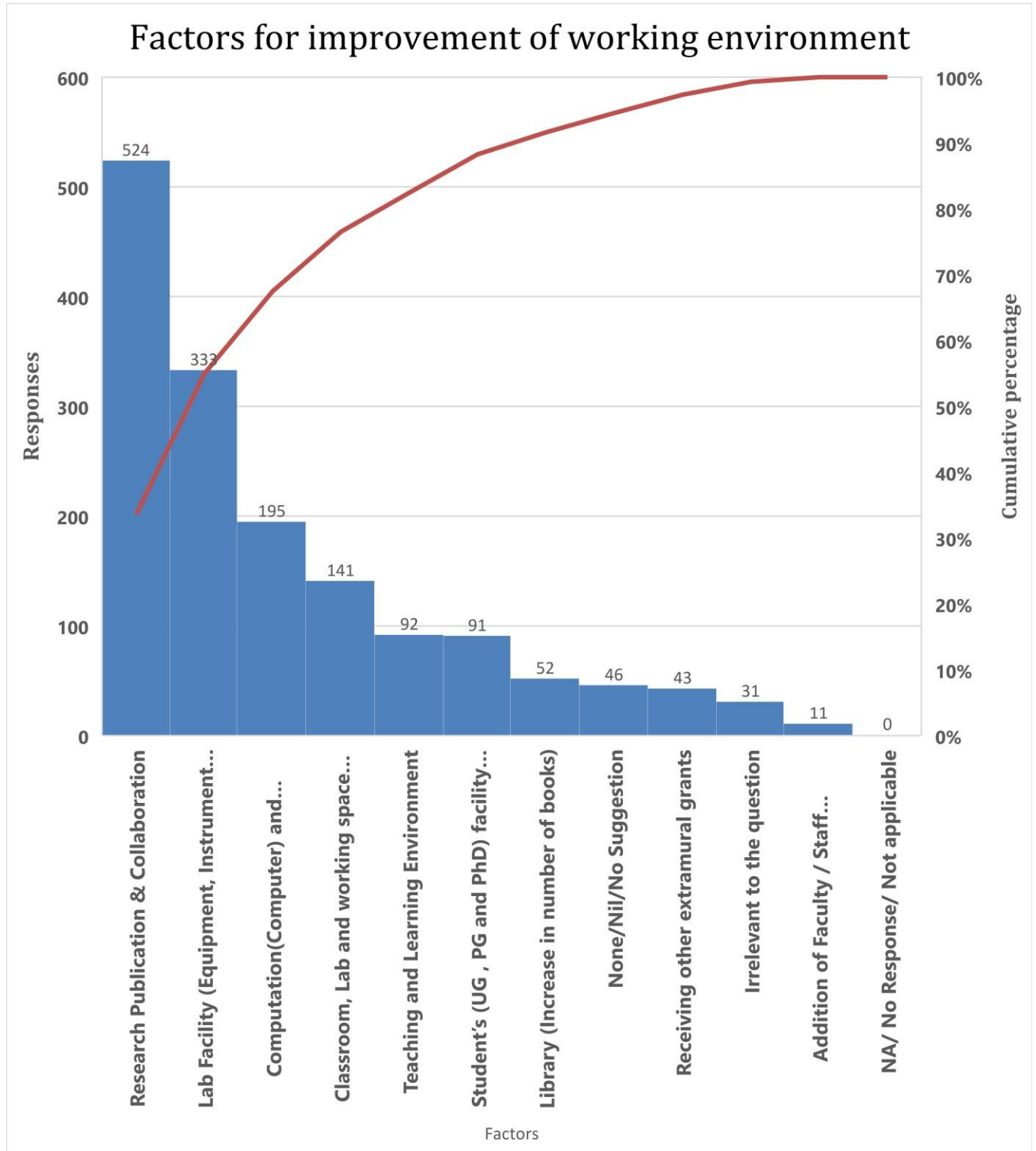
The table 5.3 represents the responses received from various FIST supported departments across southern region with respect to the factors that improved the working environment in the department.

**Table 5.3 Improvement on the Working Environment due to DST-FIST grant in Southern regions (N=1559)**

Item	N (%)
Computation(Computer) and Internet(Networking) Facility	195(12.5)
Lab Facility (Equipment, Instruments) and its maintenance.	333(21.4)
Classroom, Lab and working space Renovated	141(9.0)
Research Publication & Collaboration	524(33.6)
Student's (UG , PG and PhD) facility improved	91(5.8)
Teaching and Learning Environment	92(5.9)
Library (Increase in number of books)	52(3.3)
Addition of Faculty / Staff /Collaboration.	11(0.7)
Receiving other extramural grants	43(2.8)
None/Nil/No Suggestion	46(3.0)
Irrelevant to the question	31(2.0)
NA/ No Response/ Not applicable	0(0.0)
Total	1559

It is evident that from the table 5.3 that, out of 1559 responses, 524 (33.6%) responses perceived that research publication and collaboration in the department has been a significant factor for the improvement of working environment, followed by lab facility (equipment, infrastructure) and its maintenance with 333 (21.4%) responses. The computational and internet facility with 195 (12.5 %) responses, classrooms, lab and working space with 141 (9%) responses and other minor factors like student facility, library, additional faculty, extramural grants have been the reason to cause improvement in working environment across the departments in southern region.

**Pareto Chart on significant factors for improvement of working environment across various departments in southern region with respect to working environment**



**Fig 24: Pareto chart on factors for improvement on working environment**

#### 5.4 Impediments of DST-FIST support that prevented improvement of Working environment

The responses received from various FIST supported departments across southern region with respect to the impedimental factors towards working environment is presented in table 5.4

**Table 5.4 Impediments of DST-FIST support in Southern regions (N=918)**

Item	N (%)
Lack of faculty/Trained Manpower/Staff/ Administrative Staff	89(9.7)
Lack of Infrastructure /lack of Space/lack of equipment or Instrument/lack of books in library	152(16.6)
Delay in Funds release/ more funds needed/ Annual maintenance grants	293(31.9)
Computation and Networking facility not provided	18(2.0)
Lack of Administrative and Office support	24(2.6)
No Significance/ No impediments	23(2.5)
No Suggestion/none/nil/null	276(30.1)
Irrelevant to question	40(4.4)
NA/Not Applicable/No response	3(0.3)
Total	918

From the table 5.4 it is evident that, out of 918 responses, 293 (31.9%) responses perceived that Delay in Funds release/ more funds needed/ Annual maintenance grants were the obstacles in improving the working environment, followed by 276(30.1%) responses perceived as Nil /None.

Out of 918 responses, 152 (16.6%) responses expressed lack of Infrastructure /Space/equipment / books in library, 89(9.7%) responses expressed lack of faculty/Trained Manpower/Staff/ Administrative Staff and other factors like lack of Computation and Networking facility, Lack of Administrative and Office support are the major impediments towards the improvement of working environment across various departments in southern region.



Pareto Chart on impediments in improvement of working environment across various departments in southern region.

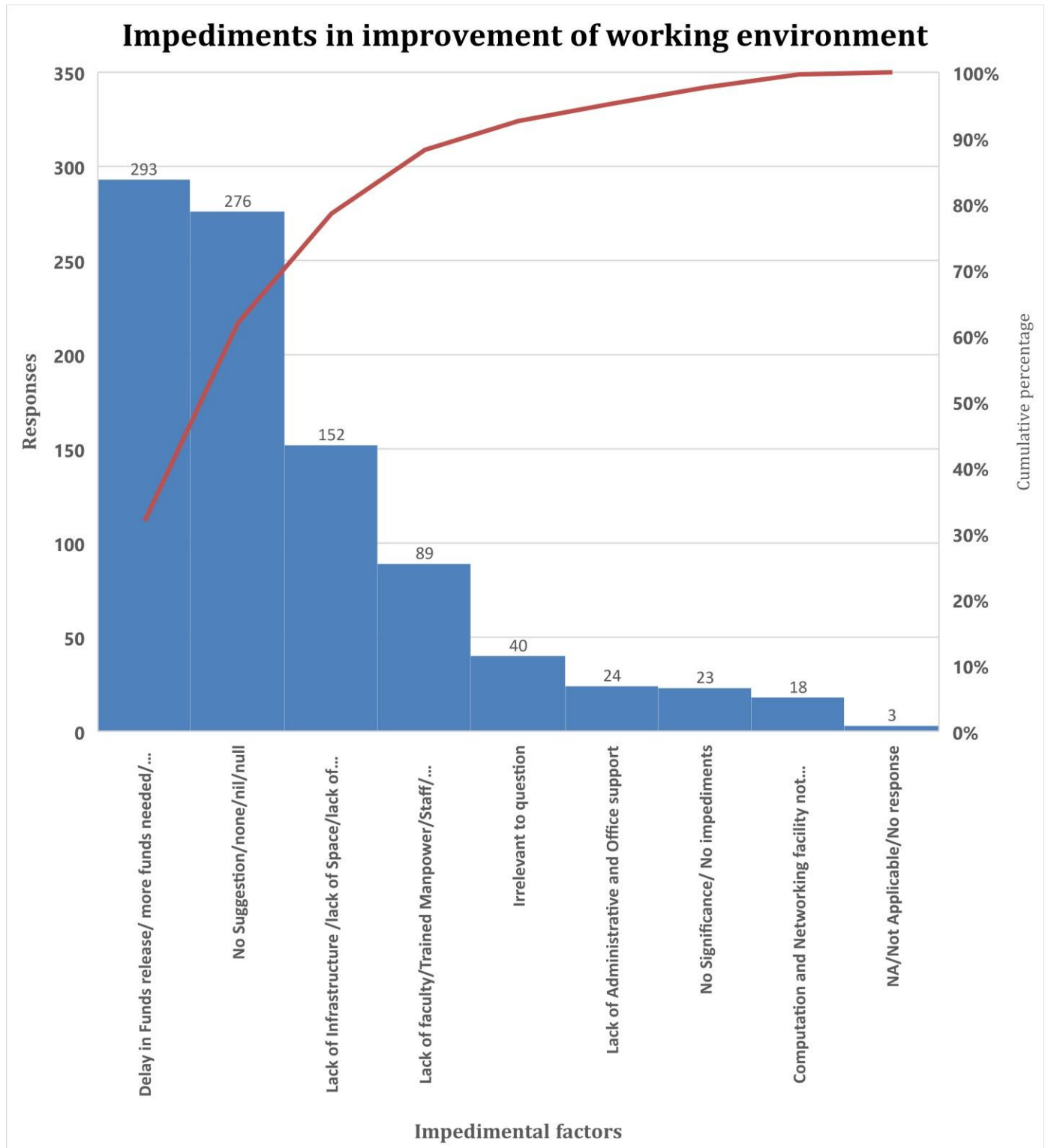


Fig 25: Pareto chart on impediments in improvement of working environment

From the collected information, it is evident that DST-FIST is having positive impact on working environment and also on capacity building of human resources.

Regarding impediments of DST-FIST support, following issues are highlighted by the respondents.

1. Delay in fund release and lack of support for annual maintenance contract.
2. Shortage of space and related infrastructure.
3. Lack of trained manpower and staff for handling procured equipment.

**To sum up, the salient features are as follows:**

- Majority of the responses perceived that the DST-FIST support has substantially improved the overall working environment at department levels.
- 83% of departments gave their opinion as improved and significantly improved for all the factors with respect to working environment.
- 152 % change is evident from the overall activities of capacity building in 509 departments across southern region.
- The activities in the capacity building increased to 13406 (after FIST) from 5319 (before FIST).
- Out of 1559 responses, 524 (33.6%) responses perceived that research publication and collaboration in the department has been a significant factor for the improvement of working environment.
- Out of 918 responses, 293 (31.9%) responses perceived that Delay in Funds release/ more funds needed/ Annual maintenance grants were the obstacles in improving the working environment, 152 (16.6%) of responses expressed lack of Infrastructure /Space/equipment / books in library.

**CHAPTER 6**  
**IMPACT ON ACADEMIC AND RESEARCH PERFORMANCE**

## CHAPTER 6

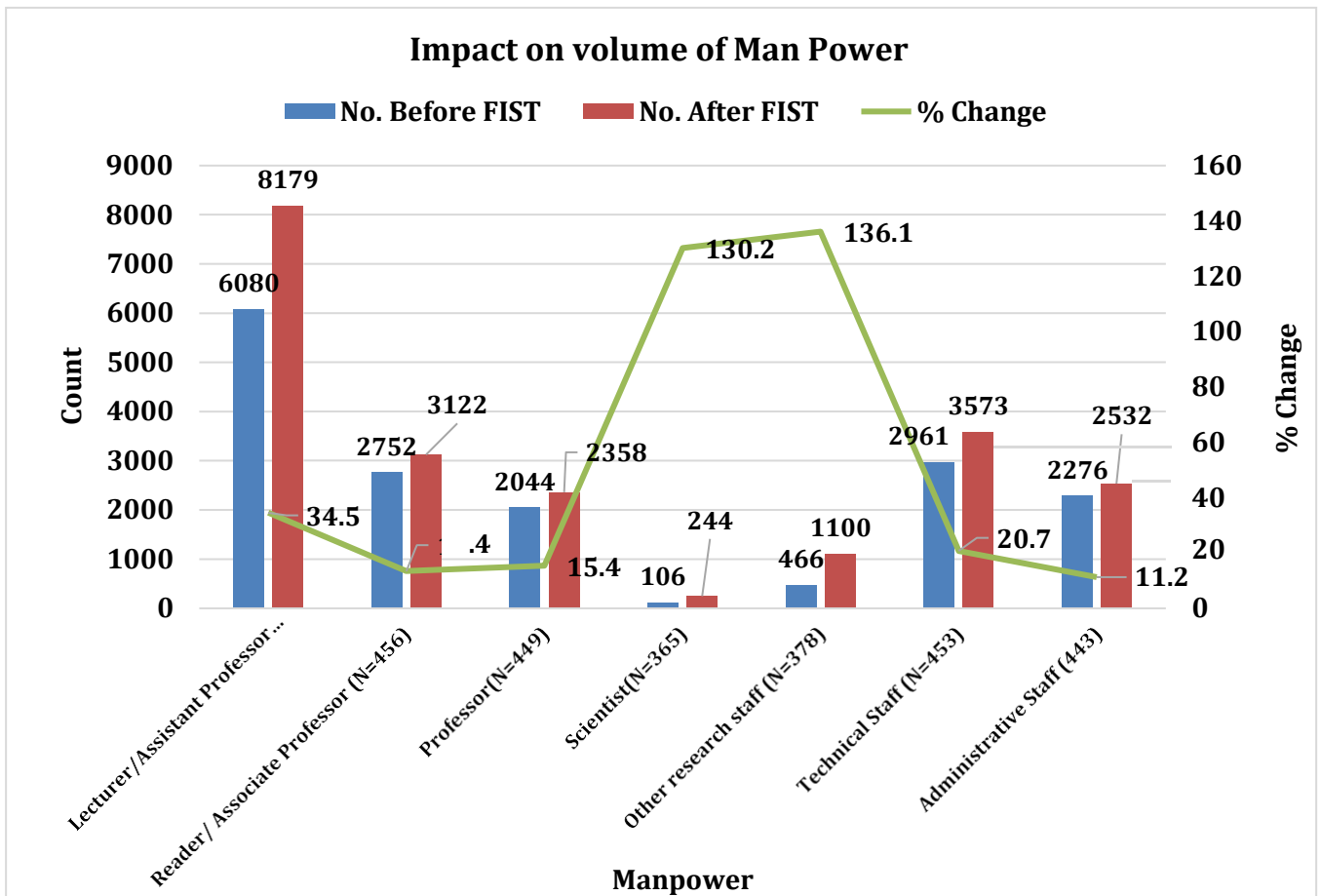
### IMPACT ON ACADEMIC AND RESEARCH PERFORMANCE

DST-FIST grants had been utilised by the institutions to set up different laboratories, to procure the equipment, instruments. These facilities have helped the institutions to start new courses, enhance the intake particularly for higher education. State of the art equipment has helped in solving research problems, thus resulting in enhancement for the registration to Ph.D. courses, which in turn increase the volume and quality of research program. All these activities enhance the research intensity in the institution and also intramural, extramural funding for research. Quality of research paper is one of the important factors used to evaluate the performance of research centre/institution. To evaluate the impact on the quality of the research program, data were collected regarding publication of books, books chapters, original articles, review articles, editorial notes in journals, monographs before and after the DST-FIST funding.

#### **6.1 Impact on Manpower**

##### **6.1.1 Improvement in manpower at department level after FIST implementation**

The role of competent manpower plays a vital role to enhance productivity and also towards the contribution for the growth of research and innovation. In educational sector, quality and quantity of manpower is directly proportional to overall productivity of the institution and quality of outgoing students. The scenario of the manpower based on designation at department level, before and after FIST implementation is shown in the Fig 26.

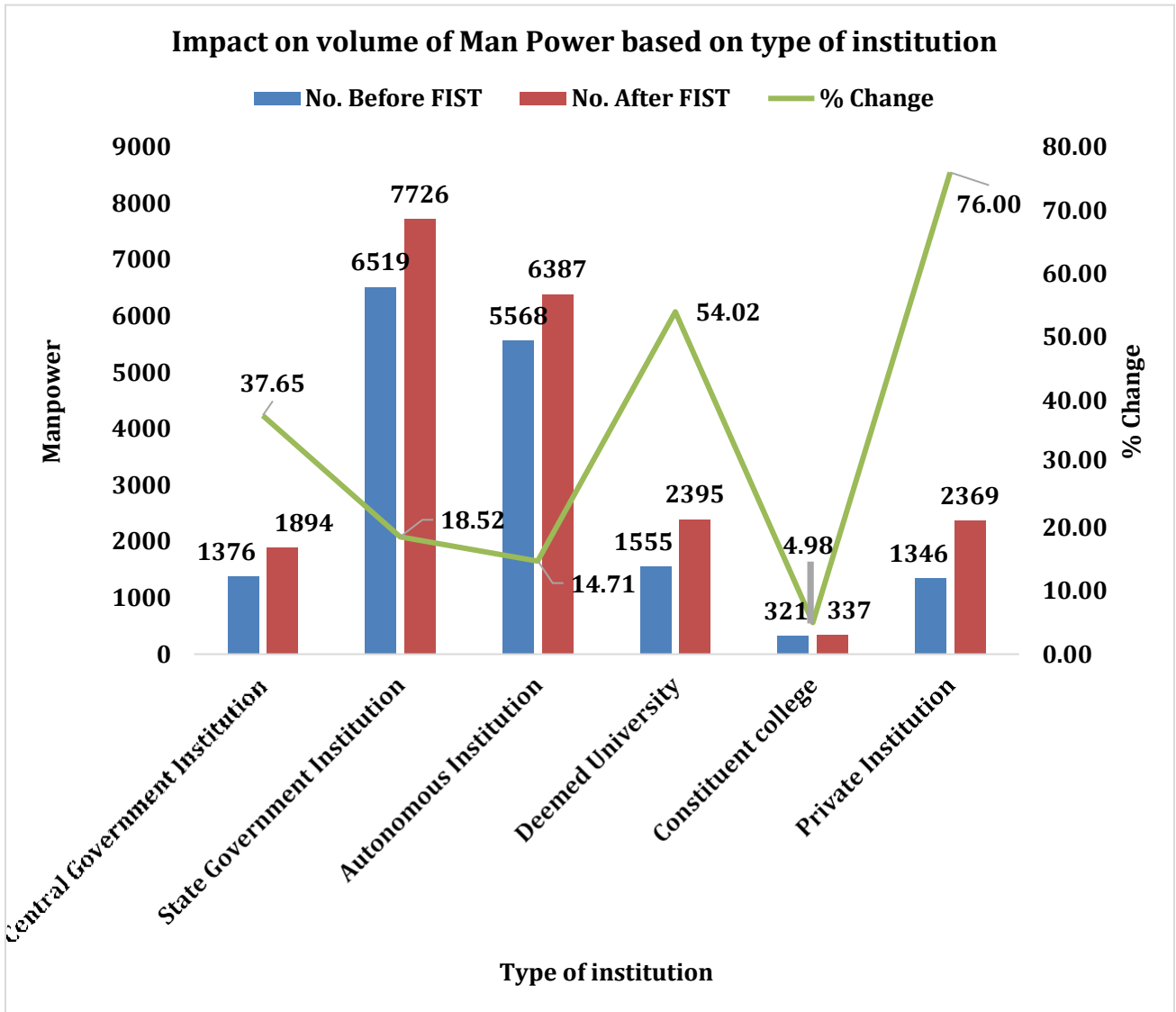


**Fig 26: Status of manpower before and after FIST implementation (N=509)**

From the Fig 26, it can be inferred that, out of 509 FIST projects, the status of the manpower, in case of lecturer/Assistant professor has changed by 34.5%. In case of Reader/Associate professor was changed by 13.4%, Professor by 15.4%, Scientist by 130.2%, research staff by 136.1 %, technical staff by 20.7 & administrative staff by 11.2%. The overall improvement in volume of manpower in different categories after FIST implementation across the institutions was about 26.5%. This may due to reasons like opening of new courses, increase in intake of various programs.

### 6.1.2 Improvement in manpower based on academic status of institution

The manpower across different institutions based on academic status is classified into central and state government institutions, autonomous institutions, deemed university, constituent colleges, and private institutions. The improvement in volume of manpower after FIST implementation at various type of institutions based on academic status is shown in the Fig 27 below.



**Fig 27: Improvement in manpower based on academic status of institution (N=509)**

From the Fig 27, it can be noted that, the volume of manpower in different institutions based on academic status before FIST was 16685 and after FIST it was changed to 21108.

The volume of manpower in central government institutions before FIST was 1376 and after FIST 1894 which accounted to an overall change of 37.6%. In case of state government institutions, the volume of manpower before FIST was 6519 and after FIST is 7726 which accounted to an overall change of 18.5%. In autonomous institutions, the volume of manpower before FIST was 5568 and after FIST 6387 which accounted to an overall change of 14.7%. In deemed university, the volume of manpower before FIST was 1555 and after FIST is 2395 which accounted to an overall change of 54%. In constituent college, the volume of manpower before FIST was 321 and after FIST is 337 which accounted to an overall change of 4.9%. In private institutions, the volume of manpower before FIST was 1346 and after FIST 2369 which accounted to an overall change of 76%.

From the Fig 25, it can be concluded that, there is a significant increase in volume of manpower in private institutions which accounted to 76% compared to central and state government institutions, autonomous institutions, deemed university and constituent colleges. The reason may be, the private management will higher flexibility and take fast decisions in growth cycle.

### 6.1.3 Improvement in manpower based on project levels

The manpower across different institutions based on project levels are classified into L0, L1 and L2. The improvement in volume of manpower after FIST implementation based on project levels in different institutions are shown in table 6.1.

**Table 6.1: Percentage change in manpower based on project levels (N=509)**

Manpower		Improvement in Manpower based on project levels (in nos.)				% Change
		Before FIST		After FIST		
		Σ	Mean ± SD	Σ	Mean ± SD	
L-0	Lecturer/Assistant Professor (N=41)	2483	60.6±56.4	3235	78.9±64.7	30.3
	Reader/ Associate Professor(N=40)	1059	26.5±17.8	887	22.2±17.8	-16.2
	Professor(N=36)	154	4.3±9.6	155	4.3±10.0	0.6
	Scientist(N=36)	3	0.1±0.4	6	0.2±0.6	100.0
	Other research staff(N=35)	3	0.1±0.5	19	0.5±1.6	533.3
	Technical Staff(N=41)	717	17.5±23.3	726	17.7±25.5	1.3
	Administrative Staff(N=40)	776	19.4±23.4	734	18.4±23.1	-5.4
Total		5195		5762		10.9
L-I	Lecturer/Assistant Professor(N=313)	2502	8.0±12.5	3296	10.5±21.7	31.7
	Reader/ Associate Professor(N=300)	1143	3.8±5.6	1413	4.7±8.1	23.6
	Professor(N=294)	919	3.1±4.7	1046	3.6±4.0	13.8
	Scientist(N=243)	54	0.2±1.0	141	0.6±1.4	161.1

**Evaluation of Impact of DST-FIST Project- Southern Region**

	Other research staff(N=253)	192	0.8±2.6	676	2.7±6.9	252.1
	Technical Staff(N=304)	1492	4.9±11.6	1804	5.9±14.3	20.9
	Administrative Staff(N=297)	1076	3.6±9.3	1338	4.5±13.3	24.3
	<b>Total</b>	<b>7378</b>		<b>9714</b>		<b>31.7</b>
L-II	Lecturer/Assistant Professor(N=118)	1121	9.5±25.4	1682	14.3±59.3	50.0
	Reader/ Associate Professor(N=116)	551	4.8±6.1	818	7.1±15.4	48.5
	Professor(N=119)	980	8.2±13.8	1194	10.0±25.8	21.8
	Scientist(N=84)	49	0.6±1.6	97	1.2±2.4	98.0
	Other research staff(N=89)	265	3.0±12.8	392	4.4±17.2	47.9
	Technical Staff(N=107)	766	7.2±16.1	1059	9.9±29.0	38.3
	Administrative Staff(N=105)	426	4.1±4.3	462	4.4±4.6	8.5
	<b>Total</b>	<b>4158</b>		<b>5704</b>		<b>37.2</b>

From the table 6.1, it can be inferred that, the overall improvement in manpower across all the three project levels, before FIST was 16731 numbers and after FIST it was 21180 numbers. Among L-0, L-I and L-II project levels, the improvement in manpower was significant in case of departments that have received L-II projects, which accounted to 37.2 %, followed by L-I with 1.7% and L0 with 10.9%.

It is interesting to note that, from the table across all the 3 project levels L-0, L-I and L-II, there is a noteworthy improvement in case of first two categories of manpower namely Lecturer/ Assistant professor and Reader/ Associate professor after FIST implementation compared with other categories.

## **6.2 Impact on Volume and Quality of Academic Program**

DST-FIST grants had been utilized by the institutions to set up different laboratories, to procure the equipment, and cutting-edge technology instruments. These facilities had helped the institutions to start new courses, enhance the intake particularly for higher education. State of the art equipment had helped them to work on new research problems, thus resulting in enhancement for the registration to Ph.D. courses, which in turn increase the volume and quality of research program. All these activities, will definitely enhance the research intensity in the institution and also helps to get intramural, extramural funding for the research.



### 6.2.1 Impact on sanctioned seats in various courses across FIST supported institutions

In order to know the impact of DST-FIST program on sanctioned seats in graduation, post-graduation, Ph.D., M.Phil. and in PG Diploma courses, the data was collected before FIST and after FIST implementation. The status of sanctioned seats in various courses before and after FIST are tabulated in table 6.2.

**Table 6.2: Impact on sanctioned Seats in various courses across FIST supported institutions (N=509)**

Courses	No. Before FIST		No. After FIST		% Change
	Σ	Mean ± SD	Σ	Mean ± SD	
Graduation (N=232)	52592	226.7±4.7.8	68308	294.4±633.7	29.9
Post-graduation (N=441)	26475	60.0±1.8.7	34181	77.5±141.1	29.1
M. Phil (N=153)	5632	36.8±1.4.9	6499	42.5±181.8	15.4
Ph.D.(N=323)	9200	28.5±3..3	15058	46.6±73.0	63.7
PG Diploma(N=28)	1104	39.4±4..2	1255	44.8±57.0	13.7
<b>Total</b>	<b>95003</b>		<b>125301</b>		<b>31.9</b>

From the table 6.2, it can be inferred that, overall improvement in sanctioned seats after FIST implementation was about 31.9 % in various courses among FIST supported institutions. Further, it is evident that, there is a major improvement in sanctioned seats in Ph.D. programs which accounted to 63.7% followed by Graduation, Post-graduation, M.Phil. and PG diploma programs. This clearly indicates that, the research and developmental activities is significantly improved as there is increase in sanctioned seats in Ph.D. program after FIST program implementation.

### 6.2.2 Impact on overall admission in various courses across FIST supported institutions

In order to know the impact of DST-FIST program on overall admission in graduation, post-graduation, Ph.D., M.Phil. and in PG Diploma courses, the data was collected on before FIST and after FIST implementation. The details of improvement with respect to overall admission in various courses before and after FIST are tabulated in table 6.3.

**Table 6.3: The status of admission in various courses across FIST supported institutions (N=509)**

Courses (N)	Before FIST		After FIST		% Change
	Σ	Mean ± SD	Σ	Mean ± SD	
Graduation(N=208)	46083	221.6±378.4	61699	296.6±610.5	33.9
Post-graduation(N=369)	23181	62.8±108.5	30411	82.4±141.0	31.2
M. Phil(N=122)	2396	19.6±30.1	2995	24.5±37.4	25.0
Ph.D.(N=186)	4540	24.4±26.7	7802	41.9±52.9	71.9
PG Diploma(N=21)	883	42.0±95.9	1166	55.5±138.3	32.0
Total	77083		104073		35.0

From the table 6.3, it can be inferred that, overall improvement in admission after FIST implementation was about 35 % in various courses among FIST supported institutions. Further, it is evident that, there is a major improvement in admission of Ph.D. programs which accounted to 71.9% followed by Graduation, PG diploma Post-graduation and M.Phil. programs. It clearly indicates that implementation of FIST program gave a remarkable improvement in overall admission of Ph.D. programs across FIST supported institutions due to the availability of S&T infrastructural facility to carry out research in diversified area.

### 6.2.3 Student Performance across the FIST supported institutions

In order to know the impact of DST-FIST program on overall pass percentage in graduation, post-graduation, Ph.D., M.Phil. and in PG Diploma courses, the data was collected on before FIST and after FIST implementation. The details of changes with respect to overall pass percentage in various courses before and after FIST are tabulated in table 6.4.

**Table 6.4: Student Performance across the FIST supported institutions (N=509)**

Courses	Before FIST			After FIST		
	No. Admission	No. Passed	(%)Pass	No. Admission	No. Passed	(%)Pass
Graduation(N=208)	46083	36802	79.9	61699	51112	82.8
Post-graduation(N=369)	23181	23564	100	30411	32898	100
M. Phil(N=122)	2396	2976	100	2995	3625	100
Ph.D.(N=186)	4540	3910	86.1	7802	6925	88.8
PG Diploma(N=21)	883	897	100	1166	1133	97.2
Total	77083	68149	88.4	104073	95693	91.9

From the table 6.4, it can be inferred that, overall improvement in pass percentage among various courses before FIST was 88.4% and after FIST was 92%.

In case of graduation courses, the pass percentage before FIST was 79.9% and after FIST it improved to 82.8%, followed by Post-graduation, the pass percentage before and after FIST was 100% and with respect to Ph.D., the pass percentage before FIST was 86.1% and after FIST it improved to 88.8%. From the table it is evident that, there was a marginal change in pass percentage of various courses after FIST implementation.

#### 6.2.4 Students passing with Grade A or First Division

In order to know the impact of DST-FIST program on students securing grade A or first division in graduation, post-graduation, Ph.D., M.Phil. and in PG Diploma courses, the data was collected on before FIST and after FIST implementation. The details of improvement with respect to students securing Grade A of First Division in various courses before and after FIST are tabulated in table 6.5.

**Table 6.5: Students passing with Grade A or First Division (N=509)**

Courses	Before FIST			After FIST		
	No. Admission	No. Passed (Grade A)	(%) Pass	No. Admission	No. Passed (Grade A)	(%) Pass
Graduation(N=208)	46083	21388	46.4	61699	29709	48.2
Post-graduation(N=369)	23181	17665	76.2	30411	23370	76.8
M. Phil(N=122)	2396	2784	100	2995	3745	100
Ph.D.(N=186)	4540	3722	82.0	7802	6692	85.8
PG Diploma(N=21)	883	555	62.9	1166	453	38.9
Total	77083	46114	59.8	104073	63969	61.5

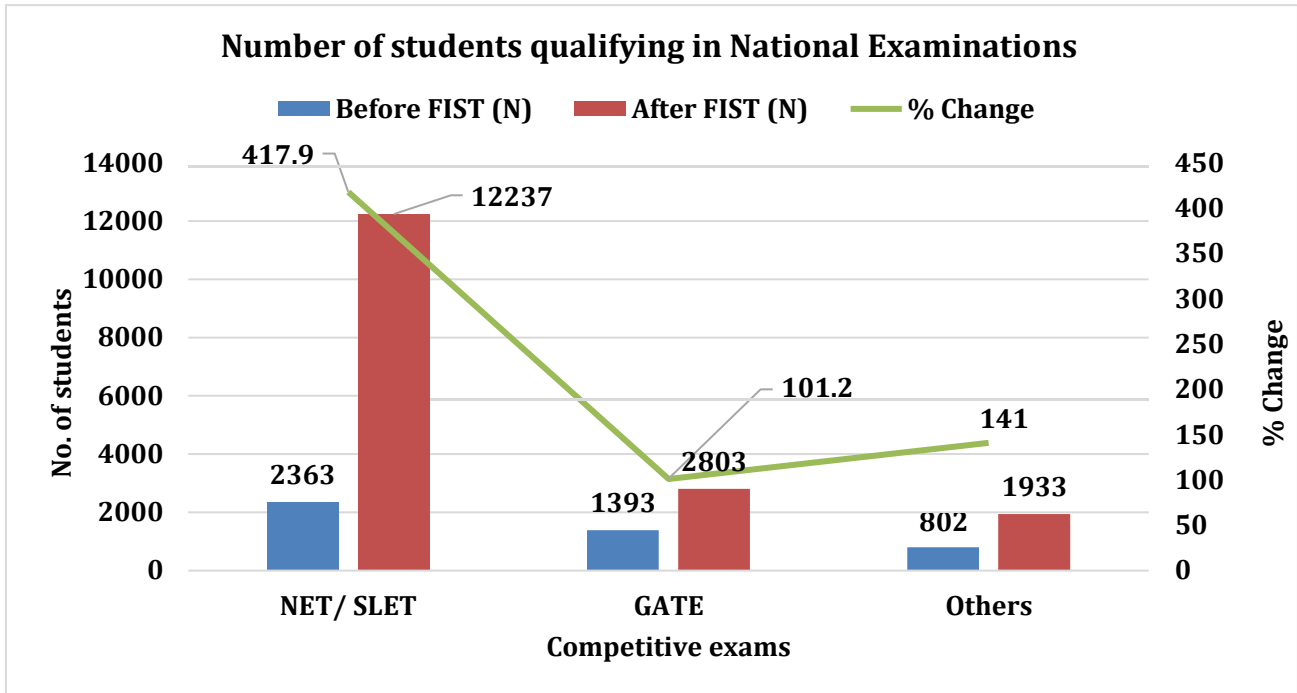
\*Ph.D. = Awarded

From the table 6.5, it can be inferred that, overall improvement in students securing Grade A or First Division in various courses before FIST was 59.8% and after FIST was 61.5%.

In case of graduation courses, the students securing Grade A before FIST was 46.4% and after FIST it was improved to 48.2%, followed by Post-graduation, the students securing Grade A, before FIST, it was 76.2% and after FIST it improved to 76.8%, in case of Ph.D. course, the students awarded with Ph.D. before FIST was 82% and after FIST it improved to 85.8% and with respect to M.Phil., the students securing Grade A before and after FIST was 100%. It is interesting to note that in PG Diploma course, the students securing Grade A before FIST was 62.9% and after FIST it declined to 38.9%. This implies decrease in students securing Grade A/First Division with respect to PG Diploma course across various departments in southern region. From the table it is evident that, there was a marginal improvement of 2% in students securing Grade A or First division in various courses after FIST implementation.

### 6.2.5 Improvement in students qualifying for National Level Examinations

The data was collected to assess the influence of DST-FIST program in improving students qualifying for NET/SLET, GATE and Other national level examination. The details of improvement in number of students qualifying in national level examinations before and after FIST are shown in the Fig 28 below.



**Fig 28: Improvement in students qualifying for National Level Examinations (N=509)**

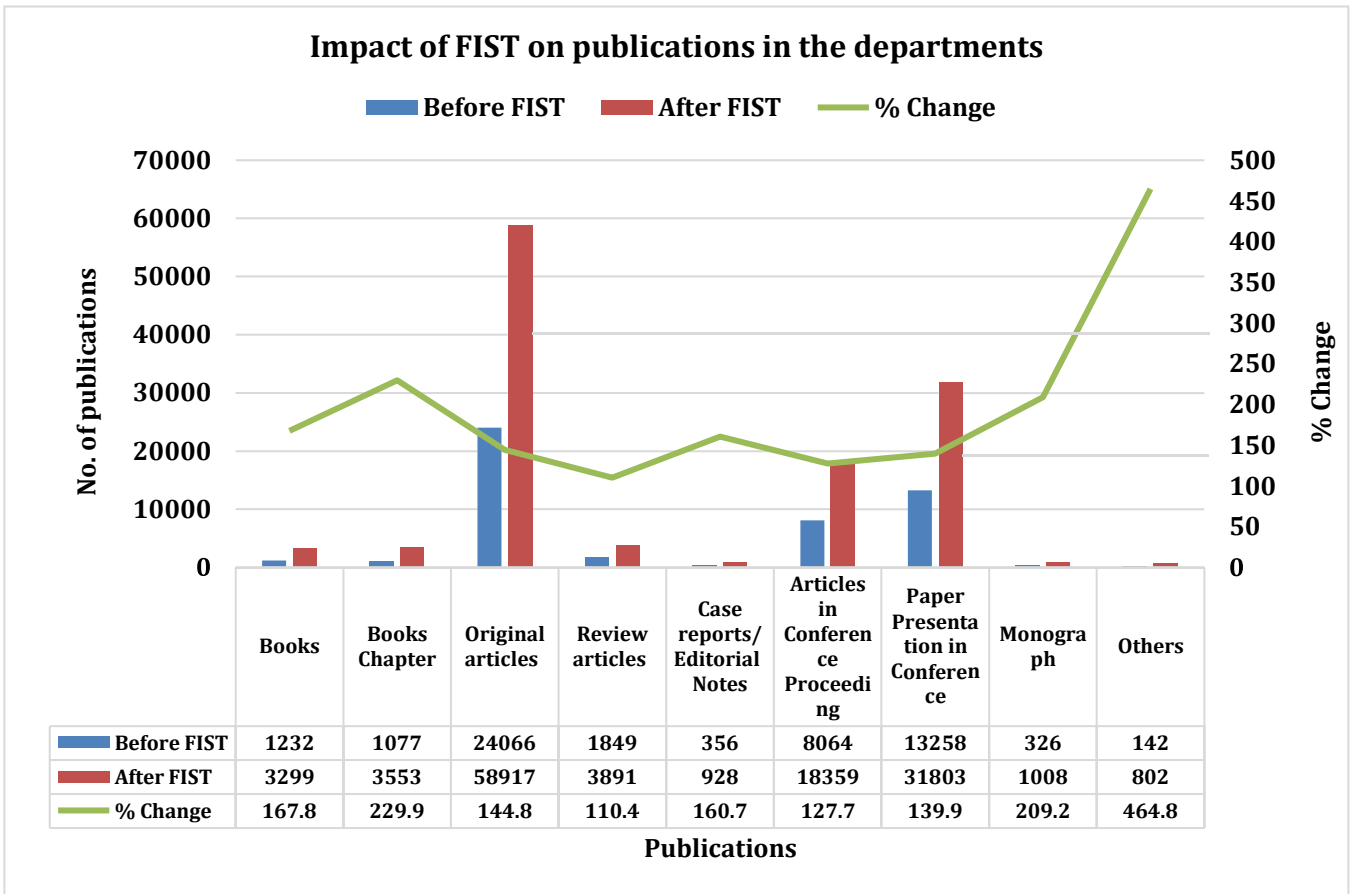
From the Fig 28, it is evident that, the overall improvement in number of students qualifying for national examinations after FIST implementation which accounted to be 272.4%.

The number of students qualifying for NET/SLET examinations before FIST was 2363 numbers and after FIST it was 12237 numbers, with an increase of 9874 qualifying students.

The number of students qualifying for GATE examinations before FIST was 1393 numbers and after FIST it was 2803 numbers, with an increase of 1410 qualifying students. The number of students qualifying for Other national level examinations before FIST was 802 numbers and after FIST it was 1933 numbers, with an increase of 1131 qualifying students. Further from the collected data, it can be inferred that number of students qualifying for NET/SLET exams are more in number compared to GATE and Other exams.

### 6.3 Impact on Volume and Quality of Research outcome

Quality of research paper is one of the important factor used to evaluate the performance of research activity in any academic institutions. Further it also enhances the quality of teaching learning process by setting higher quality standards in education. The data was collected regarding the outcome of research in terms of publication of books, books chapters, original articles, review articles, editorial notes in journals, monographs before and after the DST-FIST funding and the same is shown in the Fig 29 below.



**Fig 29: Impact on Volume and Quality of Research Program (N=509)**

From the Fig 29, it can be inferred that, the change in quality of research program before and after FIST implementation accounted to 143.3%. Further, the increase in number of books published accounted to 167.8% and book chapters accounted to 229.9%. Likewise, the original articles, review articles, case reports/editorial notes increased by 144.8%, 110.4% and 160.7% respectively. With regard to articles in conference proceedings, paper presentation in conference and monographs, there was a considerable improvement which accounted to 127.7%, 139.9% and 209.2% respectively.

### 6.3.1 Trend in research funding and output

For the purpose of identifying the changes in other research funding received by the FIST recipient departments after implementation of FIST program, the data was collected, it is as shown in table 6.6.

**Table 6.6: Trend in research funding and output (N=509)**

Items	Status of DST-FIST Support N=509				
	Decrease N (%)	Can't say N (%)	No change N (%)	Improved N (%)	Sig. Improved N (%)
Intramural Grants	3(0.6)	27(5.3)	137(26.9)	260(51.1)	82(16.1)
Extramural Grants	3(0.6)	18(3.5)	84(16.5)	284(55.8)	120(23.6)
Patents Filed	0(0.0)	53(10.4)	208(40.9)	210(41.3)	38(7.5)
Commercialization of Technology	6(1.2)	82(16.1)	253(49.7)	138(27.1)	30(5.9)
Product and Process Development	2(0.4)	72(14.1)	203(39.9)	196(38.5)	36(7.1)
Papers Published	0(0.0)	4(0.8)	20(3.9)	261(51.3)	224(44)
Trend in Impact Factor	0(0.0)	6(1.2)	14(2.8)	277(54.4)	212(41.7)
Trend in Citation Index	0(0.0)	9(1.8)	20(3.9)	287(56.4)	193(37.9)
Consultancy	3(0.6)	32(6.3)	130(25.5)	259(50.9)	85(16.7)
Extension Work	1(0.2)	26(5.1)	95(18.7)	288(56.6)	99(19.4)

From the table 6.6, it can be inferred that, the FIST recipients acknowledged that they were able to receive research funding from other sources after FIST program implementation in their respective departments.

With respect to Intramural grants 51.1% of respondents expressed as “improved” and 26.9 % claimed it to be “No Change”, followed by extramural grants, 55.8% of respondents expressed as “improved” and 23.6% claimed it to be “Significantly improved”., Patents filed, 41.3% of respondents expressed as “improved” and 40.9% claimed it to be “No Change”., Commercialization of Technology, 49.7% of respondents expressed as “No Change” and 27.1 % claimed it to be “Improved”., Product and Process Development, 39.9 % of respondents expressed as “No change” and 38.5% claimed it to be “Improved”., Papers Published, 51.3% of respondents expressed as “improved” and 44% claimed it to be “Significantly improved”, Trend in Impact Factor, 54.4 % of respondents expressed as “improved” and 41.7% claimed it to be “Significantly improved”., Trend in Citation Index, , 56.4 % of respondents expressed as “improved” and 37.9% claimed it to be “Significantly improved”, Consultancy, 50.9 % of

respondents expressed as “improved” and 25.5% claimed it to be “No Change” and Extension work, 56.6% of respondents expressed as “improved” and 19.4% claimed it to be “Significantly improved”. Majority of the FIST recipients have opined that, the DST FIST support has significantly improved the possibility to secure various grants, consultancy and extension works along with publications of articles.



### 6.4 Impact on volume and quality of Award and Recognition

The awards and recognitions received by faculty/scientists of FIST recipient departments indicates their contribution towards research and development in academia. The data was collected regarding the volume and quality of award and recognition are national and international exchange programs, national and international awards by faculty, fellowship, national and international collaboration before and after the DST-FIST funding and the same is shown in the Fig 30 below.

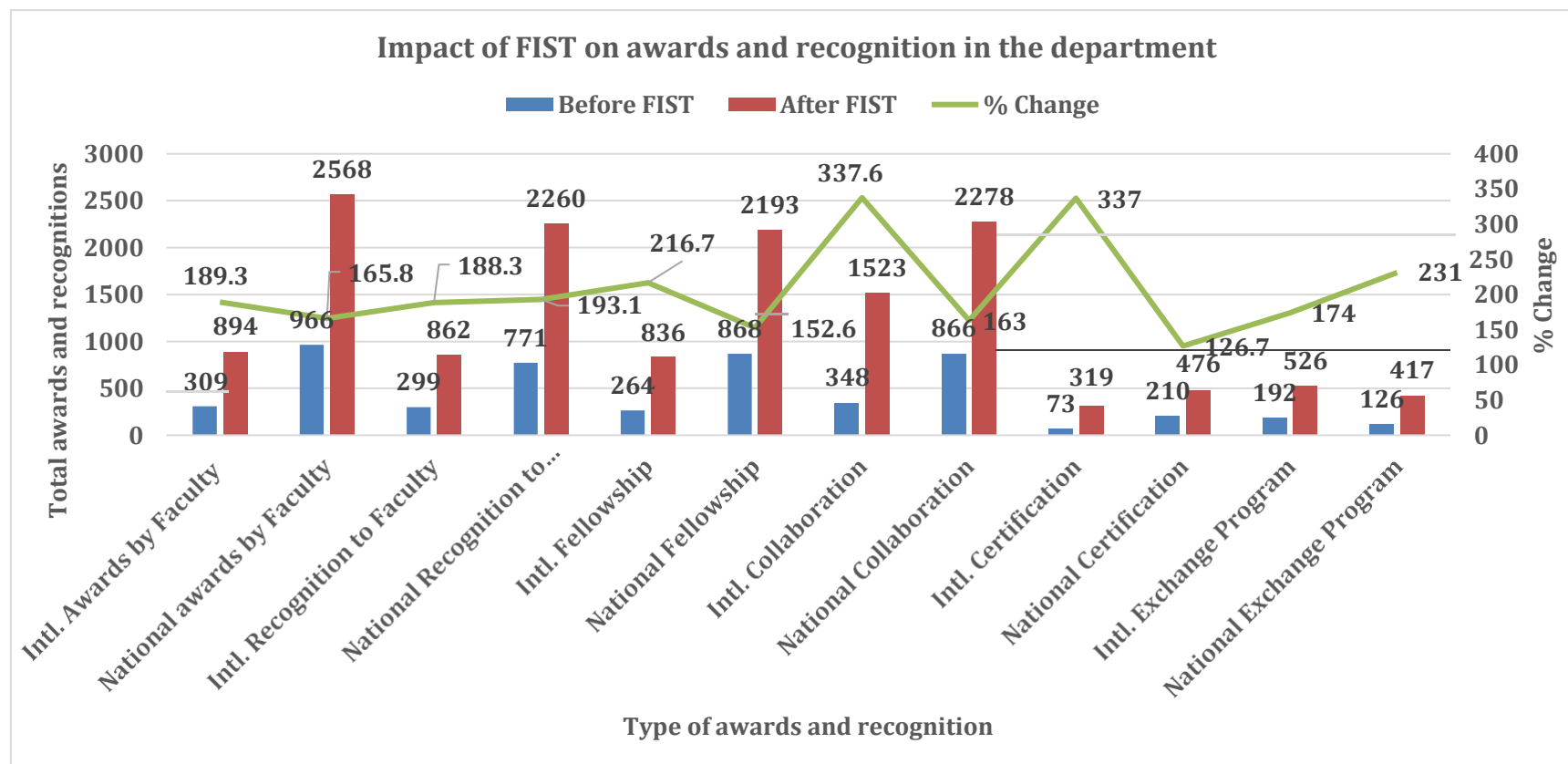


Fig 30: Awards and Recognitions by Faculty/ Scientists (N=509)

From the Fig 30, it is inferred that, the change in quality and volume of awards and recognition by faculty/scientist before and after FIST implementation accounted to 186.3%.

Further, increase in awards and recognitions pertaining to International collaboration, International certifications, National exchange program and International fellowship accounted to 337.6%, 337 %, 231 % and 216.7 % respectively.

Likewise, National recognition to faculty (193.1 % increase), International awards by faculty (189.3 % increase), International recognition to faculty (188.3 % increase), International exchange program (174 % increase), National awards by faculty (165.8 % increase), National collaboration (163 % increase) and National fellowship (152.6 % increase). Awards and recognition pertaining to National Academic certification is the least improved (126 % increase) by faculty and scientists across various departments of southern region.

## 6.5 Summary

**To sum up, the salient features are as follows:**

- The overall improvement in volume of manpower in different categories after FIST implementation across the institutions is about 26.5%.
- The status of the manpower, in case of lecturer/Assistant professor has changed by 34.5%.
- There is a significant increase in volume of manpower in private institutions which accounted to 76% compared to central and state government institutions, autonomous institutions, deemed university and constituent colleges.
- Overall improvement in sanctioned seats after FIST implementation is about 31.9 % increase in various courses among FIST supported institutions.
- Overall improvement in admission after FIST implementation is about 35 % increase in various courses among FIST supported institutions.
- Overall improvement in pass percentage among various courses before FIST was 88.4% and after FIST was 92%.
- Overall improvement in students securing Grade A or First Division in various courses before FIST was 59.8% and after FIST is 61.5%.
- Overall improvement in number of students qualifying for national examinations after FIST implementation which accounted to 272.4% increase.
- The change in quality of research program before and after FIST implementation accounted to 143.3% increase.
- Majority of the FIST recipients have opined that, the DST FIST support has significantly improved the possibility to secure various grants, consultancy and extension works.
- The change in quality and volume of awards and recognition by faculty/scientist before and after FIST implementation accounted to 186.3% increase.

**CHAPTER 7**

**BEST PRACTICES- FIST IMPLEMENTATION**

CHAPTER 7

BEST PRACTICES- FIST IMPLEMENTATION

The DST-FIST funded institutions have got number of processes in implementation of their funded projects. In order to know the effectiveness of various processes they follow, feedback was collected from the respondents of 581 projects implemented by the departments/institutions. The details of this are discussed in this chapter covering parameters like procurement process, infrastructure utilization, maintenance infrastructure, utilization of funds and administrative support.

**7.1 Respondents Level of Satisfaction in Administrative Process**

To know the respondents opinion about various administrative processes with respect to FIST program, the data was collected regarding procurement process, infrastructure utilization, maintenance of infrastructure, utilization of funds and administrative support. Based on the collected data, the respondent satisfaction level regarding administrative process involved in FIST program implementation as shown in table 7.1.

**Table 7.1: Respondents Level of Satisfaction in Administrative Process (N=509)**

Process	N	Number Satisfied	% Satisfied
Procurement Process	509	475	93.3
Infrastructure utilization	509	499	98.0
Maintenance of infrastructure	509	397	78.0
Utilization of Funds	509	487	95.7
Administrative Support	509	475	93.3

From the table 7.1, it can be inferred that, majority of the respondents were satisfied with the administrative processes involved in FIST implementation program except for maintenance of infrastructure. With respect to procurement process, 93.3% of respondents expressed satisfaction. Likewise, with regard to infrastructure utilization it was 98%, utilization of funds was 95.7%, administrative support was 93.3%, whereas in case of maintenance of infrastructure it was only 78%. This clearly indicates there was a major concern expressed by the FIST recipients regarding maintenance of procured infrastructure facility.

**7.2 Best Practices**

**7.2.1 Procurement of Equipment**

**Respondent opinion on Procurement of Equipment**

The FIST recipients opinion about the procurement of equipment, the process involved and time duration in procurement are tabulated in table 7.2.

**Table 7.2: Respondents opinion on Procurement of equipment (N=1101)**

Item	N (%)	Summarized responses
Simplified procurement process	277(25.2)	757(68.75%)
Procurement is done as per university/govt./DST rules	138(12.5)	
Administrative Supportive	125(11.4)	
Timely release of grant	217(19.7)	
No positive points	0(0)	344(31.25%)
Nil/No suggestions/None	344 (31.25)	
Total	1101	1101

From the table 7.2 it is evident that, out of 1101 responses, 757 were on a positive note and 344 included no responses/no suggestions/ not applicable and others. The positive aspects expressed by the FIST recipients with respect to procurement process and time included simplified procurement process which accounted to 25.2%, procurement as per university/government/DST norms contributed to 12.5%, administrative support accounted to 11.4%, and timely reception of grants accounted to 19.7%.

**Constraints in equipment procurement process and time**

The various constraints encountered by FIST recipients with regard to procurement of equipment, the procurement process and time is as shown in table 7.3.

**Table 7.3: Constraints in equipment Procurement Process and time (N=861)**

Item	N (%)	Summarized responses
No provision of customs, freight etc. on equipment import	72(8.4)	670 (77.81%)
Delay in release of funds	42(4.9)	
Poor administrative support	14(1.6)	
Lack of trained technical staff	30(3.5)	
Supplier related problems	61(7.1)	

Delay in procurement and payment	357(41.5)	
Lack of funds for AMC	94(10.9)	
No constraints points	5(0.6)	191 (22.19%)
No responses / suggestions	186(21.60 )	
<b>Total</b>	<b>861</b>	<b>861</b>

From the table 7.3, it is evident that, out of 861 responses, 670 responses indicated the various constraints faced by FIST recipients in equipment procurement process and time. The remaining 191 responses represented No constraints points and No responses/suggestions. The major constraints expressed by the FIST recipients was delay in procurement and payment, which accounted to 41.5. The other constraints were limited lack of funds for AMC which accounted to 10.9%, no provision of customs, freight etc. on equipment import accounted to 8.4%, supplier related problems accounted to 7.1%, delay in release of funds accounted to 4.9%, lack of trained technical staff accounted to 3.5% and poor administrative support accounted to 1.6%. As the major constraint expressed by respondents was regarding delay in installation and procurement of equipment by taking necessary measure to simplify the process of procurement and installation.

**Suggestions for improvement on procurement process and time**

To identify the better practices and suggestions for improving procurement process and time, the opinions of FIST recipients was collected as shown in table 7.4.

**Table 7.4: Suggestions for improvement on procurement process and time (N=822)**

<b>Item</b>	<b>N (%)</b>	<b>Summarized responses</b>
Centralized procurement system	2(0.2)	598 (73%)
Reduction in paper work and office bureaucracy	16(1.9)	
Currency conversion facility	19(2.3)	
Direct procurement by DST	7(0.9)	
Provision for dedicated technical staff	33(4)	
Timely release of funds	13(1.6)	
Financial independence to PI	461(56.1)	
Provision for AMC to equipment	46(5.6)	
Adequate funds for travel and hospitality	1(0.1)	
No response/suggestions	224 (27)	
<b>Total</b>	<b>822</b>	<b>822</b>

From the table 7.4, it is evident that, out of 822 responses, 73% of responses suggested improvements in procurement process and time. Around 461 (56.1%) of responses

suggested financial independence to PI. This was followed by provision for AMC to equipment which accounted to 5.6%, provision for dedicated technical staff accounted to 4%, currency conversion facility accounted to 2.3%, reduction in paper work and office bureaucracy accounted to 1.9% and timely release of funds accounted to 1.6%.

The other suggestions included direct procurement by DST (0.9%), centralized procurement system (0.2%), and adequate funds for travel and hospitality (0.1%).

### 7.2.2 Utilization of infrastructure and Services

#### Positive opinion of respondents on utilization of infrastructure and services

The FIST recipients opinion about the utilization of infrastructure and services are tabulated in table 7.5.

**Table 7.5: Responses on Utilization of infrastructure & services (N=1066)**

Item	N (%)	Summarized responses
Improvement in computational and internet facility	66(6.2)	1003 (94.09%)
Improvement in laboratory facilities	9(0.8)	
Improvement in infrastructure	205(19.2)	
Improvement in quality of research and working environment	497(46.6)	
Improvement in library facilities	8(0.8)	
Improvement in teaching and training activities	75(7)	
Improvement in admission of UG/PG students	30(2.8)	
Administrative support and fund utilization	99(9.3)	
Improvement in volume of manpower	14(1.3)	
No response/suggestions	63 (5.91)	63 (5.91%)
Total	1066	1066

From the table 7.5, it can be inferred that, out of 1066 responses, 1003 responses expressed positive points about utilization of infrastructure and services created under FIST funds. The improvement in quality of research and working environment alone accounted to 46.6%, Improvement in infrastructure (19.2%), Administrative support and fund utilization (9.3%), Improvement in teaching and training activities (7%), Improvement in computational and internet facility (6.2%), Improvement in admission of UG/PG students (2.8%), Improvement in volume of manpower (1.3%), Improvement in library and laboratory facilities was 0.8% and No response/suggestions (5.91%).



**Constraints faced in utilization of infrastructure and services**

The constraints faced by FIST recipients with regard to the utilization of infrastructure and services as shown in table 7.6.

**Table 7.6: Constrains faced in Utilization of infrastructure & services (N=789)**

Item	N (%)	Summarized responses
Delay in civil works	4(0.5)	404 (51.20%)
Delay in funding and lack of AMC support	190(24.1)	
Lack of trained technical staff	103(13.1)	
Unstable power supply and internet	31(3.9)	
Poor administrative support	73(9.3)	
Lack of space and other infrastructure	3(0.4)	
No Constraints	69 (8.7)	385 (48.80%)
No response/suggestions	316 (40)	
Total	789	789

From the table 7.6, it is evident that, out of 789 responses, 404 responses expressed various constraints with regard to utilization of infrastructure and services. The major constraints expressed by FIST recipients was about delay in funding and lack of AMC support which accounted to 24.1%. The other constraints included lack of trained technical staff (13.1%), poor administrative support (9.3%), unstable power supply and internet (3.9%), delay in civil works (0.5%) and lack of space and other infrastructure (0.4%). The number of no responses/ suggestions accounted to 40% and no constraints were 8.7%.

**Suggestions for improvement in utilization of infrastructure and services**

To identify the better practices and suggestions for improvement in utilization of infrastructure and services, the opinions of FIST recipients are collected as shown in table 7.7.

**Table 7.7: Suggestions for improvement in utilization of infrastructure and services (N=643)**

Item	N (%)	Summarized responses
More funds for infrastructure and equipment	138(21.5)	454 (70.60%)
Provision for AMC to equipment	66(10.3)	
Provision for skilled faculty and technical staff	70(10.9)	
Upgradation of teaching and research	54(8.4)	
Administration autonomy and more transparency	83(12.9)	
Proper utilization of fund	1(0.2)	
Improvement in facilities and infrastructure	42(6.5)	
No response/suggestions	189 (29.40)	189 (29.40%)
Total	643	643

From the table 7.7, it is evident that, out of 643 responses, 454 responses suggested the improvement measures for utilization of infrastructure and services.

Around 138 (21.5%) of responses expressed the need for more funds for infrastructure and equipment. The other suggestions provided were administration autonomy and more transparency (12.9%), provision for skilled faculty and technical staff (10.9%), provision for AMC to equipment (10.3%), upgradation of teaching and research (8.4%), improvement in facilities and infrastructure (6.5%) and No responses /suggestion (29.40%).

### 7.2.3 Maintenance of infrastructure

#### Positive opinion of respondents on maintenance of infrastructure

The FIST recipients opinion about the maintenance of infrastructure are tabulated in table 7.8.

**Table 7.8: Response on Maintenance of Infrastructure (N=796)**

Item	N(%)	Summarized responses
Maintenance support by parent institution	74(9.3)	534 (67.08%)
Equipment maintenance by faculty/ technical staff	81(10.2)	
Maintenance supported by DST grant	42(5.3)	
Centralization of research and academic facility	337(42.3)	
No positive point	3(0.4)	262
No response/suggestions	259 (32.53)	(32.92%)
Total	796	796

From the table 7.8, it can be inferred that, out of 796 responses, 534 responses expressed positive opinion regarding maintenance of infrastructure. The respondents appreciated the centralization of research and academic facility which accounted to 42.3%. The other points expressed are equipment maintenance by faculty/ technical staff (10.2%), maintenance support by parent institution (9.3%), maintenance supported by DST grant accounted to 5.3%, No positive point (0.4%) and No responses accounted to (32.53%).

**Constraints faced with regard to maintenance of infrastructure**

The constraints faced by FIST recipients with regard to the maintenance of infrastructure are shown in table 7.9.

**Table 7.9: Constraints faced with regard to Maintenance of Infrastructure (N=755)**

Item	N(%)	Summarized responses
Lack of AMC	131(17.35)	489 (64.7%)
Lack of long term support	103(13.6)	
Lack of trained technical staff	90(11.9)	
Delay in funding and lack of administrative support	166(22)	
No response/suggestions	266 (35.3%)	266(35.3%)
Total	755	755

From the table 7.9, it is evident that, out of 755 responses, 489 (64.7%) responses expressed various constraints with regard to maintenance of infrastructure. The major constraints expressed by FIST recipients was about delay in funding and lack of administrative support which accounted to 22%. The other constraints were lack of AMC (17.2%), lack of long term support (13.6%) and lack of trained technical staff (11.9%).

**Suggestions for improvement in maintenance of infrastructure**

To identify the better practices and suggestions for improvement in maintenance of infrastructure, the opinions of FIST recipients are collected as shown in table 7.10.

**Table 7.10: Suggestions for improvement in maintenance of infrastructure (N=740)**

Item	N(%)	Summarized responses
Timely release of maintenance grant	154(20.8)	455 (61.48%)
Provision of extended maintenance grant	176(23.7)	
Availability of trained technical staff	74(10)	
Uninterrupted power supply and administrative support for labs	51(6.8)	
No response/suggestions	285 (38.51%)	285 (38.51%)
Total	740	740

From the table 7.10, it is evident that, out of 740 responses, 455 responses suggested the improvement measures for maintenance of infrastructure.

Around 176 (23.7%) of responses expressed provision of extended maintenance grant. The other suggestions provided were timely release of maintenance grant (20.8%), availability of trained technical staff (10%) and uninterrupted power supply and administrative support for labs (6.8%).

**7.2.4 Utilization of funds**

Positive opinion of respondents on utilization of funds.

The FIST recipients opinion about the utilization of funds are tabulated in table 7.11.

**Table 7.11: Response on Utilization of Fund (N=885)**

Item*	N(%)	Summarized responses
Timely release and utilization of funds	205(23.1)	687 (77.62%)
Funds utilized as per rule	30(3.3)	
Good administration support	83(9.3)	
Support of DST	14(1.5)	
Development of infrastructure	355(40.1)	
No Positive points	3(0.8)	198
No response/suggestions	195 (22.03)	(22.38%)
Total	885	885

From the table 7.11, it can be inferred that, out of 885 responses, 77.62% of responses expressed positive opinion regarding utilization of funds. The responses regarding development of infrastructure which accounted to 40.1% followed by timely release and utilization of funds accounting to 23.1%. The other responses expressed were good administration support (9.3%), funds utilized as per rule (3.3%) and support by DST (1.5%).

**Constraints faced in utilization of funds**

The constraints faced by FIST recipients with regard to the utilization of funds are shown in table 7.12.

**Table 7.12: Constrains faced in utilization of fund (N=721)**

Item	N(%)	Summarized responses
Delay in fund release	114(15.8)	317 (44%)
Lack of fund for AMC	70(9.7)	
Currency exchange and custom clearance issues	28(3.9)	
Lack of administrative support	68(9.4)	
Lack of power supply	37(5.1)	
No response/suggestions	404(56)	404 (56%)
Total	721	721

From the table 7.12, it is evident that, out of 721 responses, 317 (44%) of responses expressed various constraints with regard to utilization of funds. This clearly indicates positive opinion about DST FIST program. The major constraints expressed by FIST recipients was about delay in fund release which accounted to 15.8%, lack of fund for AMC (9.7%), lack of administrative support (9.4%), lack of power supply (5.1%) and currency exchange and custom clearance issues (3.9%).

**Suggestions for improvement in utilization of funds**

To identify the better practices and suggestions for improvement in effective utilization of funds, the opinions of FIST recipients are collected as shown in table 7.13.

**Table 7.13: Suggestions for improvement in utilization of funds (N=704)**

Item	N(%)	Summarized responses
Timely release of funds	81(11.5)	284 (40.34 %)
Ease of administrative process	50(7.1)	
Need for additional grant	109(15.5)	
Financial autonomy for PIs	44(6.2)	
No response/suggestions	420(59.65)	420 (59.65%)
Total	704	704

From the table 7.13, it is evident that, out of 704 responses, 284 responses suggested the improvement measures for effective utilization of funds. Around 109 (15.5%) of responses expressed need for additional grant. The other suggestions provided were timely release of funds (11.5%), ease of administrative process (7.1%) and financial autonomy for PIs (6.2%).

### 7.2.5 Administrative support

#### Positive opinion of respondents on administrative support

The FIST recipients opinion about the administration support are tabulated in table 7.14.

**Table 7.14: Responses regarding Administrative support (N=817)**

Item	N(%)	Summarized responses
Good administrative support	362(44.3)	598 (73.19%)
Timely release of fund by DST	43(5.3)	
Effective communication and simplified process	113(13.8)	
Centralized procurement system	80(9.8)	
No response/suggestions	219(26.81)	219 (26.81%)
Total	817	817

From the table 7.14, it can be inferred that, out of 817 responses, 73.19% of responses expressed positive opinion regarding administrative support. The responses regarding administrative support expressed that the recipients had received good administrative support which accounted to 44.3% followed by effective communication and simplified process (13.8%), centralized procurement system (9.8%) and timely release of fund by DST (5.3%).

#### Constraints with regard to Administrative support

The constraints faced by FIST recipients about the administration support are tabulated in table 7.15.

**Table 7.15: Constrained faced with regard to Administrative support (N=668)**

Item	N(%)	Summarized responses
Poor administrative support	69(10.3)	381 (57.03 %)
Delay in the administrative process	76(11.4)	
Adherence to DST-FIST norms	2(0.3)	
Lack of space and other infrastructure	15(2.2)	
Issues in utilization of released funds	33(4.9)	
Lack of technical staff	49(7.3)	
No response/suggestions	287(42.97)	287 (42.97%)
Total	668	668

From the table 7.15, it is evident that, out of 668 responses, 381 (57.03%) of responses expressed various constraints with regard to administrative support. The major constraints expressed by FIST recipients was about delay in the administrative process

which accounted to 11.4%, poor administrative support (10.3%), lack of technical staff (7.3%), issues in utilization of released funds (2.2%) and adherence to DST-FIST norms (0.3%).

**Suggestion for improvement in administration support**

The suggestions and better practices for improvement in administration support expressed by FIST recipients are tabulated in table 7.16.

**Table 7.16: Suggestion for improvement in administrative support (N=480)**

Item	N(%)	Summarized responses
Digitalization of transactions through e-governance systems	11(2.3)	74 (15.42%)
Training to technical staff	15(3.1)	
Centralization of procurement system	9(1.9)	
Minimizing administrative delays	18(3.8)	
More autonomy for PI	6(1.2)	
Progress assessments to be done periodically	4(0.8)	
Development of nodal centers for timely decisions	11(2.3)	
No response/suggestions	406(85.58)	406 (84.58%)
<b>Total</b>	<b>480</b>	<b>480</b>

From the table 7.16, it is evident that, out of 480 responses, only 74 (15.42%) responses suggested to the improvement measures for effective administration support. Around 18 responses suggested minimizing administrative delays.

About 15 responses expressed need for training to technical staff, 11 responses each expressed development of nodal centers for timely decisions and digitalization of transactions through e-governance systems, 9 responses suggested for centralization of procurement system, 6 responses suggested more autonomy for PI and 4 responses suggested to carry out progress assessments to be done periodically.

**Policy Imperatives for strengthening FIST scheme**

The suggestions with regard to policy imperatives for strengthening FIST scheme as expressed by FIST recipients are tabulated in table 7.17.

**Table 7.17: Suggestion based on policy imperative for strengthening of FIST scheme (N=856)**

Item	N (%)	Summarized responses
On time release of funds	27(3.2)	613 (71.61%)
Additional funds for AMC and provision for currency exchange	301(35.2)	
Requirement of infrastructure, staff and space	47(5.5)	
Digitalization for transparency and better support	40(4.7)	
Continuous monitoring of fund & support from DST	136(15.9)	
Need for technical staff	19(2.2)	
Encourage research collaboration	25(2.9)	
Impact analysis of project (Within 2 years of project completion)	18(2.1)	
No response/suggestions	243 (28.39)	243 (28.39%)
Total	856	856

From the table 7.17, it is evident that, out of 856 responses, 613 (71.61%) responses suggested policy imperatives for strengthening FIST scheme. Around 301 (35.2%) of responses suggested to provide additional funds for AMC and provision for currency exchange. The other suggestions provided continuous monitoring of fund & support from DST (15.9%), requirement of infrastructure, staff and space (5.5%), digitalization for transparency and better support (4.7%), on time release of funds (3.2%), encourage research collaboration (2.9%), need for technical staff (2.2%) and need to conduct impact analysis of project (Within 2 years of project completion (2.1%).



### 7.3 Summary

**The various best practices of FIST implementation as opined by respondents are summarized below:**

- Around 98% of the respondents were satisfied with infrastructure utilization which is the basic essence of DST-FIST scheme.
- About 78% of the respondents were satisfied with policies of DST-FIST on maintenance of infrastructure.
- With respect to procurement of equipment:
  - 25.2% of respondents appreciated the ease of procurement process
  - 41.5% of the respondents expressed delay in procurement and payment process as a major constraint in implementation.
  - 56.1% of respondents suggested that financial autonomy to be given to PIs
  -
- With respect of utilization of infrastructure:
  - 46.6% of respondents expressed improvement in quality of research and work environment.
  - 24.1% of respondents expressed delay in funding and lack of AMC support to be a major constraint.
  - 21.5% of respondents suggested need for more funds for infrastructure and technical staff.
- With respect to maintenance of infrastructure:
  - 42.3% of respondents appreciated centralization of research infrastructure and academic facility will help in maintenance.
  - 22% of the respondents expressed delay in funding and lack of administrative support to be a major constraint in implementation.
  - 23% of respondents suggested the need for maintenance grant.
- With respect to utilization of funds:
  - 40.1% of the respondents appreciated the FIST support for development of infrastructure.
  - 15.8% of the respondents expressed that delay in release of funds to be a major constraint in implementation.
  - 11.5% of the respondents suggested the need for additional grants.
- With respect to administrative support:
  - 44.3% of the respondents appreciated the good administrative support.
  - 11.4% of the respondents expressed the delay in administrative process to be a major constraint in implementation.
  - 3.8% of the respondents suggested to minimize the administrative delays for timely completion of projects.
- The policy imperatives for strengthening FIST scheme, 35.2% of respondents requested for additional funds for AMC and provision for currency exchange.

**CHAPTER 8**  
**SUCCESS STORIES AND IMPEDIMENTS**

## CHAPTER 8

### SUCCESS STORIES AND IMPEDIMENTS

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 accomplishment of project. It provides different stakeholders with real-world examples, and helps 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 DST-FIST scheme.

In this context, the DST FIST scheme 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 southern region have reaped the benefits of 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 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 southern region is Rs. 9,05,81,156. In this context, the DST FIST recipient institutions with different project levels different type and located at different types 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 FIST scheme across southern region are as follows:

## Success Story 1

### St. Berchmans College, Changanassery, Kerala

#### 1. 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. It was started, with the noble aim of the Universal Catholic Church, to mould 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 the Government of Kerala. 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.

#### 2. Details of the Grant

- a) Amount of grant received: -Rs. 70.50 L
- b) Year of grant: - 2010
- c) Level of grant: - L0
- d) Purpose: - To strengthen science and technology research for post graduate science departments of St. Berchmans College.

#### 3. Output and outcomes in terms of academic achievements, publications, awards, collaborations etc.

- a) The increase in research papers from 75 (before 2010) to 132; book chapters from 2 to 22; books from 1 to 6.
- b) The increase in number of students qualifying NET and GATE from 120 to 253.

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

The grant provided under FIST scheme 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.

#### **4. 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 human kind. The educational and administrative culture in the institutions has a greater impact.

#### **5. Suggestions given by the Institute**

- a) Support for the appointment of technical personnel for effective operation and maintenance.
- b) Minor equipment and gadgets could be allotted with a reasonable proportion of the fund so that institutions need not look for new purchase options for the add-on functionalities of the equipment.
- c) The progress evaluation could be done in phases without much lapse.

## Success Story 2

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

#### 1. About the Institute:

The Melvisharam Muslim Educational Society (M.M.E.S.) was established in 1919. The 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 to Thiruvalluvar University, Vellore. The college has been re-accredited by the NAAC with 'A' Grade. At present, the college offers instruction in 31 courses at Under-Graduate level and in 6 courses at Post-Graduate level, apart from facilities for research leading to the award of Ph.D.

#### 2. Details of the Grant.

- a) Amount of grant received: - Rs. 42.50 L
- b) Year of grant: - 2010
- c) Level of grant: - L0
- d) Purpose: - To strengthen science and technology research for post graduate science departments of C. Abdul Hakeem College, Melvisharam, Vellore, Tamil Nadu.

#### 3. Output and outcomes in terms of academic achievements, publications, awards, collaborations etc.

##### Zoology department:

- a) 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 to 5.01.
- c) No. of research projects has been increased from 12 to 20 and cost of the project 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 research organizations and laboratory has been accredited by NABL (ISO 17025:2017).

**Chemistry department:**

- a) The number of international publications has been increased from 0 to 125 and citations from 0 to 1298.
- 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 total cost of Rs. 40 lakhs.
- d) Production of Ph.D. students increased from 0 to 17 after FIST implementation.

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

- a) Faculty members in department of zoology have got National and International recognition and also awarded with State and National Level awards for their research works.
- b) FIST implementation in department include 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.
- c) The outcome of DST-FIST implementation in chemistry department includes increase in research projects and consultancy services with regards to chemical and leather industries.

**4. Attributes of the success**

The college has a unique administration system which facilitates ease in handling financial related aspects. Leadership and directive attitude of management towards the implementation of any projects.

**5. Suggestions**

- a) The grant should be increased from Rs. 1 crore to Rs. 5 crores for five years.
- b) Best performed colleges or Institutions should be identified and recognized with award annually

## Success Story 3

### Sri Venkateswara University, Tirupati, Andhra Pradesh

#### 1. About the Institute:

Sri Venkateswara University, Tirupati, is established in 1954 in the world famous holy temple town of Tirupati on the sprawling campus of 1000 acres with a panoramic and pleasant hill view. With a great wisdom, the founder of this University has rightly coined the motto and the wisdom lies in proper perspective for it. The university has grown excellently from strength to strength over the past 60 years, as a premier institute of higher learning under the able and committed leaderships of successive Vice-Chancellors.

The university was started with six departments of Chemistry, Physics, Mathematics, Botany, Zoology, Economics and Philosophy. The university has 4 constituent colleges concerning various conventional and advanced subjects, in order to provide good academic and smooth administrative service to one and all. The university has 54 departments, where in 72 different PG Courses and several Diploma and Certificate courses are being run with a total academic faculty strength of around 400 and 1500 non-teaching and a student strength of 5000, including research scholars. Several novel and newly emerging PG courses have also been introduced during 2020 academic year.

#### 1 a) About the department:

The Virology department established in 1988 is an offshoot of Botany department with Prof. M.V. Naidu as founder teacher and offers PG and Ph.D. programmes in Virology. The department has made commendable progress through inter institutional collaboration at local, National and International levels. Several students of Virology have qualified for GATE and CSIR\_NET and joined the National Research Institutes like AIIMS, TIFR, ICRISAT. So far 3 M.Phil. And 8 Ph.D. degrees were awarded and 3 research students are working. Six research projects were completed and 105 research papers/reviews/bulletins are in account for the department apart from bringing out 3 books and 3 manuals. The department has organized 6 seminars/training courses since its inception.



Courses offered : M.Sc. (Virology) & Ph.D. (Virology).

**2. Details of the Grant.**

- a) Amount of grant received: - Rs. 42.50 L
- b) Year of grant: - 2008
- c) Level of grant: - L1
- d) Purpose: - To strengthen science and technology research for Post Graduate Science Department of Virology, S V University, Tirupati.

**3. Output and outcomes in terms of academic achievements, publications, awards, collaborations etc.**

- a) Faculty published the research papers in scopus indexed journals and also obtained funding from other agencies.
- b) The faculty registered for National patents and also made MoUs with other institutes.
- c) New practicals were designed to strengthen the class work, which in turn the students were trained hands-on in practicals.
- d) Students placed in National laboratories for research work went abroad under Erasmus Mundus Brave programme (European commission).

The procurement of essential equipment strengthen the new frontiers of research and renovation of research laboratories improved the research activities. Also the procurement of an advanced reference books/lab manuals strengthened the class work and practicals.

**4. Attributes of the success**

- a) Leadership of the head of the department and competent faculty and their dedicative work towards research.
- b) Desire to innovate in the field of virology.

## 5. Suggestions

- a) Allocate a skilled trained technician for the proper utilization and maintenance of equipment.
- b) Provision for AMC to maintain sophisticated equipment for their potential use in long-term basis.
- c) Budget should be allocated to organize the workshops/training programmes, research exchange programmes and other departmental development programmes such as entrepreneur programmes, patent charges.
- d) Permission to carry forward unutilized grant for further instalment.

## Success Story 4

### Bishop Heber College

#### 1. About the Institute:

**Bishop Heber College** is a religious minority educational institution established by the Tiruchirappalli - Thanjavur Diocese of the Church of South India. Its main objective is to cater for the higher educational needs of the members of the Church of South India and other Christians and specially to provide for them an educational atmosphere in keeping with the Christian ideals of the Church. The college, however, admits students of all faiths and religions and seeks to provide for them the best possible higher education.

#### 1 a) About the department:

PG & Research department of chemistry was established in the year 1966 with pre-university course in chemistry. Presently, it is one of the potential departments in the college, with a rich research culture and offering Undergraduate to Ph.D. in chemistry. A team of dedicated and efficient faculty members with 9 recognized research advisors serves the department. The department has a sophisticated instrumentation facility sponsored by DST-FIST. The DBT – star college scheme gives the right drive for institutions in this regard. The PG & Research Dept. of chemistry proposes to strengthen the existing curriculum offered to the undergraduates.

#### 2. Details of the Grant.

- a) Amount of grant received: -Rs. 50.92 L
- b) Year of grant: - 2006
- c) Level of grant: - L1
- d) Purpose: - To strengthen science and technology research for post graduate department of chemistry, Bishop Heber College.

**3. Output and outcomes in terms of academic achievements, publications, awards, collaborations etc.**

- a) Quality of classrooms took a leap under the scheme as it helped to create an ambience for doing & learning Science.
- b) The number of publications in peer reviewed journals & in Web of Science, Scopus Indexed journals increased from 51 (2005) to 194 (2017), h-index: 12(max), Citation index:468(max), IF: 7.279(max).
- c) Rs. 3.04 Lakhs was generated through various consultancy services.
- d) 6 International and 14 National collaborations were established exclusively for research.
- e) 511 Papers presented in National and International conferences.
- f) 3 Patents filed.
- g) 28 Ph.Ds., 64 M.Phils. and 690 PG projects completed during the period.
- h) A record sum of Rs.1.79 Crores could be raised as financial resource through fellowships, (Rs. 28.85L), travel grant (Rs.7.13L)& 25 major and minor research projects and PG projects (Rs.1.44Cr).
- i) 8 faculty members are now reviewers in ACS and Elsevier Journals.
- j) 3 International and 3 National Conferences hosted by the department during the period
- k) The department is recognized under DBT-STAR Scheme, Government of India.
- l) 2 Women-Scientists funded by DST-WOS(A).
- m) Best Researcher Awards & Best Science Department award by the College 2012 & 2016 onwards.

The grant provided under FIST scheme has immensely improved the infrastructural facilities in department of chemistry.

- a) To mention a few, the Institution could provide the state of the art infrastructural facility (Heber Analytical Instrumentation Facility-HAIF) necessary to house the high end equipment purchased under the grant.
- b) Fluorosis Mapping in Salem and Trichy District -Rajiv Gandhi National Drinking Water Mission.
- c) Defluoridation of water in Trichy District.
- d) IGNITE (Forum for students interdisciplinary Research)

#### **4. Attributes of the success**

The functionality of college through efficiency and creativity, catering to the educational needs of all, especially the poor, the needy and the under-privileged. The institution created a Centralized Instrumentation Facility in housing all the sophisticated instruments and provision for all colleges and research staff to use the procured instruments for their research work at minimal cost. The college council had set policies and guidance to responsible staff in order to create a sophisticated centralized instrumental zone procured under various funding agencies, in turn to provide opportunities for research and development in science and technology to various institutions across the region. The college is able to spread the research culture to various rural colleges/institutions across the Trichy district of Tamil Nadu.

#### **5. Suggestions**

- a) Fund could be provided for maintenance and appointment of technical personnel as well so that sophisticated instruments could be maintained and utilized for their full life term.
- b) Minor equipment and gadgets could be allotted with a reasonable proportion of the fund so that Institutions need not look for new purchase options for the add-on functionalities of the equipment.
- c) The progress evaluation could be done in phases without much lapse.

## Success Story 5

### Indian Institute of Science, Bangalore, Karnataka

#### 1. About the Institute:

The brain child of Jamsetji Nusserwanji Tata, a successful businessman and philanthropist, the Indian Institute of Science (IISc) was conceived in the late 1800s. To this end, Tata set up a provisional committee to come up with a blueprint for the proposed university. It was eventually established, through a vesting order passed on 27 May 1909 by the Indian Government, in the southern city of Bengaluru on 371 acres of land donated by the Mysore Durbar. The Institute which started with just two departments – General and Applied Chemistry and Electrical Technology – today has over 40 departments spread across six divisions: Biological Sciences, Chemical Sciences, Electrical Sciences, Interdisciplinary Research, Mechanical Sciences, and Physical and Mathematical Sciences. It also has a new campus at Challekere in Chitradurga district in Karnataka.

#### 2. Details of the Grant.

- a) Amount of grant received: -Rs. 480.07 L
- b) Year of grant: - 2009
- c) Level of grant: - L2
- d) Purpose:- To strengthen science and technology research in department of microbiology and cell biology.

#### 3. Output and outcomes in terms of academic achievements, publications, awards, collaborations etc.

- a) Establishment of Electron Microscopy facility within the Division.
- b) Establishment of Bio-imaging facility at the Department level.
- c) Improvement in overall quality of research.
- d) Ease in obtaining other extra mural funds due to recognition of the Department as DST-FIST Level II.

DST FIST Program made possible to do many important contemporary and sophisticated experiments with the use of FIST funded equipment in the department. FIST funding has created excellent infrastructure that has made the students research to be more competitive by producing advanced data and higher impact publications. Faculty careers also got greatly benefited and this has brought recognitions to them and the Department, both Nationally and Internationally.

#### **4. Attributes of the success**

The functionality and brand image of the institution. Establishment of Centralized Instrumentation Facility in the department has contributed in higher level to achieve the research targets. Rational policies and guidance from the Institute also supported the department. Finally, the Institution's Social responsibility to serve the society.

#### **5. Suggestions**

- a) Infrastructure funds to be released at the earliest for the full sanctioned amount.
- b) Component of funding on AMC should be enhanced for better use of FIST support.
- c) Increase the overall budget of equipment and maintenance funds.
- d) Dedicate funds for up gradation of existing equipment or buying new versions of equipment under previous FIST grants.
- e) Provide technical support in manpower (engineering/ instrument specialists) for running the sophisticated facilities.

## Success Story 6

### Indian Institute of Technology Madras, Chennai, Tamil Nadu

#### 1. About the Institute:

Indian Institute of Technology Madras is one among the foremost institutes of national importance in higher technological education, basic and applied research. In 1956, the German Government offered technical assistance for establishing an institute of higher education in engineering in India. The first Indo-German agreement in Bonn, West Germany for the establishment of the Indian Institute of Technology at Madras was signed in 1959.

The Institute was formally inaugurated in 1959 by Prof. Humayun Kabir, Union Minister for Scientific Research and Cultural Affairs. IIT Madras is a residential institute with nearly 550 faculties, 8000 students and 1250 administrative & supporting staff and is a self-contained campus located in a beautiful wooded land of about 250 hectares. It has established itself as a premier centre for teaching, research and industrial consultancy in the country. The institute has sixteen academic departments and a few advanced research centres in various disciplines of engineering and pure sciences, with nearly 100 laboratories organized in a unique pattern of functioning. A faculty of international repute, a brilliant student community, excellent technical & supporting staff and an effective administration have all contributed to the pre-eminent status of IIT Madras. The campus is located in the city of Chennai, previously known as Madras. Chennai is the state capital of Tamilnadu, a southern state in India.

#### 1 a) About the department:

The Department of Physics- set in the sylvan campus of IIT Madras conducts research in many frontier areas. These areas include experimental solid state physics, optical and laser physics, and various aspects of theoretical and computational physics ranging from



condensed matter to string theory and cosmology. The department conducts programs at the Bachelor's, Master's as well as at the Doctoral Research levels. Also conducts a vibrant undergraduate program - Bachelor of Technology (B.Tech.) in 'Engineering Physics'-- in conjunction with the Department of Electrical Engineering. The department offers three types of Master's programs: a Dual Degree program that consists of a Bachelor of Science and a Master of Science in Physics, a separate Master of Science (M.Sc.) program in Physics, and a Master of Technology (M.Tech.) in Functional Materials and Nanotechnology. We also conduct a regular Doctoral Research (Ph.D.) program. Currently, the department has 56 faculties and 23 staffs.

## **2. Details of the Grant.**

- a) Amount of grant received: -Rs. 270 L
- b) Year of grant: - 2007
- c) Level of grant: - L2
- d) Purpose:- To strengthen science and technology research in department of physics, IIT Madras.

## **3. Output and outcomes in terms of academic achievements, publications, awards, collaborations etc.**

- a) Good exposure to computing techniques, establishment of SQUID magnetometer and Helium liquefier facilities in the department.
- b) M.Tech., M.Sc. and final year B.Tech. students have gained good exposure to experimental aspects of low temperature physics and phase transitions in condensed matter physics.
- c) Several sponsored research projects have been awarded to the department on basis of the facilities established by FIST support.
- d) There has been significant increase in number of publications of research work in high impact journals and this is possible with good quality of data collected using the FIST funded MPMS SQUID Magnetometer instrument.

The FIST scheme has an immense impact on the visibility of the department and also research scholars for their research. Sponsored

projects in the field of Correlated Oxides, Metallic systems, Thin Films, and heterostructures have been awarded to the faculty of the department.

#### **4. Attributes of the success**

The leadership and functionality of the institution. Establishment of Integrated Centralized Instrumentation Facility. Rational policies and guidance from the department heads. Integrity among the students and the lecturers for innovation in frontline areas.

#### **5. Suggestions**

- a) DST needs to invest more funds in basic science research, as India is nowhere comparable in terms of NSF, DFG, Max-planck, CNRS kind of funding.
- b) The present FIST funding should be tripled for the department in order for the country to produce high quality research papers.

**CHAPTER 9**  
**CONCLUSION AND SUGGESTIONS**

## CHAPTER 9

### CONCLUSION AND SUGGESTIONS

In the last two decades, the research on science and technology has created an excitement and expectations by its very nature. The subject is of immense academic interest having it do more with innovations, new knowledge creation etc. using various technologies. The Scientific Policy Resolution of 1958, Technology Policy Statement of 1983 and Science & Technology Policy of 2003, Govt. of India, emphasizes on importance of S&T as a crucial aspect for the development and recognition of the country.

In current global scenario, India can be an ideal destination for new knowledge creation and innovations. The educational institutions and research centers are the cradles of innovation and extensive research and development activities. With increasing global research landscape, to have global presence, the S&T infrastructure in the academic institutions needs to be strengthened. In this regard, India's expenditure on scientific R&D has been consistently increased over years. India's national gross expenditure on R&D in S&T is between 0.6-0.7 % of GDP (Courtesy: R&D Expenditure Eco-system, Govt. of India, July 2019). Further, the government has taken many steps to improve the scientific R&D through various schemes and has scaled up funding in many new research domains.

The DST-FIST is one such scheme initiated by Government of India in the year 2000 for rebuilding the S&T infrastructure in universities and academic institutions in the country. Over the last two decades, more than 2000 crores of rupees were funded to institutions in India. In order to identify the impact of such fundings on academic institutions and to evaluate the progress made, the present study was undertaken.

The study mainly focuses on evaluating the DST FIST program in Southern Region across seven states (Andaman and Nicobar, Andhra Pradesh, Kerala, Karnataka, Tamil Nadu, Puducherry and Telangana). The DST-FIST grants sanctioned during 2000-2011 was considered for the study.

The projects were sanctioned at three different levels: L0, L1 & L2 for enhancing S&T infrastructure to support the educational institutions to modernize their laboratory facilities, research labs, and to enhance the quality of academic programs to stay in par with foreign universities. The impact of DST-FIST funds across 159 institutions in southern region was assessed through a survey based methodology for which a survey instrument was developed. The data collected through the survey instrument was analyzed using descriptive statistics.

The results inferred from the analysis are as follows:

Majority of the PIs were Male which accounted to 79.51% and 20.49 % of them were Females. With respect to gender of respondents who responded to the survey, 80% of them were Male and 20% of them were Females. Around 52.7% of PIs are superannuated and 30.5% are in service.

A total grant of Rs.41318 lakhs was sanctioned for 509 departments of 159 institutions in southern region, which accounts for Rs 41318lakhs, which accounts to 36.82% of total projects at the national level. An average percentage growth in terms of grants sanctioned is 9% per year and average percentage growth in terms of institutions receiving FIST support is 7% per year for the period 2000-2001. The Tamil Nadu State has received highest number of FIST projects (250 projects) in southern region with a total amount of 16440.8 lakhs of rupees. On an average, Tamil Nadu and Karnataka state have received 39.8% and 32.9 % of total amount of DST-FIST grants sanctioned to southern region and are ranked one and two respectively. The state government supported institutions have received highest number of FIST grants accounting to Rs 13485.13 lakhs (66 institutions).

With respect to project levels, majority of the projects distributed are of L-I level (374 projects), followed by L-II Level (163 projects) and L-0 Level (44 projects). Out of 413.18 crores of rupees sanctioned for 159 institutions across southern region, 90% of the funds were effectively utilized by the institutions.

For the survey period, average difference in amount sanctioned and disbursed is Rs.1865 lakhs for the surveyed period which accounts for 4.51% of total sanctioned amount.

Across the southern region, Rs.369.9 crores has been utilized for procurement of 2620 equipment and other infrastructural facilities to promote R&D activities and to improve quality of teaching learning process.

With respect to working status of equipment and infrastructural facilities created under DST-FIST funds, 79.8% of the equipment are in working condition and are installed within 4 months of purchase date. Average gap between sanctioned year and purchase year of equipment is one and half year.

Out of 2620 equipment, the overall utilization of 1700 equipment was between 76-100%. The average utilization of 40.8% of equipment by internal users per week was about 14+ users and 17.2% of equipment was utilized by 0-4 users per week. Likewise, the average utilization of 48.3% of equipment by external users per week was about 0-4 users. From this it can be concluded that around 65% of equipments are effectively utilized in the range of 76-100%.

A total of 56 equipment procured under DST FIST grants are in the range of Rs 1 crore and above. 52.3% (1371) of the equipment are procured under FIST grant are in the cost range of 0-499999 rupees, out of which 79.72% (1093) of equipment are still working and only 21.13% (231) of working equipment have AMC. Image Velocimetry system is the most repeated equipment in southern region.

In the surveyed institutions, availability of internet facility for faculty/scientist, staff/students, office/administration and library was predominant compared to other infrastructural facilities which accounted to more than 95%. Out of 159 institutions, 152 (95.6 %) DST-FIST institutions have dedicated placement cells to address placement and higher studies related activities. Out of 509 departments, 276 (54.22%) departments have classrooms in the range of 1-5, followed by 110 (21.61%) departments in the range of 5-10. This may be due to requirement number of class room for the post graduation department is less, but 340(66.8%) departments have smart classrooms in the range of 1-5 and 50 (9.8%) departments have smart classrooms in the range of 5-10.

Computerization of admissions and examination process, computational facilities and lab safety, were available in the DST-FIST institution. The overall improvement in volume of manpower in different categories in DST FIST implemented Institution, after FIST implementation across the institutions is about 26.5%. There is a significant increase in volume of manpower in private institutions which accounted to 76% compared to central and state government institutions, autonomous institutions, deemed university and constituent colleges. Overall improvement in sanctioned seats after FIST implementation is about 31.9 % increase in various courses among FIST supported institutions. Overall improvement in admission after FIST implementation is about 35 % increase in various courses among FIST supported institutions. Overall improvement in pass percentage among various courses before FIST was 88.4% and after FIST was 92%. Overall improvement in students securing Grade A or First Division in various courses before FIST was 59.8% and after FIST is 61.5%. Overall improvement in number of students qualifying for national examinations after FIST implementation which accounted to 272.4% increase. The change in quality of research program before and after FIST implementation accounted to 143.3% increase. Majority of the FIST recipients have opined that, the DST FIST support has significantly improved the possibility to secure various grants, consultancy and extension works. The change in quality and volume of awards and recognition by faculty/scientist before and after FIST implementation accounted to 186.3% increase.

Majority of the responses perceived that the DST-FIST support has substantially improved the overall working environment at department levels. 83% of respondents gave their opinion as improved and significantly improved for all the factors with respect to working environment. 152 % change is evident from the overall activities of capacity building in 509 departments across southern region.

Out of 1559 responses, 524 (33.6%) responses perceived that research publication and collaboration in the department has been a significant factor for the improvement of working environment. Out of 918 responses, 293 (31.9%) responses perceived that Delay in Funds release/more funds needed/Non availability of annual maintenance grants, were the obstacles in implementing the DST- FIST Project.

The results derived through the analysis, indicates that, there is an improvement in research key indicators such as, improvement in research publications, Patent, Improvement in work environment, presence of International collaborations, awards and recognition and others.

Based on the survey results, it is also evident that work environment, capacity building, manpower, sanctioned seats, , student admission and performance, quality of teaching and learning infrastructure were improved to a greater extent in DST- FIST supported Institution.

#### Best Practices

- Around 98% of the respondents were satisfied with infrastructure utilization which is the basic essence of DST-FIST scheme.
- About 78% of the respondents were satisfied with policies of DST-FIST on maintenance of infrastructure.
- With respect to procurement of equipment, respondents acknowledged the ease of procurement process, delay in procurement and payment process as a major constraint in implementation and suggested more financial autonomy to be given to PIs
- With respect of utilization of infrastructure, respondents acknowledged improvement in quality of research and work environment, delay in funding and lack of AMC support to be a major constraint and suggested the need for more funds for infrastructure and technical staff.
- With respect to maintenance of infrastructure, respondents appreciated centralization of research infrastructure and academic facility will help in maintenance, delay in funding and lack of administrative support to be a major constraint and suggested the need for maintenance grant.

- With respect to utilization of funds, respondents appreciated the FIST support for development of infrastructure, delay in release of funds to be a major constraint and suggested the need for additional grants to improve S&T infrastructure in their facilities.
- With respect to administrative support, respondents appreciated the good administrative support from DST-FIST, delay in administrative process to be a major constraint and suggested to minimize the administrative delays for timely completion of projects.

### **Policy Imperatives for strengthening the scheme**

Further to strengthen the scheme various suggestions and policy imperatives were derived from the respondents during the time of survey and it is listed below:

- Timely release of funds
- Requirement of infrastructure, staff and space needs to be considered for support.
- Administrative support/Online smooth working, Transparency, efficiency /Communication required from various stake holders.
- Continuous monitoring of funds & support from DST.
- Financial implication for pre-budget quotations.

### **Overall Impact of DST-FIST Program**

The DST- FIST support appears to be high and indeed, it is significant in most of the institutions/departments of the southern region, where it is implemented. Majority of the respondents perceived that, the functioning of institutions and their performance has significantly improved with the assistance of DST-FIST scheme.



## Suggestions

Based on the personal interview with DST-FIST funded department/institutions and by analyzing the survey responses, following suggestions are made:

- Details of infrastructure and equipment facilities created along with the expert profile can be made available in respective institutional websites as well as on DST-FIST portal. Such initiatives will improve the institution to collaborate with other organizations and promote collaborative activities for the mutual development. This can enhance the utility of the equipment and revenue.
- Certain states have received less number of research grants, that is a matter of concern and in those states awareness about the DST-FIST scheme needs to be initiated.
- From the survey results it is observed that most of the grant recipients are geographically located in urban area. Hence, measures can be taken to avoid regional imbalance.
- It has observed that, there are repetitive infrastructure in the cost range of 1crore and above were established under DST-FIST grants, such as XRD, SEM, NMR, PIV etc. which could be avoided in future by creating centralized facilities or with an appropriate measures.
- Acknowledgment of DST-FIST in research publications, in filing patents and other related activities can be made mandatory. This will help the policy makers to track the impact of research area and outcomes.
- It is been observed across the FIST supported institutions, that there is a shortage of technical staff and non-availability of funds for maintenance of facility under FIST grant. In this regard, a provision can be considered under FIST scheme to address the above concern or there should be some binding on DST-FIST institution to maintain and provide necessary infrastructure and manpower to operate.
- Timely release of funds will help in effective utilization and minimizes the constraints faced.
- After the completion of projects, periodic review and updating of research outcomes of the facilities created under FIST support needs to be monitored. In this direction, DST can insist FIST recipients to submit the progress made online.

- The academic sector is expected to expand in the coming years, it is certain that S&T infrastructure will also witness significant expansion. In this regard, the significant growth in S&T investment needs to be continuously monitored and necessary to measure its performance.
- New emerging domain areas need to be considered for the support.

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**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 ..... Name of survey field Investigator	..... Signature of Respondent ..... Name of Respondent
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### 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 where respondent is 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 within the 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

**Appendix-1: Data collection Questionnaire**

Confidential: Only for research and assessment

Qre No.  updated: Jan 28, 2019

**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: <input type="text"/>
1.2	Name of University/Institute/College*	
1.2a	*Affiliating University in case of college	
1.3	Address for correspondence	
1.4	State	
<b>About Department</b>		
1.5	Name of the Dept./School/ Centre	
1.6	Year of establishment of Department/School/Centre	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
1.7	Address for correspondence	
1.8	Year of commencement of PG program in the department (yyyy)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Not Applicable = 8888 Not Available = 9999
1.9	Year of commencement of Ph.D. program in the department (yyyy)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Not Applicable = 8888 Not Available = 9999
1.10	No. of FIST Grant Received	<input type="text"/> <input type="text"/>
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 <input type="checkbox"/> State Government Institution <input type="checkbox"/> Autonomous Institution <input type="checkbox"/> Deemed University <input type="checkbox"/> Constituent College. <input type="checkbox"/> Private Institution <input type="checkbox"/>
1.13	Financial Status of Organization	Central Govt. <input type="checkbox"/> State Govt. <input type="checkbox"/> OthersSpecify..... <input type="checkbox"/>



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

**Appendix-1: Data collection Questionnaire**

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1.31	Is your examination system computerized	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1.32	Do you have computational facilities	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1.33	Do you have separate Biological research Labs	Yes <input type="checkbox"/>	No <input type="checkbox"/> NA <input type="checkbox"/>
1.34	Do you have separate Chemical research Labs	Yes <input type="checkbox"/>	No <input type="checkbox"/> NA <input type="checkbox"/>
1.35	Do you have separate Physical research Labs	Yes <input type="checkbox"/>	No <input type="checkbox"/> NA <input type="checkbox"/>
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	<input type="text"/> <input type="text"/> <input type="text"/>	Not Applicable = 888 Not Available = 999
1.38	How many smart class rooms / Lecture theatre in the College/Dept./School/Centre	<input type="text"/> <input type="text"/>	Not Applicable = 88 Not Available = 99
1.39	Does your organization have placement cell?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1.40	Does your organization have IPR Cell	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1.41	Does your organization have Incubation Center	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1.42	Do you have Lab safety guidelines	Yes <input type="checkbox"/>	No <input type="checkbox"/>

**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	

**2.8 Procurement of Equipment\***

S. No.	Name of Equipment	Date of purchase	Date of installation	Cost in Rs.	Current Status	
					Working	Non-working
1					<input type="checkbox"/>	<input type="checkbox"/>
2					<input type="checkbox"/>	<input type="checkbox"/>
3					<input type="checkbox"/>	<input type="checkbox"/>
4					<input type="checkbox"/>	<input type="checkbox"/>
5					<input type="checkbox"/>	<input type="checkbox"/>
6					<input type="checkbox"/>	<input type="checkbox"/>

\*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						<input type="checkbox"/>	<input type="checkbox"/>
2						<input type="checkbox"/>	<input type="checkbox"/>
3						<input type="checkbox"/>	<input type="checkbox"/>
4						<input type="checkbox"/>	<input type="checkbox"/>
5						<input type="checkbox"/>	<input type="checkbox"/>
6						<input type="checkbox"/>	<input type="checkbox"/>

\*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	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.2	Room temperature, Light and ventilation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.3	Sufficient Working Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.4	Communication: Internet, Telephone, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.5	Personnel Development Opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.6	Administrative and Office Support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.7	Motivation for innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**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.

<b>VOLUME OF MANPOWER</b>			
<b>S.No.</b>	<b>Provide the number of man power</b>	<b>Before FIST</b>	<b>After FIST</b>
4.1	How many faculty were/are working in your College/Dept/School/Centre?		
	a. Lecturer / Assistant Professor	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	b. Associate Professor/ Reader	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	c. Professor	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
4.2	How many DST sponsored Scientist/ research professional were/are working in your College/Dept/School/Centre?		
	a. Scientists	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	b. Other research staff	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
4.3	How many Tech/Admin staffs are/were working in your College/Dept/School/Centre?		
	a. Technical Staff	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	b. Administrative Staff	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
<b>Number of sanctioned strength in various courses in the College/Dept/ School / Centre.</b>		<b>Before DST– FIST Support</b>	<b>After DST– FIST Support</b>
4.4	Graduation	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	Post-graduation	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	M.Phil.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	Ph.D.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	PG Diploma	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
4.5	<b>Number of students being admitted in your College/Dept/ School / Centre t</b>		
	Graduation	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	Post-graduation	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	M.Phil.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	Ph.D.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
	PG Diploma	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

**Appendix-1: Data collection Questionnaire**

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

**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	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	b. Books Chapters	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	c. Original articles	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	d. Review articles	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	e. Case reports / Editorial Notes	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	f. Articles in Conference Proceedings	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	g. Paper presentation In Conference	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	h. Monographs	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
	i. Any other	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>

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)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.3	Trend of Extramural grant received (excluding FIST)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.4	Trend in patents filed by your organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.5	Commercialization of technology by your organization	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.6	Product and process develop by your organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Quality of Research</b>						
5.7	Papers published in SCI/SCIE Journals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.8	Trend in Impact Factor of Published articles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.9	Trend in average citation index of published articles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.10	Consultancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.11	Extension work/interaction with industries?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>





**SECTION 8: BEST PRACTICES**

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

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

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

**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. on a 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	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.2	Students passed out	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.3	Students NET/GATE etc. Results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.4	Content of the Syllabus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.5	Introduction of New PG Program , if any	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.6	Students' placement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.7	Enrolment of Research Students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.8	Number of Ph.D. Awarded	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.9	Faculty positions (sanctioned)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.10	Faculty positions (filled)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.11	Awards, Visiting assignments, PDF assignments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.12	Volume of Research Publications by Faculty/Scientists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.13	Quality of Research Publications by Faculty/Scientists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.14	Extra mural grant received	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.15	Computational and Major Equipment Facilities in the Department	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.16	Departmental Library Facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.17	Accreditation level by the NAAC/NBA/UGC/MCI peer review team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.18	Academic reputation and visibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.19	Community/ outreach program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.20	Attracting talent to organization	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.21	Visitors from abroad / reputed institute	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.22	Quality of Teaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.23	Research Environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**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-----