

Report
On
Evaluation of Impact of DST-FIST Program

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Department of Science and Technology
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Western Region

(Goa, Gujarat, Maharashtra and Rajasthan)

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Chapter 1

Introduction, genesis of DST-FIST program and need of present Study

1.1 Science and Technology policies and genesis of DST-FIST

Scientific development in Indian subcontinent can be divided in three important periods; the *vedic* era were 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 of 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 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. The 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 science and technology are perceived as complements to effective economic policies, not as substitutes. (Rosenberg; 1990)¹.

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. 1960's, therefore, 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 (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

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 NER 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- year's 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
Total	88	1019	516	1623	124533

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, and 7.4% to Earth 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).

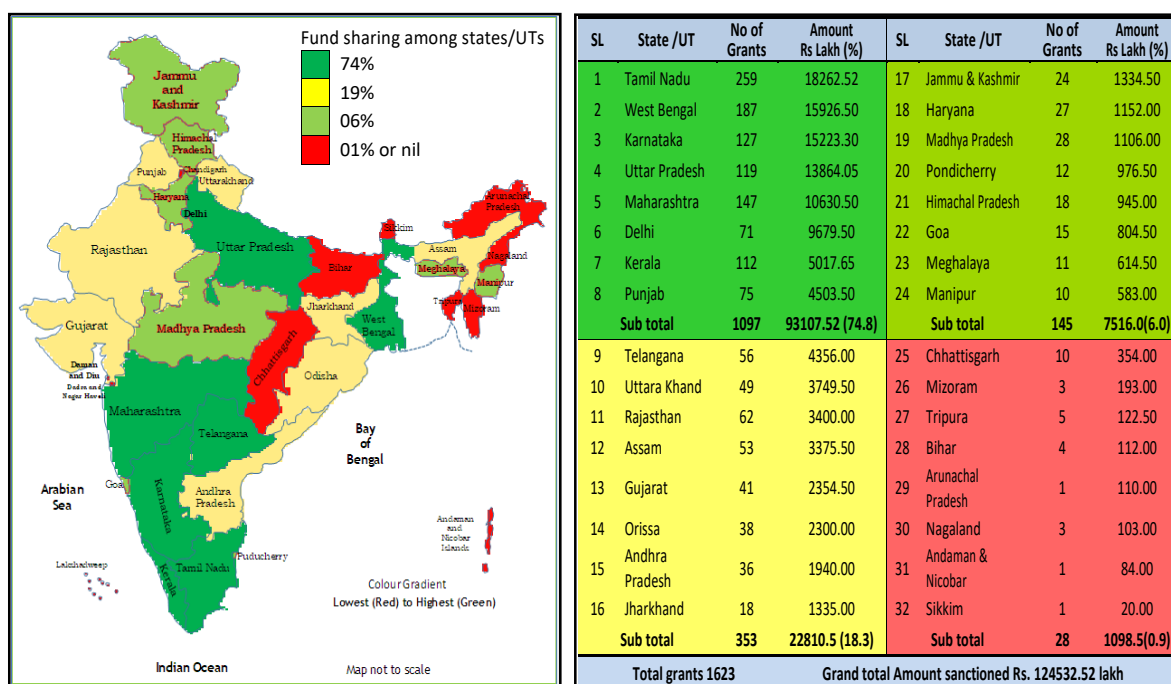
Table 1.3: Expansion of the FIST over different subject areas

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)
Total	88	1019	516	1623	124533	(100.00)

*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 200-2011, about 74% has gone to institution from the eight states or UTs. The pattern of funding is presented on the map of India.

Fig1.1: Expansion of the FIST across various States in the country



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 globalised 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 entrepreneurs¹.

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.’²These 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, and 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

¹ For detail see dbtindia.gov.in

²For detail see <https://dst.gov.in>

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 organisations 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 organisations, 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 utilisation of the same important issues identified in these policy documents are: (a) identification of the priority areas, (b) sources and extent of funding, (c) utilisation 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 recognise 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) utilisation 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 labour 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.³ 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

³Later 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).

(1996) developed indicators that measure the gains for S&T. Salter and Martin (2001) later improved upon Pavitt, and identified at least six categories of benefits:

- Increasing the stock of useful knowledge
- Training skilled graduate
- Creating new scientific instrumentation and methodologies
- Forming 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 calibre 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 organisation. Nath et al (2002) argues the case for creating a 'learning organisation'. S&T competence and intellectual wealth generated through R&D activities are human embodied. A 'learning organisation' would have appropriate mechanism to hone human embodied knowledge as part of organisation knowledge. The impact analysis has to focus on the learning part of the organisational activities.

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Chapter 2

Objective, Methodology and execution of study

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, canthers, 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 organisation. 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 organisational practices and human resource endowment of the organisation 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.

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, and 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 2.1 below.

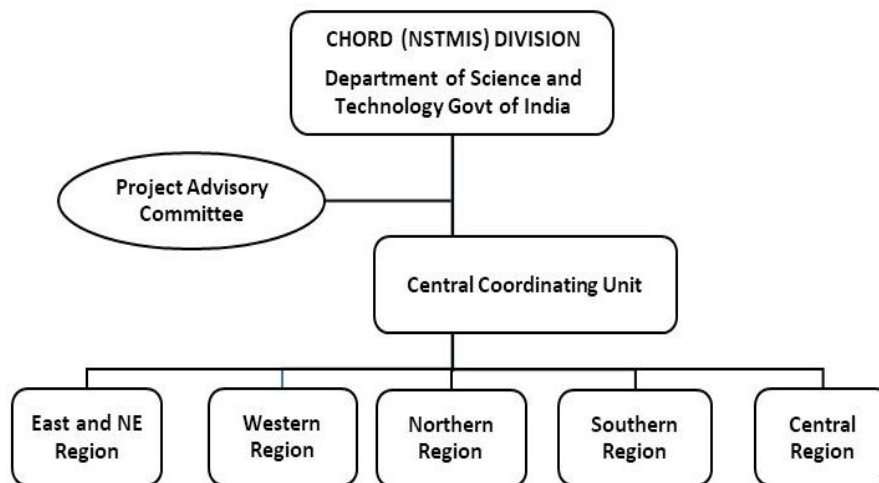


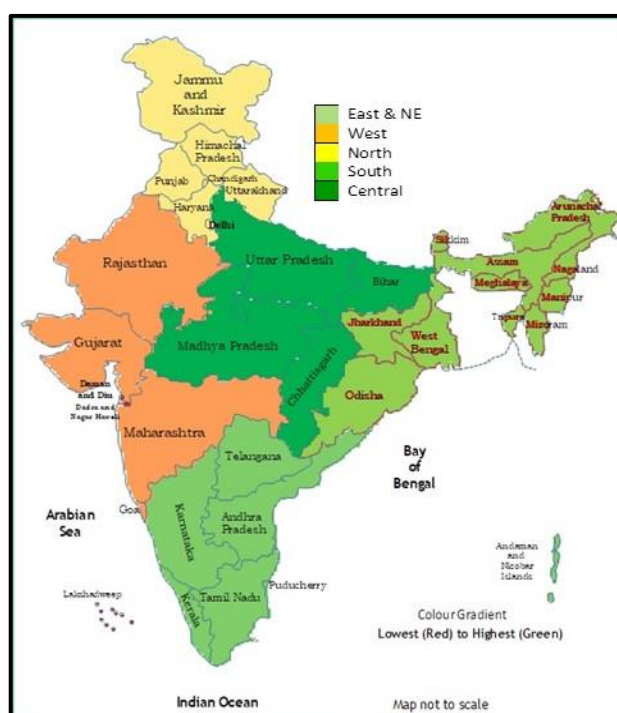
Fig 2.1 the operational structure of the study network

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 2.1 on the map of India.

Table 2.1 States/UTs allocated to 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	

Fig 2.1 Geographic coverage by regions



The basic information of each institution funded under FIST program during 2000-2011 was provided by FIST division of DST. Total 1623 projects were funded and completed till 2016. Number of Institutions, departments and grants supported by FIST falling in each region were allocated to respective Regional coordinators as summarised in table 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.

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
Total	425	1456	1623

*A FIST grant is considered as unit.

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

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

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 2.1. 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-I 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 **Appendix-B**.

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 focussed in the study

Focus areas	Issues for consideration
Advancement in knowledge	Specialities, Theories, Methodologies, Facts, and Models
Research Activities	Contribution to research, Type of research, Inter-sectoral, Interdisciplinary, International including collaboration
Training of researchers	Research competence, Related competence
Technology	Product and process, Services, Know how
Recognition	Credibility, Visibility, Prizes, Awards
Impact on Curricula	New courses, New Training programme, Pedagogical tools
New human Resources	Added for the project, Career opportunities
Learning Organisation	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.

2.7 Field operation and data collection

The field investigators visited each beneficiary institution. 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 print version (hard copy) of questionnaire and basic information of the grant obtained from DST records. Attempt was made to update email and phone number of PI of each grant. Principal investigators, Heads of Departments or Institutions were contacted and appointment for a visit of field investigator was taken. An advance copy of questionnaire was sent to PIs 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 their paper 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. Primary respondent was the Principal Investigator (PI) of FIST assistance usually Head of the Department or Institution. In the absence of PI, present person in charge; the project or current Head of Department or Institution was contacted to collect the information. 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 these data files are given in [Appendix-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 9 of the data collection tool used 19 open ended questions that resulted into unstructured text responses. The 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

While evolving this network proposal it was important understand how share the responsibilities and work as a well-coordinated team. In consultation with project steering committee and DST all project coordinators agreed to follow 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

- i. Recruitment of staff and field investigators.
- ii. Establish close coordination with central coordinating unit.
- iii. Planning and execution of data collection in the respective region according to the methodology approved in the project.
- iv. Submitting data to DST and CCU after data cleaning, reliability and validation analysis.
- v. Supervision and monitoring of data collection in respective region.
- vi. 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 present the time frame specific to each activity.

Table 2.4: Time frame for the study

Sr.no.	Time	Activity
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 a time for interview. Because of their other commitments they were not able to provide full information in one session and 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 (eg 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.

Chapter 3

Criteria for FIST grant and Characteristics of grant recipients

3.1 Introduction:

In this chapter we present the information about the Department, about the FIST project and about its coordinator or respondent. We present here the details of 4 states belonging to Western region i.e. Goa, Gujarat, Maharashtra and Rajasthan, distribution of year of commencement of PG and Ph.D. Program, number of FIST grant received in the department/institutes, Academic status of different institutions/college/university, financial status of organization etc. We also present the information about the level wise distribution, distribution of year of sanction of FIST grant as per sanction order, Total sanctioned, received and utilized amount in different state under the FIST support, distribution of amount in different year from 2000-2011. Also providing the information about the current status of FIST project coordinators, Gender of respondent, number of times grant is sanctioned and level wise sanctioned grants etc.

3.2: State wise distribution of FIST grant.

Table 3.1
Distribution of state, no. of Universities/ Institute/ College and no. of Departments/ School/Centre, who selected for DST-FIST Grants/Projects.

State	No. of Universities /institutes/college	No. of Dept./school /Centre	No. of Projects (%)	Total Cost (in lakhs)(%)
Goa	02	11	13(7.51)	798.50(7.51)
Gujarat	08	25	31(17.92)	1632.11(15.35)
Maharashtra	39	78	92(53.18)	6093.35(57.30)
Rajasthan	16	34	37(21.39)	2110.44(19.85)
Total	65	148	173(100)	10634.40(100)

This table No. 3.1 shows the distribution of state wise number of total respondents who have provided the information and total cost of projects sanctioned in different states. Overall for this study of Western region, the information of 65 university/institutes/college and 148 Department/school/centre are collected. Total 173 projects information are obtained in the form of duly filled questionnaire.

The above table shows that Maximum 92(53.18) PIs of Maharashtra have provided the information in the form of duly filled questionnaire and have utilized 57.30 % of total budget. As well as Minimum 13(7.51%) projects are from Goa provided the information in the form of duly filled questionnaire. Also, they have utilized 7.51% budget out of total budget of respondents. Also, maximum 39 University/institutes/college and having 78 Department/school/centre of Maharashtra state have responded for this study/Project. Minimum 2 University/institutes/college and having 11 Department/school/centre of Goa state provided information for this study/Project. As well as Gujarat having 8 university/institutes/college having 25 Departments/school/centres and Rajasthan state have 16 university/institutes/college and having 34 department/school/centre. So here it can be concluded that Maharashtra has the maximum number of projects and Goa has the lowest.

3.3: Grants Sanctioned and Utilization.

Table 3.2
Total Amount Sanctioned, utilized and unutilized (in Crores)

SR. No.	Region	Amount Sanctioned Rs. (in crores)	Amount Received Rs. (in crores)	Amount Unutilized
1	Western	106.34	89.69	16.64

In the Western region a total amount of Rs. 106.34 crores was sanctioned to Departments/Institutes, the amount of Rs. 89.69 crores was received by Departments/Institutes and Rs. 16.64 crores was unutilized.

Table 3.3
Distribution of number of FIST grant among departments/school/Centre.

No. of FIST Grants	No. of Departments (%)
Received Once	110(74.3)
Received Twice	33(22.1)
Received Thrice	5(3.40)
Total	148(100)

The maximum i.e. 110(74.3%) Institutions/Departments has received one time FIST grants, 33 (22.1%) received two times and minimum 5(3.40%) Institutions/Departments have received FIST grants thrice. Thus, it can be seen that only 3.40 percent Institutions/Departments are successful in getting three time FIST grants.

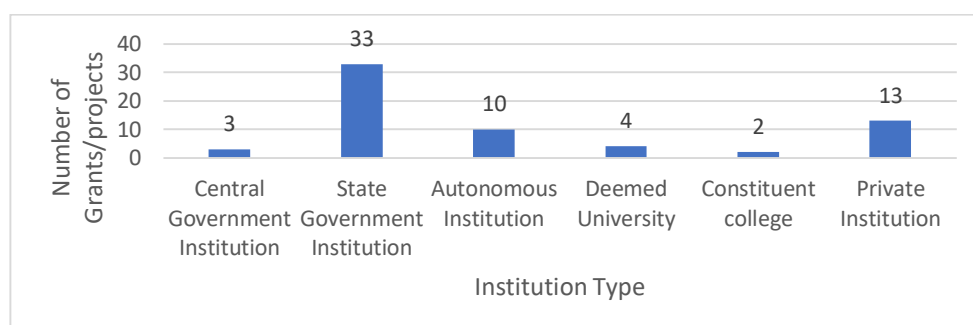
Table 3.4
Amount Received from other than FIST grants from the period 2012-19

Other grants	Amount in Rs. (Crores)
Between 2012-2015	22.8
Between 2016-2019	17.4

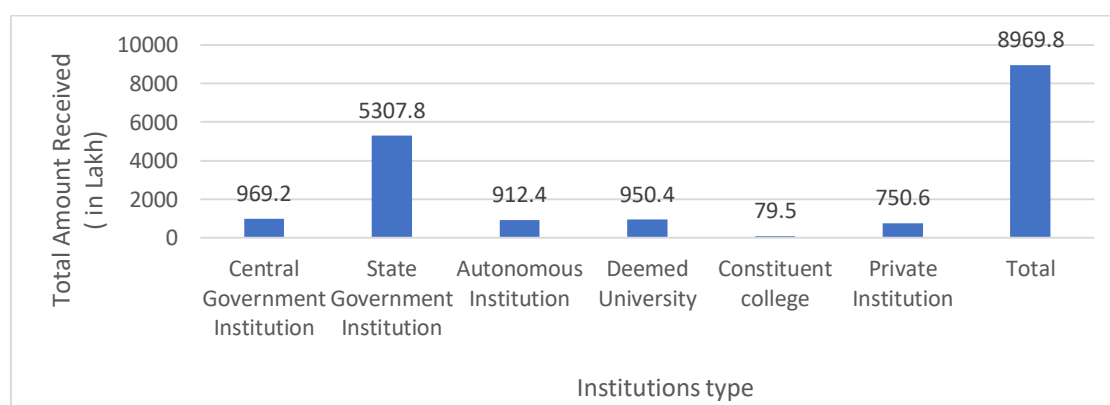
From the above table, it is seen that Rs. 22.8 crores and Rs. 17.4 crores fund are received by Departments/ Institutions from other than FIST grants between 2012-2015 and 2016-2019 respectively.

Overall total 40.2 crores amount was received during 2012-2019 from other than FIST grants.

Graph 3.1
Distribution of grants according to Institutions type.



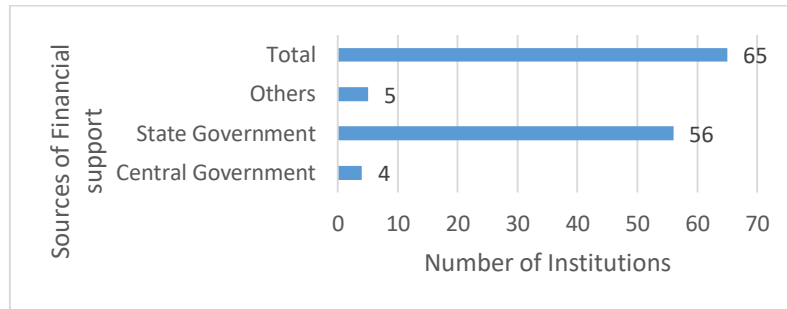
Graph 3.2
Distribution of total amount received according to Institutions type.



The above table shows, the distribution of sanctioned grants and the total amount received according to the institutions type. There are 65 institutions in the western region who gave the information for this study and the total amount received was 8969.8 lakhs. The maximum number of grant.33 (50.76%) was received by State Government Institutions and the amount

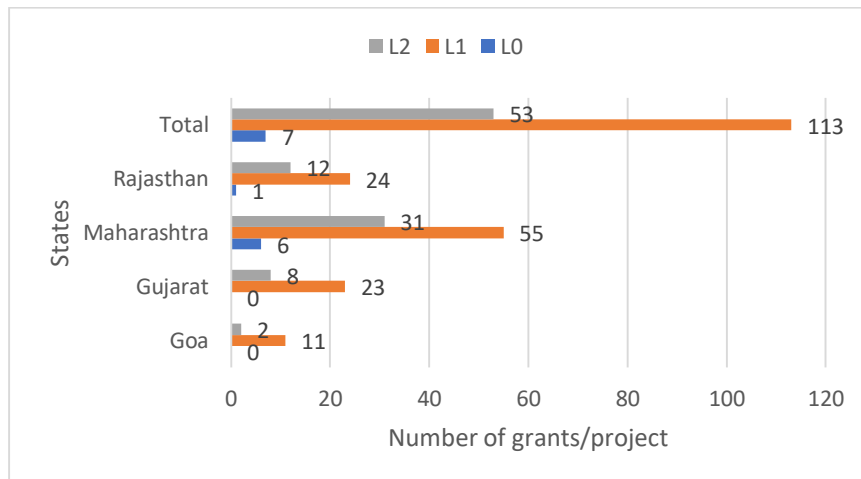
received was 5307.8(59.2%) lakhs. The minimum number of grants, 02(3.07%) was received by the Constituent Colleges and the total amount received was 79.5(0.9%) lakhs.

Graph 3.3
Distribution of University/College/Institute according to sources of funding.



It can be seen that out of 65 Institutions/Departments maximum 56 (86.15%) are state Government funded organizations, minimum 4(6.15 %) are Central Government funded organizations and 5 are getting funds from other sources.

Graph 3.4
State wise distribution of grant/project according to level.

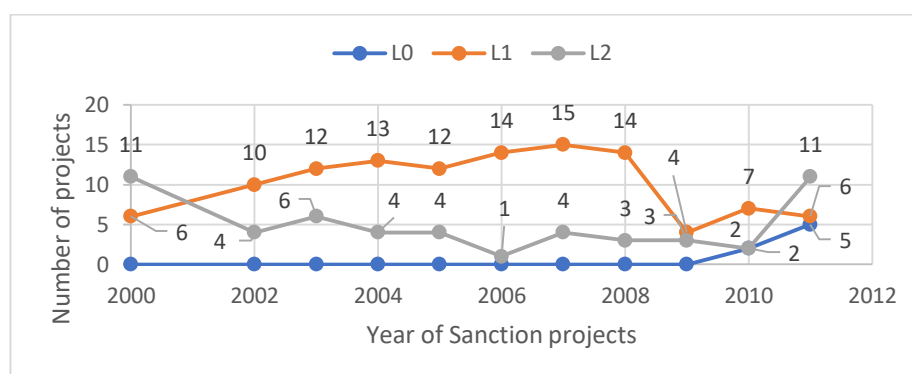


The above graph shows, the state wise distribution of sanctioned grants/projects according to Level. Out of 173 total project, the maximum 92(53.18%) project information was received from the Maharashtra state and the minimum 13 project information was received from the Goa state for this study.

Also shows that, out of 07 project in the L0 level grant maximum 06 project and 01 project information was received from the Maharashtra state and Rajasthan state respectively. Out of

113 project in the L1 level grants, maximum 55 project, minimum 11 project information was received from the Maharashtra state and Goa state. Out of 53 total project in the L2 level grants, maximum 31 projects and minimum 2 project information was received from the Maharashtra state and Goa state respectively.

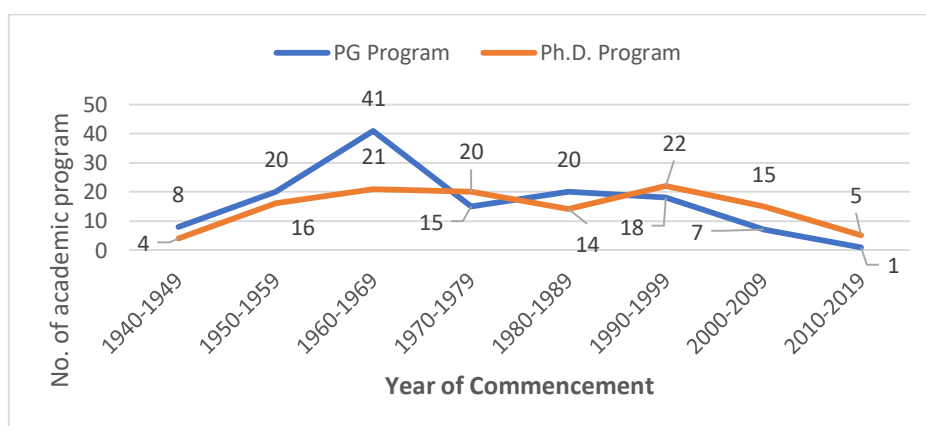
Graph 3.5
Level wise distribution of sanctioned grants/project during 2000-2011.



The above table 3.5 shows, the distribution of sanctioned grants/projects during 2000-2011 level wise. The L0 level of grant started in the year 2010 and L1 and L2 level of grants started in the year 2000. Total sanctioned projects up to 2011, that is 07 L0 level projects, 113 L1 level and 53 L2 level projects information are received for this study.

3.4. Details of Academic Programs start.

Graph 3.6
Year wise commencement of academic programs in departments/school/centre.

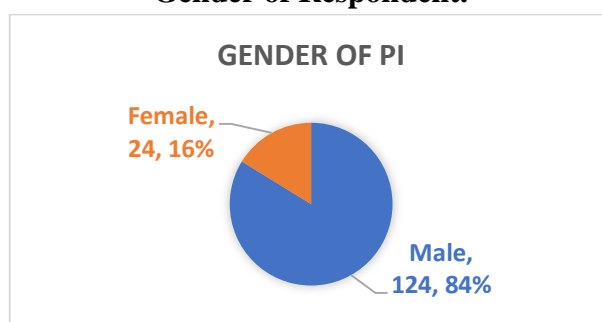


The commencement of PG and Ph.D. Program in the different decades are presented in the above Table 3.9. It can be seen that the start of PG and Ph.D. programs have taken place

mainly after 1940 and onwards. The maximum number of PG and Ph.D. programs are started during 1960 – 1970 and their numbers are 52 and 38 respectively. Thus, almost all programs are started after 1940. It can be concluded that the most of the PG and Ph.D. programs were started after the independence in India.

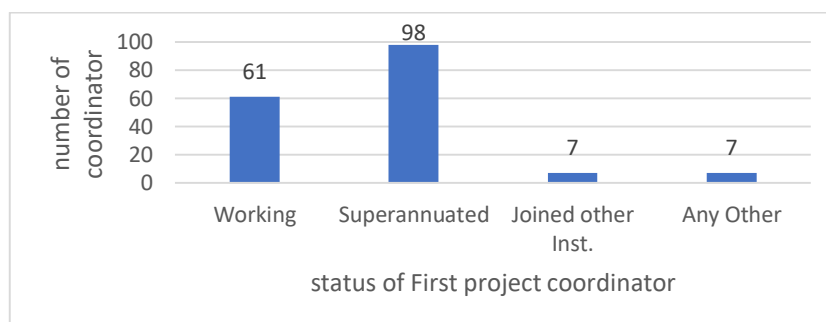
3.5. Details of Project Coordinators and Respondents.

3.7 Gender
Gender of Respondent.



The above table shows, out of total 148 respondents, 124 i.e.84 percent are Male and 24 i.e. 16 percent are Female. Thus, male respondent's number is very high compare to female respondents.

Graph 3.8
Working status of First project coordinator.



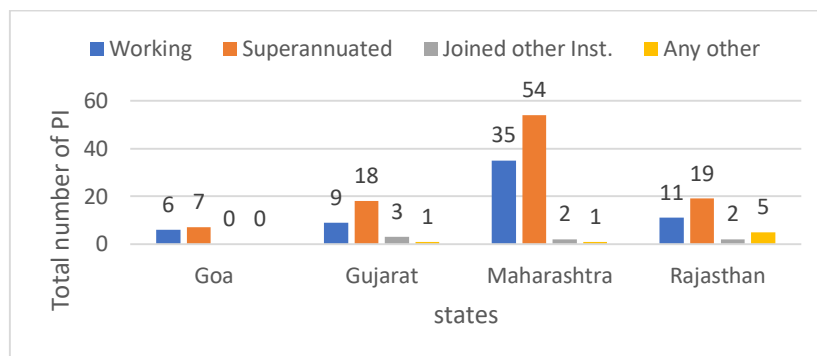
It can be seen from above table that the maximum 98 (56.65%) first project coordinators are superannuated, but 61 (35.26%) are still working and 07 have joined some other Institutions.

Table 3.5
Designation of Respondent.

Designation of Coordinator	Total (%)
Vice/Director/Principal/Chairman	34 (22.97)
HOD/Professor	104 (70.27)
Asso. /Asstt. Professor	10 (0.67)
Total	148 (100)

The above table 3.12 shows that out of 148 respondent's 104 (70.27%) respondents are HOD/professor, 34(22.97%) respondents are Vice/Director/Principal/Chairman who gave all the necessary information for this study. Thus, it seems the responsibility of project coordinator has been given to mainly senior teaching staff like Heads / Professors.

Graph 3.9
State wise status of First PI.

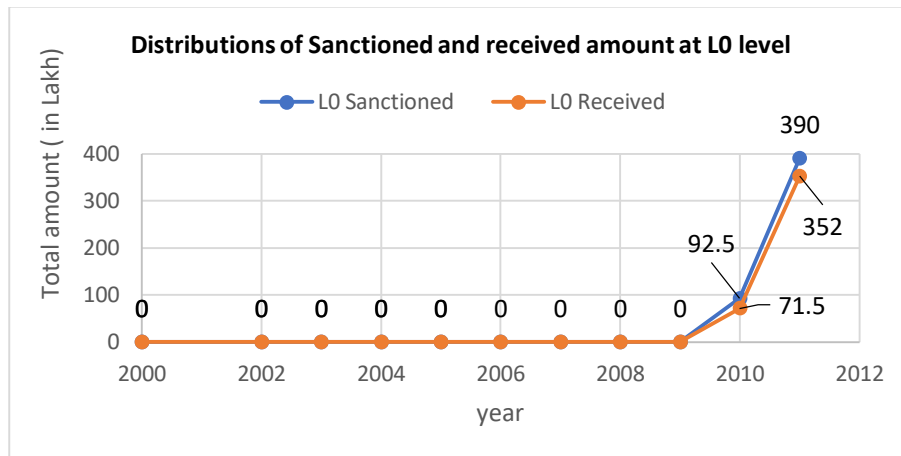


The above table shows, the state wise working of first PI. In the Goa state out of 13 first PI, 6(0.46%) are working and 7(0.53%) are superannuated. No first PI have Joined Other Institutions. In Gujarat state out of 31 first PI's, maximum 18(0.58%) are superannuated, but 9(0.29%) first PI are still working and 3 (.096) joined other Institutions. In the Maharashtra state, out of 92 first PI's, maximum of 54(0.58%) are superannuated, but 35(0.38%) first PI's are still working and 2 (0.021%) have joined other Institutions. In Rajasthan state, out of 37 first PI's, maximum i.e. 19(0.51%) are superannuated, but 11(0.29%) first PI are still working and 2 (0.054%) left to join other Institutions.

3.6. Distribution of Grant according to the Level of FIST Program.

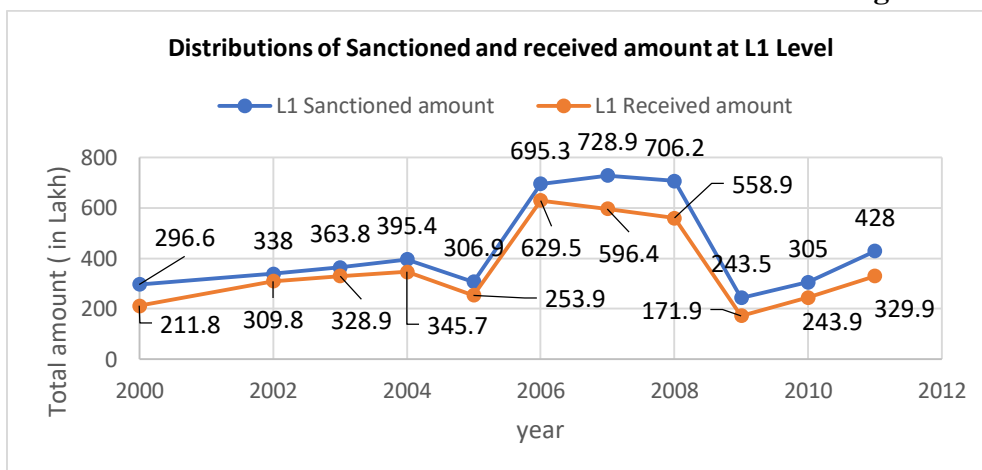
Graph 3.10

Distributions of Sanctioned and received amount at L0 level during 2000-2011



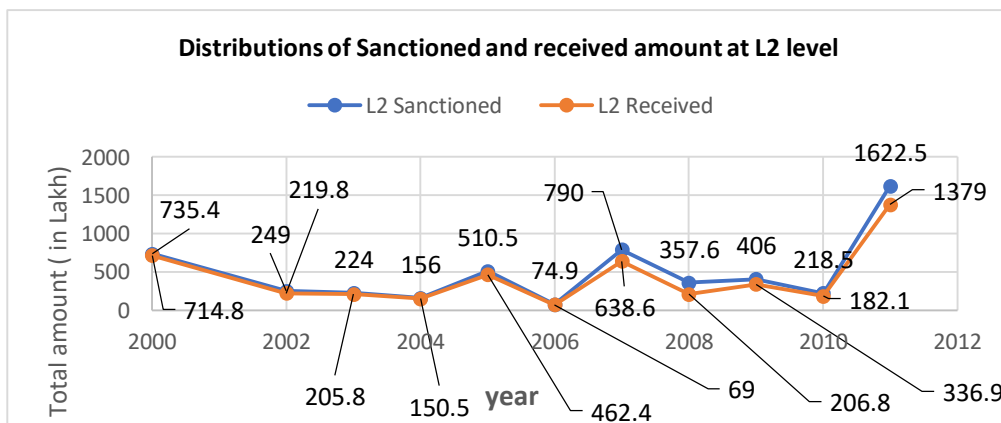
Graph 3.11

Distributions of Sanctioned and received amount at L1 level during 2000-2011



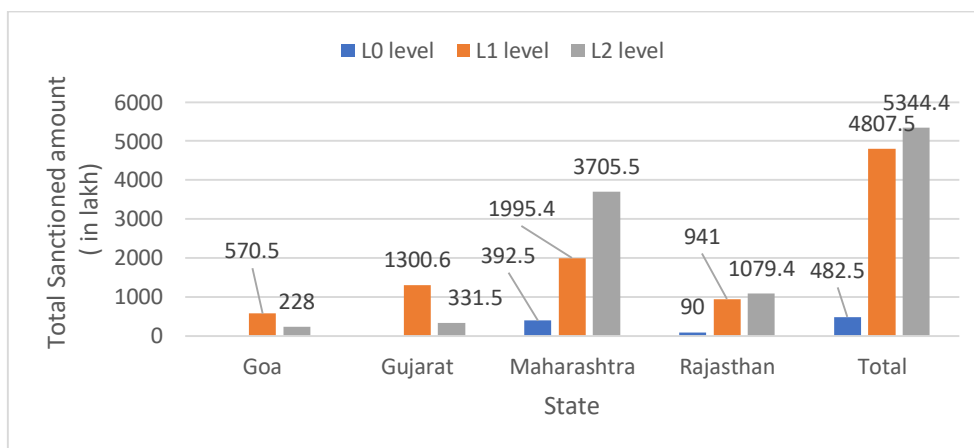
Graph 3.12

Distributions of Sanctioned and received amount at L2 level during 2000-2011



From above table 3.14, the layout of DST-FIST grants at various levels is presented. The amounts presented here are in lakhs of Rs. Here it can be seen that at level L0 the highest amount received was 352.0 lakhs out of total amount sanctioned 390.0 lakhs in the year 2011. At level L1 the highest amount sanctioned was 728.9 lakhs and amount received was 596.4 lakhs in the year 2007. Also the highest amount received was 629.5 lakhs out of total amount sanctioned 695.3 lakhs in the year 2006. At level L2 the highest amount received was 1379.0 lakhs out of total amount sanctioned 1622.5 lakhs in the year 2011 also least amount received was 69.0 lakhs out of total amount sanctioned was 74.9 lakhs. The highest total amount was sanctioned under FIST was 2440.5 lakhs in 2011, 1518.9 lakhs in 2007. Overall it can be seen that the highest total amount was sanctioned under FIST and more than 80% amount received in the respective years. A total amount of 10634.40 lakhs was sanctioned by DST at different levels and total 8969.76 lakhs amount was received i.e. during 2000-2011, 84% total amount was received from the DST to the Department/institution/centre.

Graph 3.13
State wise distribution of sanctioned amount in Western region states. (N=173)



The above table shows, the Level wise distribution of sanctioned amount in accordance to the states. In the level L0, the highest Rs.392.5 lakhs sanctioned for the Maharashtra state and then followed by Rs. 90.0 lakhs sanctioned for the Rajasthan state. No amount was sanctioned for the Goa and Gujarat state. In the level L1, the highest Rs.1995.4 lakhs sanctioned for the Maharashtra state followed by Rs. 1300.6 lakhs for Gujarat state and least

570.5 lakhs sanctioned for the Goa state. Also in the level L2, the highest Rs.3705.5 lakhs sanctioned for the Maharashtra state and least Rs. 228.0 lakhs sanctioned for the Goa state. Overall the highest Rs. 6093.3(57.3%) lakhs was sanctioned for the Maharashtra state and least i.e. Rs. 798.5(7.5%) lakhs sanctioned for the Goa state.

3.7. Conclusion:

The western region consists of 4 states namely Goa, Gujarat, Maharashtra and Rajasthan. In the Western region 263 projects were allotted and 173 have given their responses in the duly filled questionnaire. Total 65 Universities/ Institutes/ College sand 148 Departments/Schools/ Colleges have provided the information. A total of Rs.10634.40 lakhs are sanctioned to these 173 FIST projects. Number of sanctioned projects of L0, L1 and L2 level are 07, 113 and 53 respectively. The state wise distribution is as Goa -13, Gujarat -31, Maharashtra -92 and Rajasthan -37. The P.G. and Ph.D. programs are mostly started after 1940 onwards and maximum number of Department/ Institute/ colleges have started these two programs during 1960 – 1970. The women's percentage of coordinators is 16.2 only. Mainly Head of the Department/ Professors are Project coordinators for this DST-FIST program. The percent of L0, L1 and L2 level grants sanctioned are 4.54, 45.20 and 50.26 respectively during 2000to 2011.

Chapter 4

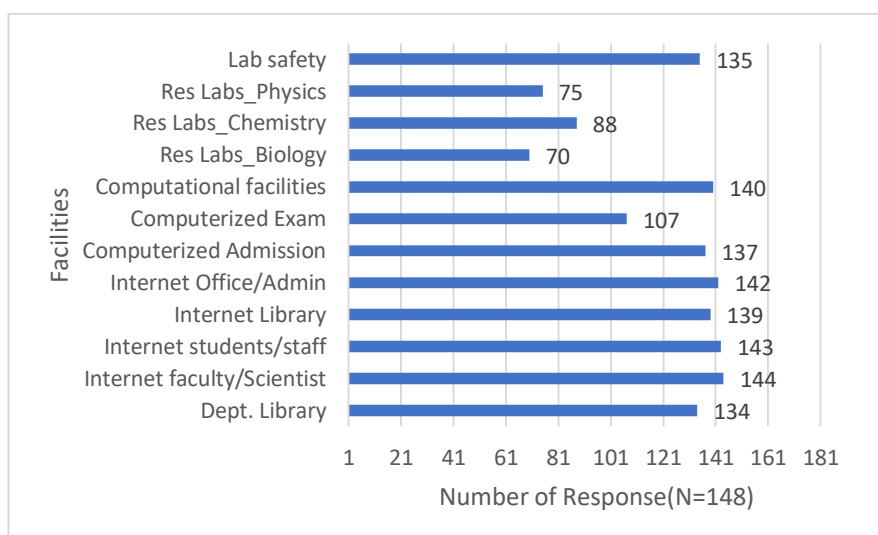
Infrastructure & Equipment created under FIST grant

4.1 Introduction:

This chapter four consists of the information on Infrastructure and Equipment created under FIST grant. A good infrastructure facilitates, better teaching and thus attracts good students and gives quality student outcomes. It also helps in attracting better research scholar and faculty and promotes research amongst the students. In this chapter, it has been tried to find out the present infrastructure facilities at Department/ Institute/ Colleges and the improvements in them after receiving the FIST grant. For this study, Department/ Institute/ Colleges having academic autonomy and financial autonomy have been considered. Further, the analysis has been done in more detail by considering the level of FIST grant state wise, general classrooms, smart classrooms and also different equipment along with their cost and current status and facilities created by the Department/ Institute/ Colleges. The information on the difficulties faced by the respondents in procuring the above facilities are collected and also studied.

4.2 Infrastructure Created Under FIST Grant.

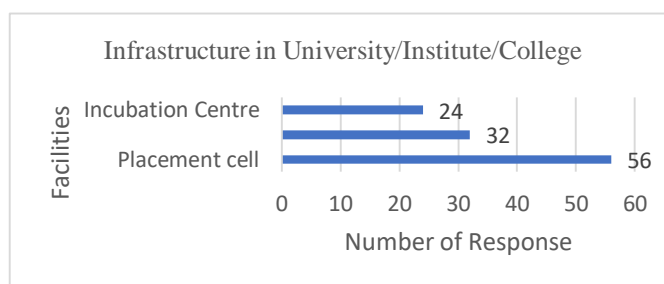
Graph 4.1
Distribution of present infrastructure in the Dept./school/Centre (N=148)



The above graph 4.1, shows the infrastructure facilities present in in Department/School/Centre. It can be seen that out of 148, 134(90.54%) Institutions/Departments are having library, 144 i.e. 97.30% have internet facility in their Department for, faculty/Scientists and 143 (96.62%) are having Internet for Students/ other staff in the Department. Moreover, 93.92% have internet in library and 92.57% have said

they computerized admission process. Also, 107 i.e. 72.30% have responded that they take computerized exam. Upon being asked about the Computational facilities that they have in their department 140 i.e. 94.59 % have replied positively. On being asked about the subject wise research labs in their institutions 47.30% have said they have separate Bio. Labs, 59.46% have said they have separate chemical Labs and 50.68% have separate physical labs. Here it can be said that maximum institutions have separate research lab for chemistry. Around 91.22% i.e. 135 have lab safety guidelines with them. Thus, internet facility for faculties, students/ staffs, internet in Library and office, computerised admission, computational facilities and Lab facility are existing in more than ninety percent of the Departments/Schools/Centres.

Graph 4.2
Infrastructure in University/Institute/College. (N=65)



The above graph 4.2 shows the information about infrastructure available in the University/Institute/College. A total of 56 University/Institutions/College out of 65 i.e. 86.15% have said that they have placement cell, 49.23% i.e. 32University/Institutions/College have said that they have IPR cell, 24 University/Institutions/College i.e. 47.4% have Incubation centre.

Table 4.1
Infrastructure available in departments/school/Centre has according to
Academic autonomy Institutes at the time of survey (N=148)

Facilities	Academic status (Department)						Total (%)
	Central Govt. (n=5)	State Govt. (n=89)	Autonomous (n=16)	Deemed University (n=14)	Constituent college (n=2)	Private Institution (n=22)	
Dept. Library	4	81	16	10	2	21	134 (90.54)
Internet faculty/Scientist	5	86	16	14	2	21	144 (97.30)
Internet students/staff	5	85	16	14	2	21	143 (96.62)
Internet Library	5	82	16	14	2	20	139 (93.92)
Internet Office/Admin	5	84	16	14	2	21	142 (95.95)
Computerized Admission	5	82	14	14	1	21	137 (92.57)
Computerized Exam	4	62	12	12	1	16	107 (72.30)
Computational facilities	5	82	16	14	2	21	140 (94.59)
Res Labs Biology	2	36	5	10	1	16	70 (47.30)
Res Labs Chemistry	3	47	6	12	2	18	88 (59.46)
Res Labs Physics	3	42	6	9	2	13	75 (50.68)
Lab safety	5	80	12	14	2	22	135 (91.22)

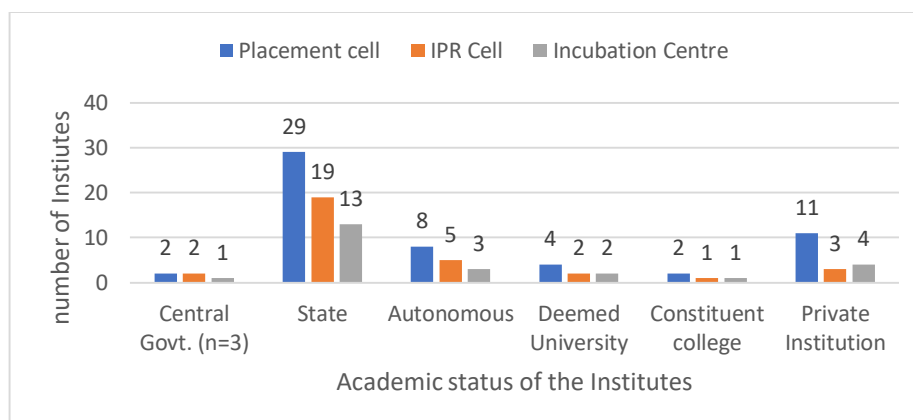
The above table no 4.1, presents the distribution of various facilities existing in central Government, Academic institutions etc. They have internet facilities, Internet for Library and computational facilities are the best. All of them have computerized admission and lab safety guidelines.

The state government, Academic Institutions all have good internet facilities for faculty, students and staff. The autonomous organization all have internet for office and administration and also have other computational facilities. Also internet facility for faculty and students is good. Internet for library is also good and maximum have departmental library.

In the deemed university also all have internet facilities and admission is computerized in all the organization. All the institutions have computational facilities and placement cell and labs safety guidelines also. In the constituent colleges also most of the facilities are present.

In the private institutions all of them have lab safety guidelines. A significant number of them have internet facilities for faculty, students and staff. They have good computational facilities and also computerized admissions.

Graph 4.3
Infrastructure available at Institutes level where institute has academic, Autonomy Institutes at the time of survey (N=65)



The above Graph 4.3, shows the infrastructure available in the University/Institute/College according to the academic status. A total of 56 University/Institutions/College i.e. 86.15% have said that they have placement cell, 49.23% i.e. 32 University/Institutions/College have said that they have IPR cell and 24 University/Institutions/College i.e. 36.92% have Incubation centre.

Table 4.2
Infrastructure available in the department, where institutes got financial autonomy either from central/State/Other govt. /sources Institutes at the time of survey (N=148)

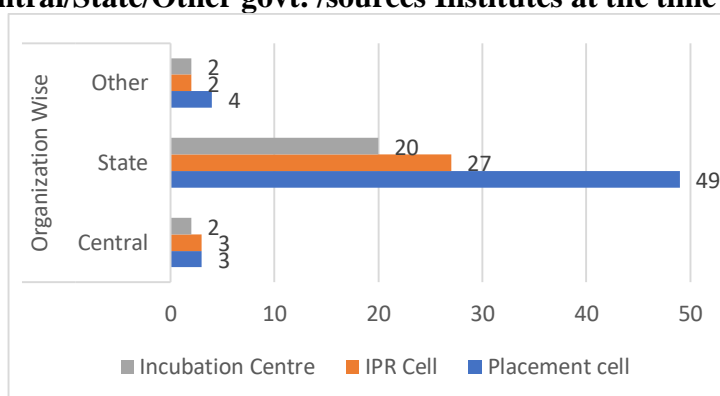
Facilities	Organization Wise			
	Central (n=10)	State (n=124)	Other (n=14)	Total (%)
Dept. Library	9	115	10	134 (90.54)
Internet faculty/Scientist	10	120	14	144 (97.30)
Internet students/staff	10	119	14	143 (96.62)
Internet Library	10	116	13	139 (93.92)
Internet Office/Admin	10	118	14	142 (95.95)
Computerized Admission	9	114	14	137 (92.57)
Computerized Exam	5	93	9	107 (72.30)
Computational facilities	10	117	13	140 (94.59)
Res Labs Bio	4	58	8	70 (47.30)
Res Labs_Chem	6	73	9	88 (59.46)
Res Labs_Phy	6	62	7	75 (50.68)
Lab safety	10	111	14	135 (91.22)

From the above table 4.2, it is visible that in the central government funded organizations, Internet facility for faculty, student, office staff and administration, all have computational facilities and internet library as well as lab safety guidelines. A significant number of them have departmental library, computerized admissions. The least number of them have computerized exam. In the state Government funded organizations all of them have internet facility for faculty and a significant number of them have internet facility for

students, office staff and administration and a least number of them have Incubations Centre. In other funded organizations, all of them have internet facility for faculty, students, office staff and administration. They also have computerized admission and lab safety guidelines. Overall it can be seen that all most all organizations have internet facility for faculty/student/office.

Graph 4.4

Infrastructure available in the institutes, where institutes got financial autonomy either From Central/State/Other govt. /sources Institutes at the time of survey (N=65)



It is visible from graph 4.4 that in the central government funded organizations, a significant number of them have placement cell and IPR cell and least number of them have incubation centre. In the state Government funded organizations, a significant number of them have placement cell and lesser number of them have IPR cell and Incubation Centre. A large number of Institutions are having placement cell and least number of Institutions are having Incubation Centre.

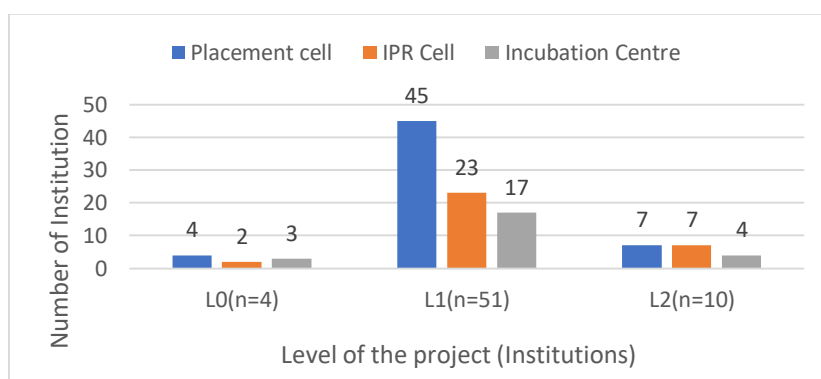
Table 4.3

Infrastructure available in Dept. Level Wise (N=148)

Facilities	Level Wise			
	L0(n=7)	L1(n=104)	L2(n=37)	Total (%)
Dept. Library	7	94	33	134 (90.54)
Internet faculty/Scientist	7	100	37	144 (97.30)
Internet students/staff	7	99	37	143 (96.62)
Internet Library	7	96	36	139 (93.92)
Internet Office/Admin	7	98	37	142 (95.95)
Computerized Admission	6	96	35	137 (92.57)
Computerized Exam	6	74	27	107 (72.30)
Computational facilities	7	99	34	140 (94.59)
Res Labs Biology	6	49	15	70 (47.30)
Res Labs Chemistry	7	54	27	88 (59.46)
Res Labs Physics	7	51	17	75 (50.68)
Lab safety	7	93	35	135 (91.22)

The table 4.3 gives the information of infrastructure based on different level of funding. In the department receiving L0 level grant it can be seen that maximum of them have departmental library, internet facility for faculty. Research labs and admission/ exam are computerized. All have lab safety guidelines. The next is the level L1, it can be seen that maximum of them have Internet facility for faculty/scientist, students and staff also have internet facilities for library, office. Most of them also have computerized admission, exam. But, Res labs are available in least number of Institutes. Most of the L2 level Institutes are having all the facilities but least number of them have Research labs.

Graph 4.5
Infrastructure available in the Institutes Level Wise (N=65)



In the above graph 4.5, the infrastructure available in the institutes are presented according to the level of project. In the L0 level, maximum they have placement cell and Incubation Centre in the institutes and least number of them have IPR cell. In the level L1 and L2, most of the institute have placement cell and significant number of them have IPR cell also least number of them have Incubation Centre. Institutes received level L2 grants, all such institutes have Placement cell and IPR cell but least number of them have Incubation centre. Over all, the percentage of placement cell, IPR cell and Incubation Centre existing in the institutes are 86.15, 49.23 and 36.92 respectively.

Table 4.4
Infrastructure available in the Dept. State Wise (N=148)

Facilities	State				
	Goa (n=11)	Gujarat (n=25)	Maharashtra (n=78)	Rajasthan (n=34)	Total (%)
Dept. Library	4	23	75	32	134 (90.54)
Internet faculty/Scientist	11	25	76	32	144 (97.30)
Internet students/staff	11	25	75	32	143 (96.62)
Internet Library	11	23	74	31	139 (93.92)
Internet Office/Admin	11	25	75	31	142 (95.95)
Computerized Admission	10	23	71	33	137 (92.57)
Computerized Exam	9	15	62	21	107 (72.30)
Computational facilities	11	22	75	32	140 (94.59)
Res Labs Bio	7	9	36	18	70 (47.30)
Res Labs_Chem	6	12	50	20	88 (59.46)
Res Labs_Phy	6	13	39	17	75 (50.68)
Lab safety	10	22	72	31	135 (91.22)

The state-wise infrastructure information is presented in the above Table 4.4. In Goa, all Institutes have internet facility for faculty, students, staff, office / administration, internet in library, computational facility and lab safety manual. Least number of them have Department library.

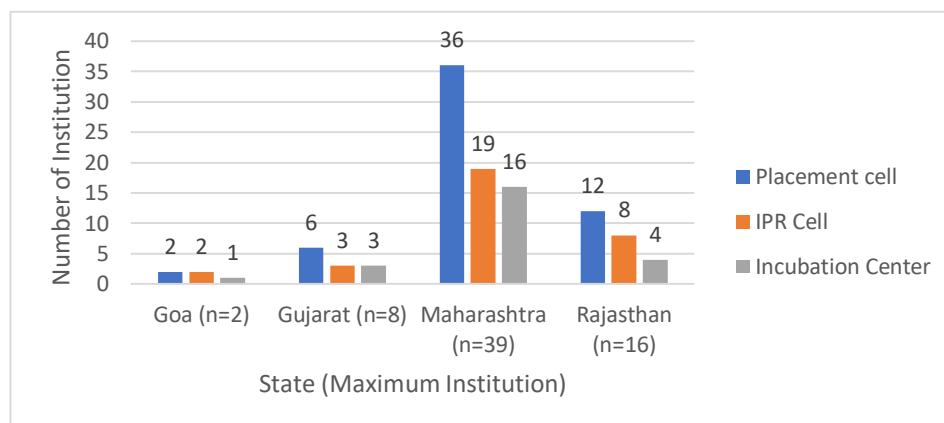
In the state of Gujarat, all have internet facility for faculty, students, office and administration. A significant of them have internet library. Least number of them have separate research lab for Biology.

In Maharashtra state, a very large number of Institutes have department library and internet facility for faculty/Scientist, office/administration. A significant number of them have internet facility for students and computational facilities and least number of them have a separate research lab for Biology.

In the state of Rajasthan, it can be seen that all Institutions have computerized admission. A significant number of them have internet facility for faculty and students and they have also computational facilities. Overall, it is visible that internet facility for faculty is good in all the states. Further, it is seen that more than 90 percent Departments/ Institutes are having

Departmental Library, internet for faculty, student/staff, and internet in Library and in office, centralized admission, computational facilities and Lab safety.

Graph 4.6
Infrastructure available in the Institutes State Wise (N=65)



The above graph 4.6 presents state wise infrastructure available in the institutes. In the Goa state, all the institutes have placement cell and IPR cell but least number of Institutes have Incubation centre. In the Gujarat state, most of them have placement cell and less number of them have IPR cell and Incubation centre. In Maharashtra state, most of the institutes have placement cell and more than 50 percent of them have IPR cell and Incubation centre. In Rajasthan state, 12 institutes have Placement cell but lesser of them have IPR cell and least have Incubation centre. The percentage of Institutes in all the four states having placement cell, IPR cell and incubation cell are 86.15, 49.23 and 36.92 respectively.

4.3 Distribution of General Classrooms and Smart classrooms

Table 4.5
Distribution of General Classrooms available in the beneficiary's Dept. /Inst. /college. (N=148)

Range (No. of General Class Room)	No. of Department	% of the Department
01-05	58	44.96
06-10	35	27.13
11-15	4	3.10
16-20	2	1.55
21+	30	23.25
Total	129*	100

*129+7 (Not applicable) +12 (Not available) =148 Department/Inst./college

From the above Table4.5 it can be seen that presently, one to five classrooms are available in 58 (44.96%) Institution/Department out of 148 Institution/Department. Six to

Ten classroom are available in 35 (27.13%) Institution/Department. Also it is seen that 30 Institution/Colleges said that presently they have more than 21 classrooms. Out of 148, 19 Institution/Department said that they do not have classroom. Therefore, large number of classrooms are also available in 23.25 percent Institutes.

Table 4.6
Distribution of Smart Classrooms available in the beneficiary's Dept./Inst./college. (N=148)

Range (No. of Smart Class Room)	Smart Classroom in the Department	% of Smart Classroom in the Department
1-5	84	77
6-10	18	16.5
11-15	1	0.9
16-20	1	0.9
21+	5	4.5
Total	109*	100

*109+8(Not applicable) +31(Not available) =148

From the above table no. 4.6, it is seen that presently, out of 109 Departments, one to five smart classrooms are available in 84 (77%) Institutions/Departments. Six to Ten smart classroom are available in 18 (16.5%) Institutions/Departments. Also, 05 Institutions/Colleges are having more than 21 smart classrooms. It is also seen that out of 148, 39 Institutions/Departments do not have any smart classrooms.

Table 4.7
Distribution of Classrooms presently available in the Dept. /Inst. Academic status wise. (N=129)

Range	Academic status						Total (%)
	Central Government Institution (%)	State Government Institution (%)	Autonomous Institution (%)	Deemed University (%)	Constituent college (%)	Private Institution (%)	
1-5	2(50)	42(54.5)	7(43.7)	2(22.2)	0(0)	5(23.8)	58(44.9)
6-10	2(50)	25(32.4)	5(31.2)	0(0)	1(50)	2(9.5)	35(27.1)
11-15	0(0)	1(1.2)	0(0)	2(22.2)	0(0)	1(4.7)	4(3.1)
16-20	0(0)	1(1.2)	0(0)	1(11.1)	0(0)	0(0)	2(1.5)
21+	0(0)	8(10.3)	4(25)	4(44.4)	1(50)	13(61.9)	30(23.2)
Total	4(100)	77(100)	16(100)	9(100)	2(100)	21(100)	129(100)

The above table 4.7 shows the present available classroom in the Department on academic status wise. It is clear from the table that most of the classroom i.e. 77 are available in the Department/Institution which are Institutes of State Government. In the state Government Institutes, 1 to 5 classrooms are available in the 42 Departments/Institutes, 25 Departments possess six to ten classrooms and 08 Departments/Institutes have more than 21

classrooms. The private Institutions, having more than 21 classrooms are in 13 departments/institutions.

Out of 129 Departments/Institutions, 2 are constituent colleges, 4 Central Government, 9 Deemed universities, 16 Autonomous Institution, 21 private and 77 are State Government Institutions.

Table 4.8
Distribution of Smart Classrooms presently available in the Dept. /Inst.
Academic status wise. (N=109)

Range	Academic status						Total (%)
	Central Government Institution (%)	State Government Institution (%)	Autonomous Institution (%)	Deemed University (%)	Constituent college (%)	Private Institution (%)	
1-5	0(0)	57(89)	8(72.7)	3(33.3)	2(100)	14(66.6)	84(77)
6-10	2(100)	7(10.9)	3(27.2)	1(11.1)	0(0)	5(23.8)	18(16.5)
11-15	0(0)	0(0)	0(0)	1(11.1)	0(0)	0(0)	1(0.9)
16-20	0(0)	0(0)	0(0)	1(11.1)	0(0)	0(0)	1(0.9)
21+	0(0)	0(0)	0(0)	3(33.3)	0(0)	2(9.5)	5(4.5)
Total	2(100)	64(100)	11(100)	9(100)	2(100)	21(100)	109(100)

The above Table 4.8 presents the smart classrooms availability in the Departments by academic status wise. From the table, it is clear that most of the smart classrooms i.e. 64 are available in the Departments/Institutions which are state Government Institutes. In the state Government institutes, one to 5 smart classrooms are available in the 57 Departments/Institutes and 07 Departments have six to Ten smart classroom. In the private institution, one to five smart classrooms are available in 14 Department/Institutions. Thus, majority (77%) of Departments/Institutions are having one to five classrooms. Out of 109 Departments/Institutions, 2 are Central Government and constituent colleges each, 9 Deemed University, 11 Autonomous Institution, 21 private and 64 are State Government Institutions.

Table 4.9
Distribution of Classrooms presently available in the
Dept. /Inst. Level wise. (N=129)

Range	Project level			
	L0	L1	L2	Total (%)
1-5	Nil	47	11	58 (44.96)
6-10	Nil	24	11	35 (27.13)
11-15	Nil	3	1	4 (3.1)
16-20	Nil	Nil	2	2 (1.5)
21+	7	21	2	30 (23.25)
Total	7	96	27	129 (100)

The table 4.9, it can be seen that the Departments/ Institutions received project level L1, total 96 have classrooms out of them 47 have less than 5 general class rooms,24 six to ten,03 have eleven to fifteen, 21are having more than 21 and none are having between 16 to 20 classrooms. In the Departments/Institutes received project level L2, total 27 department have general class rooms out of them maximum 22 Departments have up to10 class rooms, 1 Department has 11 to 15 general class rooms and sixteen to twenty and more than 21 classrooms are existing in 2 Departments/Institutes each. Also, the project L0 level, all the 7 Departments/Institutes have above 21 general class rooms.

Table 4.10
Distribution of Smart Classrooms presently available in the Dept. /Inst. Level wise. (N=109)

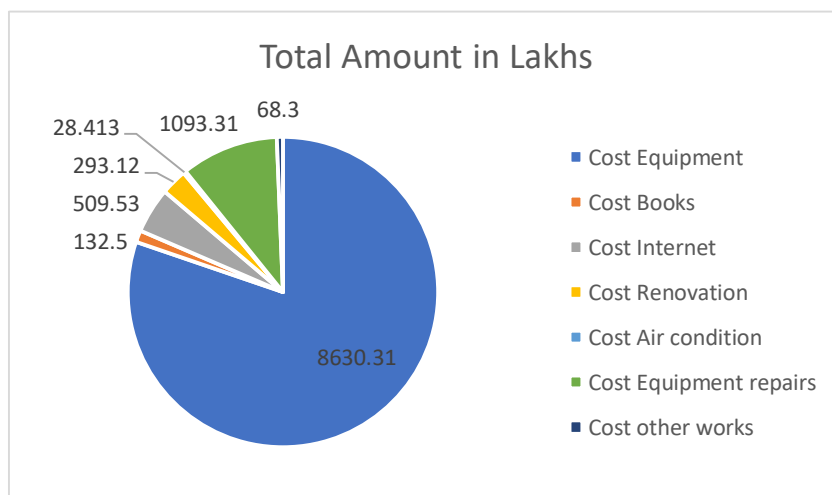
Range	Project level			
	L0	L1	L2	Total
1-5	4	67	13	84(77)
6-10	3	9	6	18(16.5)
11-15	0	0	1	1(0.9)
16-20	0	0	1	1(0.9)
21+	0	4	1	5(4.5)
Total	7	80	22	109 (100)

From above table 4.10, L1 level project awarded Department/Institutes, total 80 Departments have smart classrooms out of them 67 maximum Departments have less than 5 smart class rooms. The L2 level project awarded Institutes, total 22 Departments have smart class rooms out of them maximum 13 Departments have less than 5 smart classrooms. Also at the project L0 level, out of 7Departments/Institutions, 4 have less than 5 smart class rooms.

4.4: Expenditure Made on Various Items.

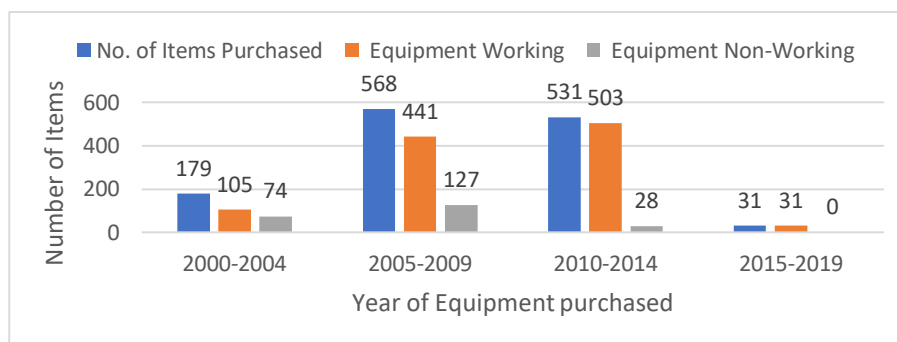
Graph 4.7

Expenditure on Infrastructure created under FIST



It can be observed from above graph 4.7 that the expenditures under FIST grant is made on Equipment, Library Books, Internet and communication system, Renovation of Labs, Air conditioning and repair of equipment. Maximum amount 80.24 percent grant is utilized for purchasing of Equipment and 10.17 percent on its repair. The percentage of expenditure on Internet, renovation and Books are 4.74, 2.73 and 1.23 respectively.

Graph 4.8
Current Status of Equipment procured under FIST



The status of equipment created under FIST grant is presented in the above Table. It is seen that maximum 568 i.e. 43.4% Equipment were purchased in the year 2005-2009 and most of them i.e. 77.64% equipment are working and rest of them i.e. 22.35% are non-working. The equipment purchased in the year 2010-2014 are 531 i.e. 40.6% and most of them i.e. 94.72% are working and rest of them i.e. 5.27 % are non-working. The equipment purchased i.e. 31 equipment in the year 2015-2019 are 31 and all are in working condition. Overall from 2000 to 2019 total number of equipment purchased are 1309 and out of these 1080 i.e. 82.50% equipment are working and rest of them 229 i.e. 17.49 % equipment are non-working.

Table 4.11
Distribution of Equipment's procured under FIST
according Cost & Current Status

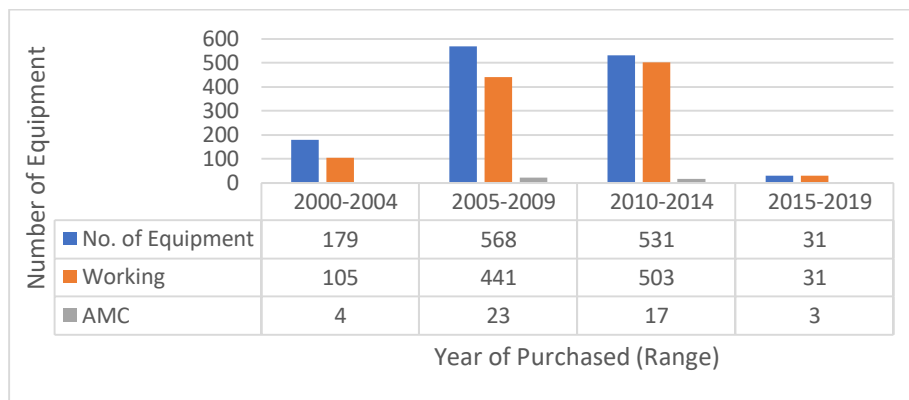
Cost range Rs.	No. of Equipment	% of Equipment	Working		AMC	
			n	%	N	%
0-100000	585	44.7	489	83.58	10	1.7
100000-1000000	531	40.6	420	79.09	25	4.7
1000000-2000000	104	7.9	87	83.65	7	6.7
2000000-3000000	32	2.4	29	90.62	3	9.3
3000000-5000000	33	2.5	31	93.93	0	0
5000000-10000000	18	1.4	18	100	1	5.5
10000000-20000000	6	0.5	6	100	1	16.66
Total	1309	100.0	1080	82.50	47	3.5

*Working + Non-Working (229 + 1080) = 1309

*AMC (Yes) + AMC (No) (47+ 1262) = 1309

From table 4.11, it is seen that the maximum 585 equipment are less than Rs. 100000 and out of them 489 (83.58%) are working and only 10 i.e. 1.7 % equipment have AMC. The 531 (40.6%) equipment are under Rs. 100000-10000000 cost range and out of them 420 (79.09%) are working and only 25 i.e. 4.7 % are in AMC. The number of equipment costing Rs. 20 – 30 lakhs and 30 – 50 lakhs are 32 and 33 respectively and more than 90 percent are in working condition. Only 18 equipment are under Rs. 50 – 100 lakhs cost range and all of them are working but only 1 equipment have AMC. Similarly, 6 equipment are under Rs.100-200 lakhs cost range and all of them are working but only 1 equipment have AMC. Thus, total 1309 equipment are purchased and out of these 1080 (82.50%) are working and 47 (3.5%) are in AMC and 182 are non-working.

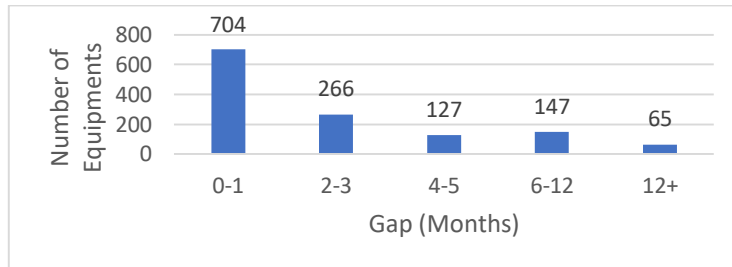
Graph 4.9
Distribution of Equipment's procured under FIST
according Current Status and AMC



The details of equipment working/non-working and year of their purchase has already discussed above and here, its AMC is being discussed to see their maintenance by Institutes. From above graph 4.9, the status of equipment created under FIST can be seen. It is seen that 568 i.e. 43.4% Equipment purchase in the year 2005-2009 and most of them i.e. 77.64% equipment are working and 23 equipment have AMC. The equipment Purchased in the year 2010-2014 are 531 and most of them i.e. 94.72% are working but only 17 i.e. 3.2% equipment have AMC. All Equipment purchase i.e. 31 equipment in the year 2015-2019 are working and only 9.6 % equipment have AMC. Overall from 2000 to 2019 total equipment purchased are 1309 and 82.50% equipment of them are working and 47 i.e. 3.5% equipment are having AMC.

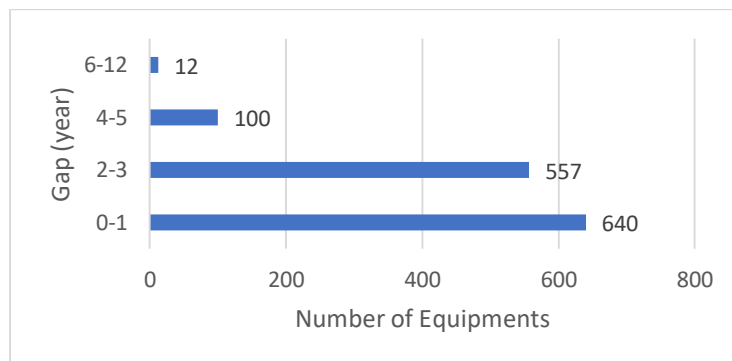
4.5: Factor Associated with Procurement and Installation of Equipment's.

Graph 4.10
Gap between Purchase and Installation of Equipment



It can be seen from above graph that 53.8 percent Equipment have less than 1 month's gap between Purchase and Installation of Equipment. The gap of 2 – 3, 4 – 5 and 6 – 12 months between purchase and installation are of 266 (20.3%), 127 (9.7%) and 147 (11.2 %) respectively. Also 5 percent Equipment have above 12 months' gap between Purchase and its Installation. Thus, more than 50 percent equipment are installed within one month of purchase and approximately 75 percent equipment are installed before 03 months of purchase.

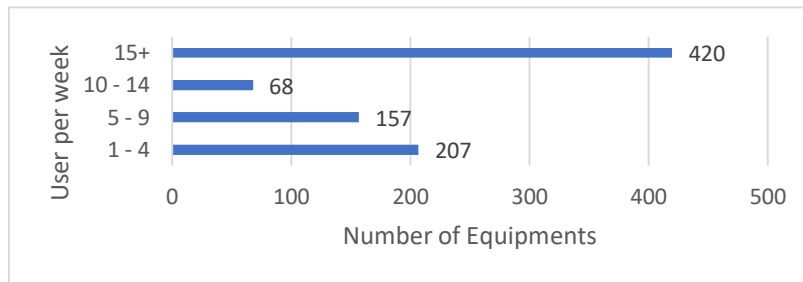
Graph 4.11
Gap between Purchase year of equipment and Sanction year of grant.



This graph 4.11 shows the distribution of gap between sanction and purchase of equipment. It can be seen that 640 (48.9%) equipment are purchased between 1 – 2 years of sanction. The number of equipment purchased in the gap of 2 – 3, 4 – 5 and 6 – 12 years from sanction are 557 (42.6%), 100 (7.6%) and 12 (0.09%) respectively.

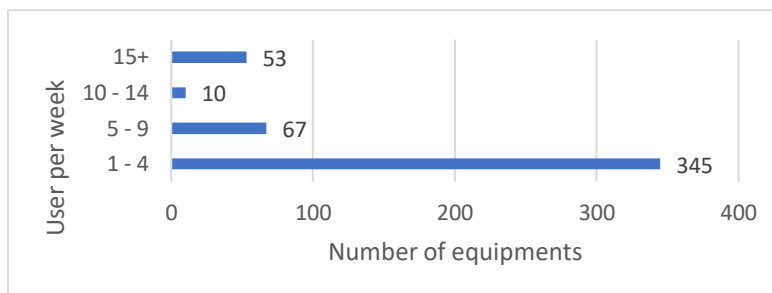
4.6: Utilization of Equipment's.

Graph 4.12
Utilization of Equipment procured under FIST Internal user



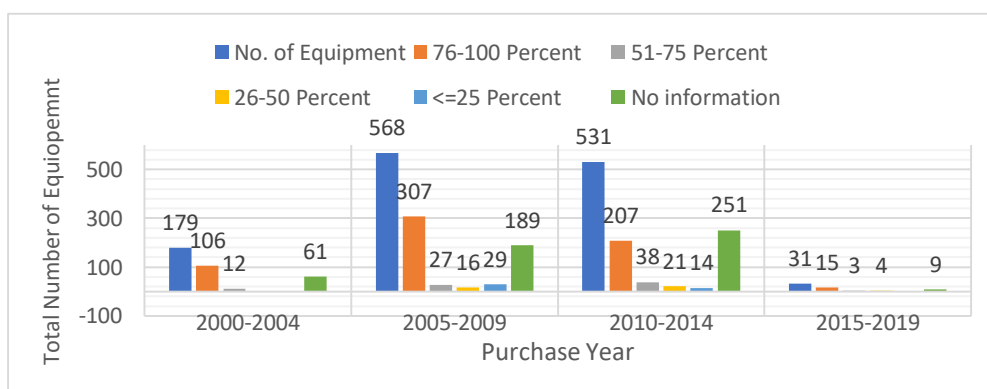
From graph 4.12, it is seen that maximum 420 i.e. 49.29 percent Equipment are utilized by more than 15 Internal users per week. Also 207 i.e. 24.29% Equipment are utilized by 1 to 4 internal user per week. Similarly, 157 (18.42%) are utilized by 5 to 9 Internal user per week and 68 (7.9%) equipment are utilized by 10 to 14 Internal user per week. Thus, approximately 50 percent equipment are utilized by 15 or more internal users per week.

Graph 4.13
Utilization of Equipment procured under FIST by External Users



From Graph 4.13, it is observed that maximum 345 i.e. 26.4% Equipment are utilized by less than 4 external users per week. The external users between 5 – 9 and more than 15 per week are 67 (4.9%) and 53 (4.0%) respectively. Also minimum 10 i.e. 0.7% Equipment are utilized 10 to 14 external user per week.

Graph 4.14
Percent Utilization of Equipment



The graph 4.14 presents the percent utilization of equipment created under FIST program. Maximum 568 i.e. 43.4% equipment are purchased in the year 2005-2009 and out of them 307 i.e. 54% equipment are maximum 76 to 100 percent utilized by users and 29 i.e. 5.1% equipment are less than 25% utilized by users. Similarly, 189 equipment information are not available which were purchased during 2005 -2009.

Minimum 31 i.e. 2.4% equipment are purchased in the year 2015-2019 and out of them 15 i.e. 48.4% equipment are between 76 to 100 percent utilized by user and 4 i.e. 12.9 % equipment are less than 50% utilized by user and 9 equipment information are not available. Over all 1309 equipment are purchased between 2000-2019 and out of them 635 i.e. 48.5% equipment are utilized between 76 to 100 percent by users, 80 (6.1%) equipment between 51 to 75 percent, 41 (3.1%) equipment between 26 to 50 percent and 43 (3.3%) equipment are less than 25 percent utilized by users. The information of 510(39%) equipment is not available.

4.7 Conclusion:

The analysis carried out in previous sections provides some very useful conclusions. Infrastructure Facilities like Library, Internet for faculty and student/ Staff, Internet in Library and office/ administration, computerized admission, computational facilities, and laboratory safety are existing in more than 90% Universities/ Institute/ Colleges. The percentage of Universities/ Institute/ Colleges having placement cell, IPR cell and Incubation centre are 86.15, 49.23 and 36.92 respectively. Most of the Department/Institution/Colleges are having 1 to 5 classrooms and smart classrooms and some also have 6 to 10 classrooms and smart classrooms. Under the FIST grant, major amount i.e. 80.24 % are utilized for purchase of equipment and 10.17% for its repair. The 82.5% equipment purchased under FIST grant are in working condition. 43.4% and 40.6% equipment are purchased between 2005 to 2009 and 2009 - 2011. Starting years 2000 – 2004, 13.7% and recent past 2015 to 2019, 2.4% equipment are Purchased only. Approximately 85.3% equipment are costing less than Rs. 10 lakhs and out of these 44.7% are less than Rs. 1 lakh. More than 50% equipment are installed within one month of purchase and 20% are installed between 2-3 months of purchase i.e. approximately 75% are installed before 3 months of purchase. Approximately 50% equipment are utilized by 15 or more internal users per week and external users less than 4 per week are 72.6%. The maximum utilization of equipment between 76 to 100 percent is highest i.e. 48.5%.

Chapter 5

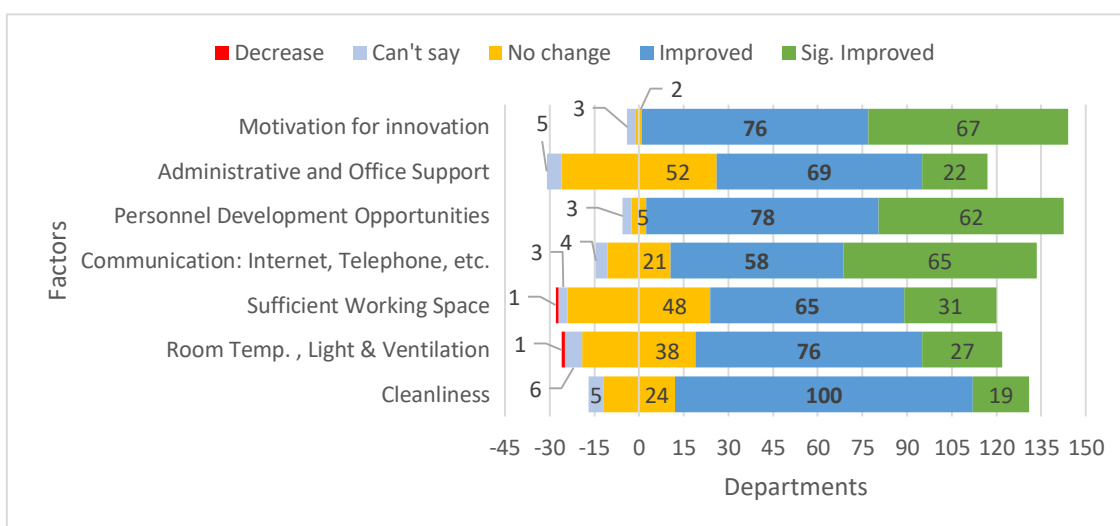
Impact on working environment, capacity building and collaboration

5.1 Introduction:

The working environment of Department plays a crucial role in the development of quality human resources and research facilities. Working environment of a work place can be judged by various parameters in the form of available facilities like; cleanliness, ventilation, working space, communication, administration and office support etc. Good facilities available in the Department also positively affects and motivates for innovation and personal development. This chapter presents the analysis of impact on working environment and also its impediments, capacity building and collaboration etc. due to award of DST-FIST grant.

5.2: Impact on Working Environment

Graph 5.1
Impact on Working Environment after DST-FIST support Department wise.

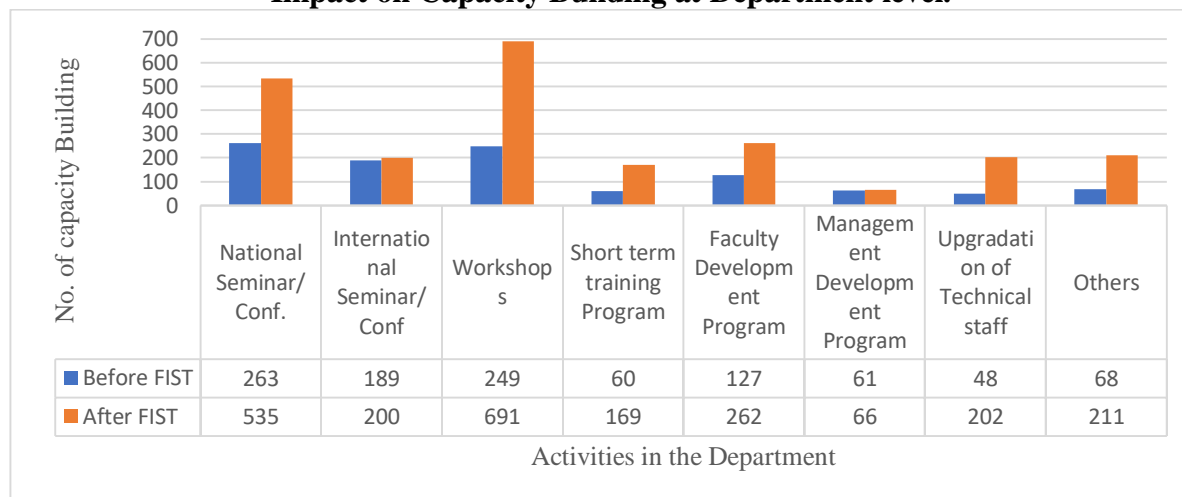


The above graph presents the different factors such as cleanliness, room temperature/Light/ventilation, sufficient working space, communication, personnel development opportunities, administrative and office support motivation for information regarding the impact on working environment after DST-FIST support. All these factors measured in Likert scale. This table shows that the improvement of approximately 40 – 70 percent for the factors such as cleanliness, room temperature/ light/ventilation, sufficient working space, administrative and office support and motivation for innovation. Further, the percentage of significantly improved responses are also very high for communication, personal development opportunities and motivation for Innovation. It can be seen that after

the DST-FIST support working environment of the College/Department/School/Centre is improved whereas communication is significantly improved.

5.3: Impact on Capacity Building

Graph 5.2
Impact on Capacity Building at Department level.



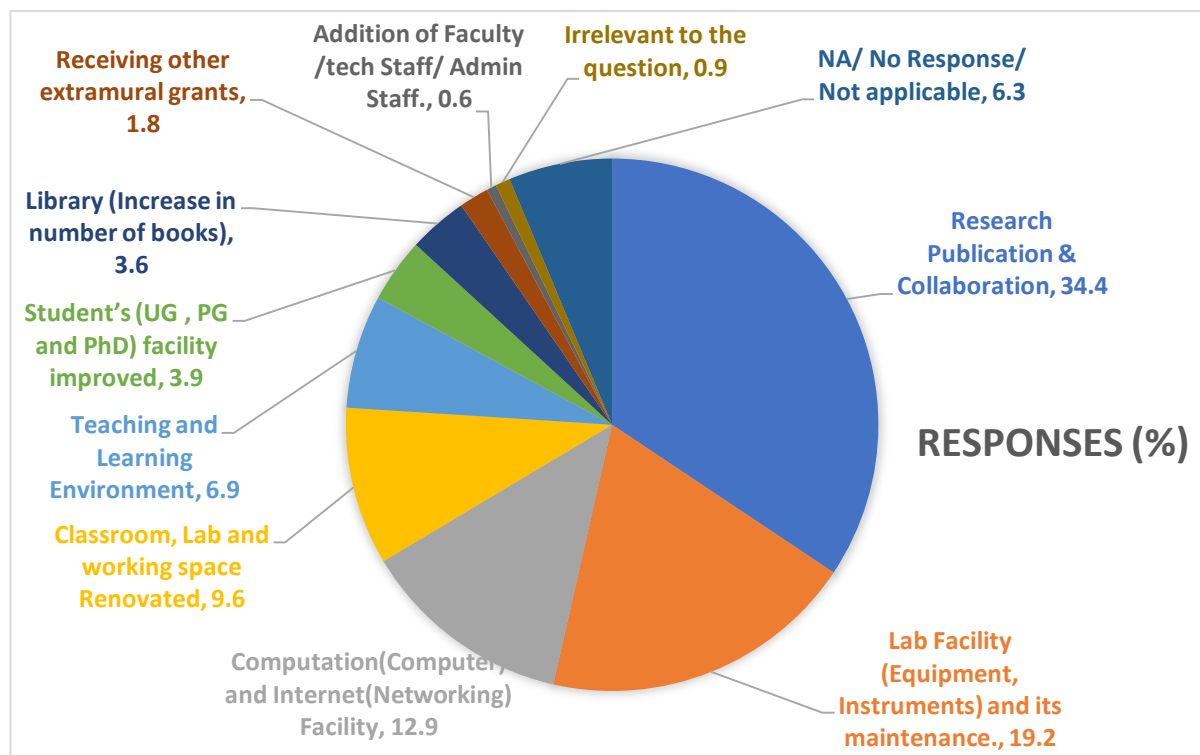
This graph presents the changes taken place after the sanction of DST-FIST program on capacity building activities. The maximum change of 321 percent is seen in the activity of up gradation of technical staff, the activities like National seminar/ conference, Workshops, Short term training program, Faculty development program and others have increased by 100 -200 percent and minor increase is noticed (i.e. 5 -8 percent) in International Seminar/ conference and Management development program. It can be noticed that all the activities have increased due to award of DST-FIST program.

The impact of various activities is presented in Table 5.2 which reveals that maximum impact is on Workshops i.e. 2.98 followed by National Seminar/ Conference i.e. 1.83 and up gradation of Technical Staff i.e. 1.04. Moreover, Impact on all activities are positive.

5.4: Improvement of the Working Environment

Graph 5.3

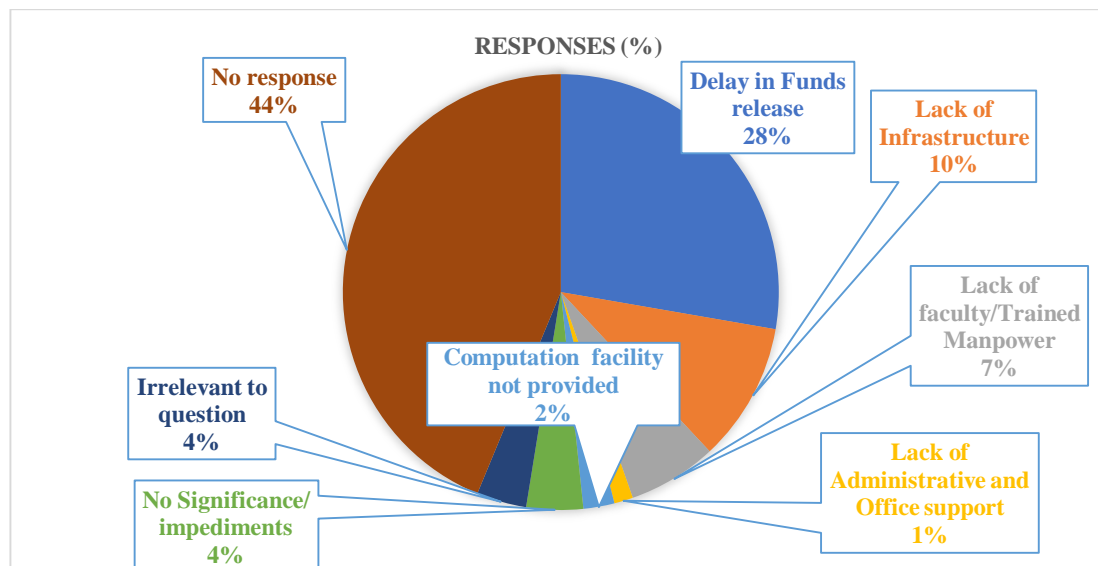
Summary of responses (Item) on Improvement of the Working Environment due to DST-FIST grant in west regions (N=334).



This graph 5.3 shows that 34.4 percent responses were regarding the improvement of Research publication and collaboration due to DST-FIST support followed by lab facility and its maintenance which is 19.2%. The 12.9 percent responses is contributed towards the improvement of computation and Internet facility and 9.6 percent for classroom, lab working space renovated. The percentage of improvement in the field of teaching and learning environment. Students' facility improvement and increase in the number of books in the library are 6.9, 3.9 and 3.6 respectively. Thus, it can be concluded that research publication & collaboration has improved maximum and followed by Lab facility and then computation facility.

5.5: Impediments of working environment.

Graph 5.4
Summary of responses (Item) on Impediments of working environment due to DST-FIST support in western regions. (N=213)



The above table presents the hindrance while implementing the scheme. The maximum 44 percentage are of non-responses/ Not Applicable. But, the delay in fund release/ more funds needed/ annual maintenance grants are expressed by 28 percent. The lack of infrastructure and lack of faculty are opined by 10 and 7 percentage respectively. Therefore, the main impediment is delay in fund release/ more funds needed/ Annual maintenance grants while implementing this scheme.

5.6: Conclusion:

The working environment of the Department/ Institutes/ Colleges has improved/ significantly improved after the DST-FIST grant. The factors like motivation for innovation, Personal development opportunity, communication (Internet & telephone) and cleanliness etc. are showing visible improvement. Major improvement is seen in up gradation of teaching staff, organization of short term training program, workshops. The impact of DST- FIST grant is positive on all the activities and having greater impact on Workshops, National Seminar/ Conferences. Faculty development program and National Seminar/ Conferences etc. are due to the FIST grant. The research publication & collaboration has increased by 34.4%, lab facility by 19.2% and Computation & Internet by 12.9%. The main impediments are delay in fund release, need of more funds and annual maintenance grants.

Chapter 6

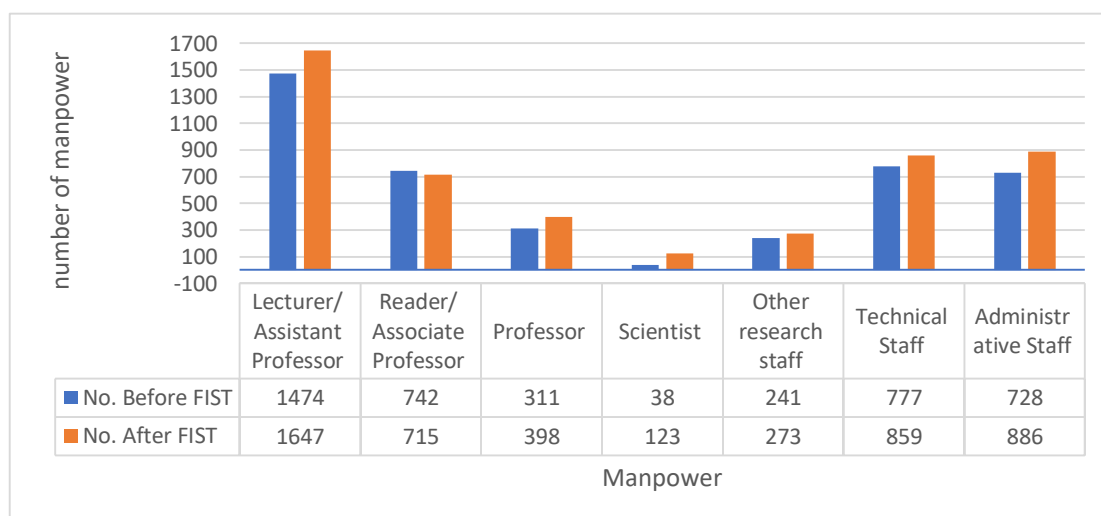
Impact on academic and research performance

6.1: Introduction:

This chapter deals with the impact on academic and research performance of Department/ Institutes/ Colleges. The impact on volume of manpower in Department/ Institutes/ Colleges are studied. For this Central Government, State Government, Autonomous, Deemed, Constituent and Private Universities/ Institutes/ Colleges have been considered. Impact on volume of manpower is also studied for changes before and after FIST and also for different level of FIST grant. Impact on sanctioned seats and number of students admitted in various courses, impact on pass percentage of students, improvement in grades of the students, number of students qualifying in National examinations are studied. The evaluation of impact on volume and quality of research has also been done and finally an overall view of the respondents has been observed on changes before and after FIST findings.

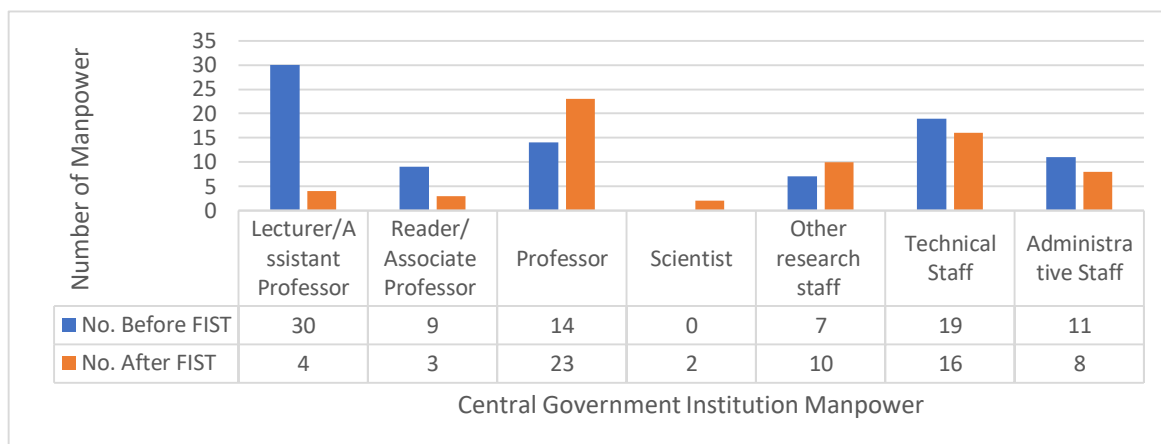
6.2: Impact on volume of Man Power

Graph 6.1
Impact on volume of Man Power department wise.

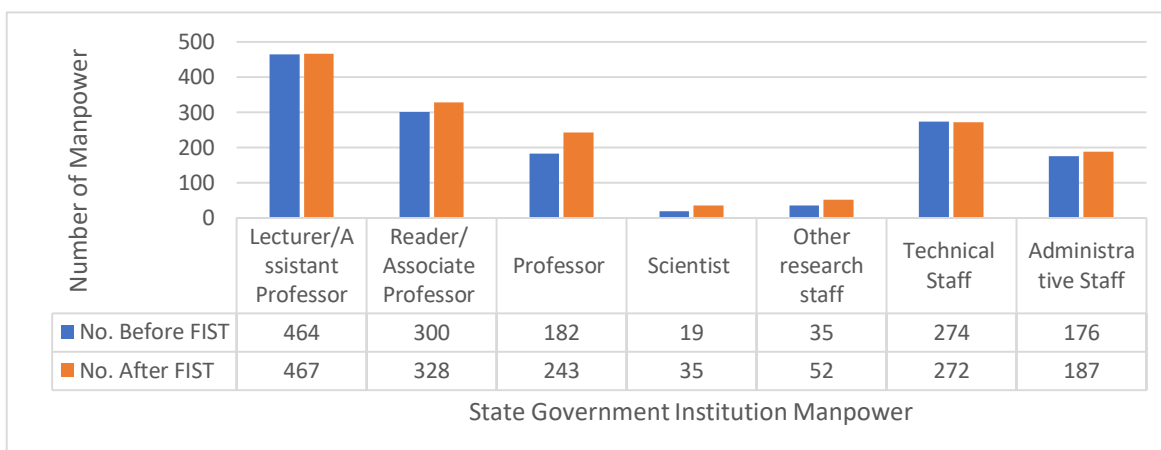


The graph 6.1 shows the percentage change in the Man power in the Department after the DST-FIST support compare to before the award. The increase is seen maximum percentage in Scientist which is increased by 223.68 % but Reader/Associate Professor decreases by 3.64 percent. The overall increase in percentage in the man power before and after FIST is 13.6 percent i.e. after DST-FIST support man power in the College/Department/School/Centre are increased. From Table 6.1, it can be seen that the impact of DST-FIST support is positive on all type of man powers except on Reader/ Associate Professor. The maximum impact is on Lecturer/ Assistant Professor (i.e. 1.16) and followed by Administrative staff i.e. 1.06.

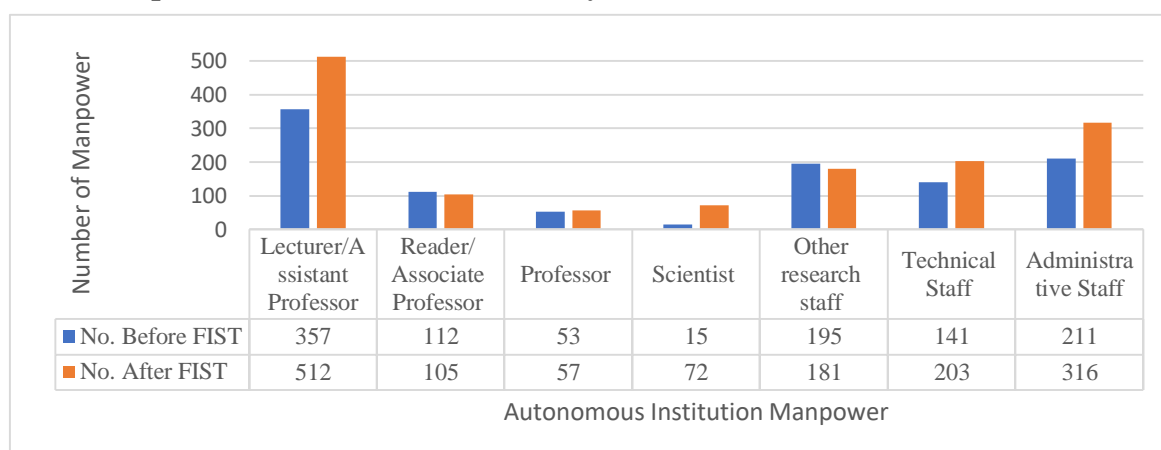
Graph 6.2
Impact on volume of Man Power by Central Gov. Institutions (N=148)



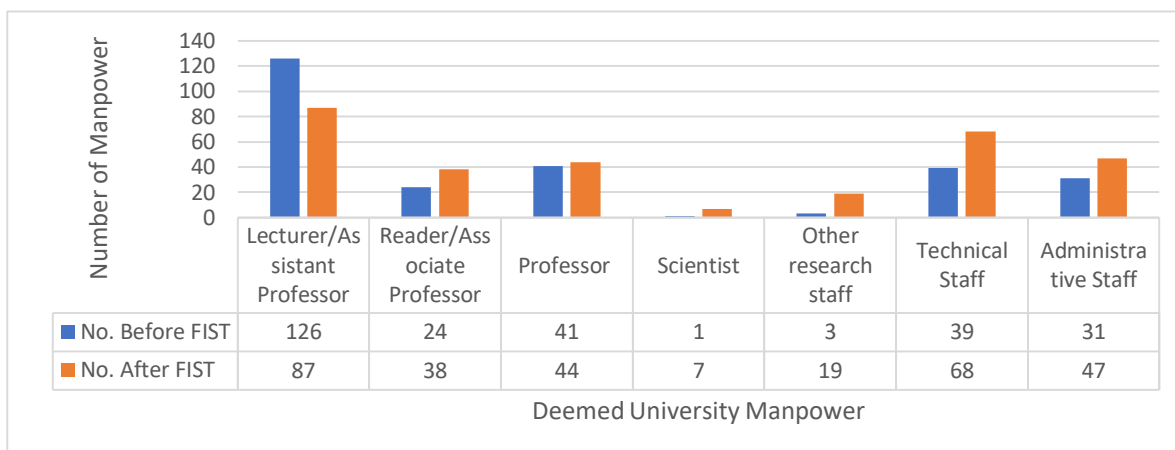
Graph 6.2a
Impact on volume of Man Power by State Gov. Institutions (N=148)



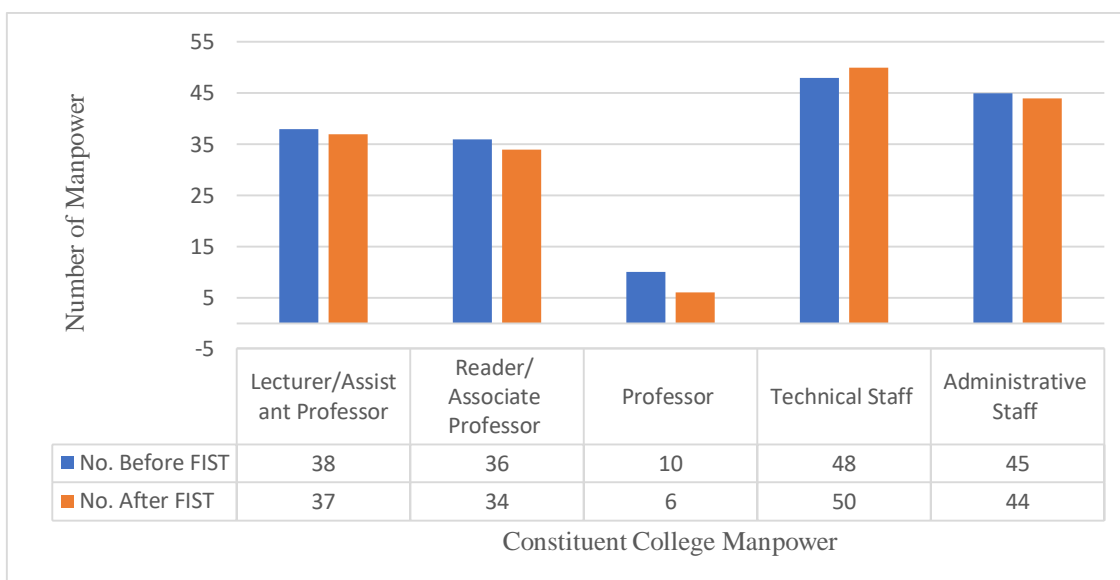
Graph 6.2b
Impact on volume of Man Power by Autonomous Institutions (N=148)



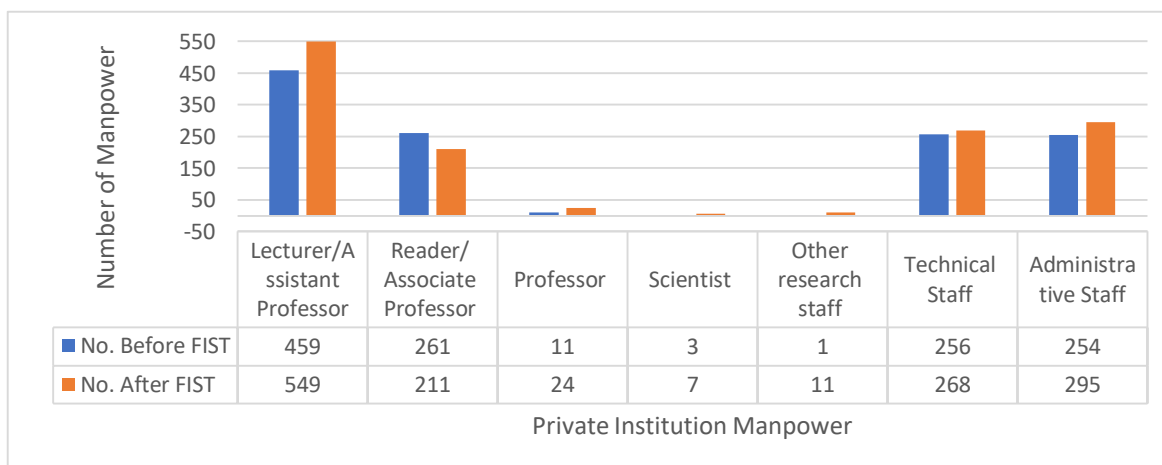
Graph 6.2c
Impact on volume of Man Power by Deemed University (N=148)



Graph 6.2d
Impact on volume of Man Power by Constituent College (N=148)



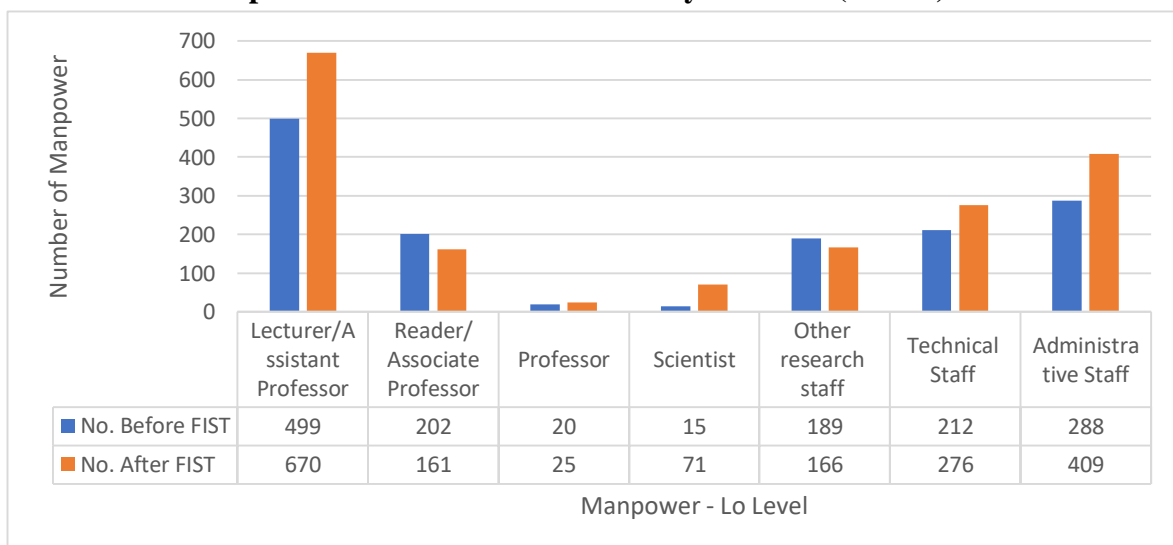
Graph 6.2e
Impact on volume of Man Power by Private Institution (N=148)



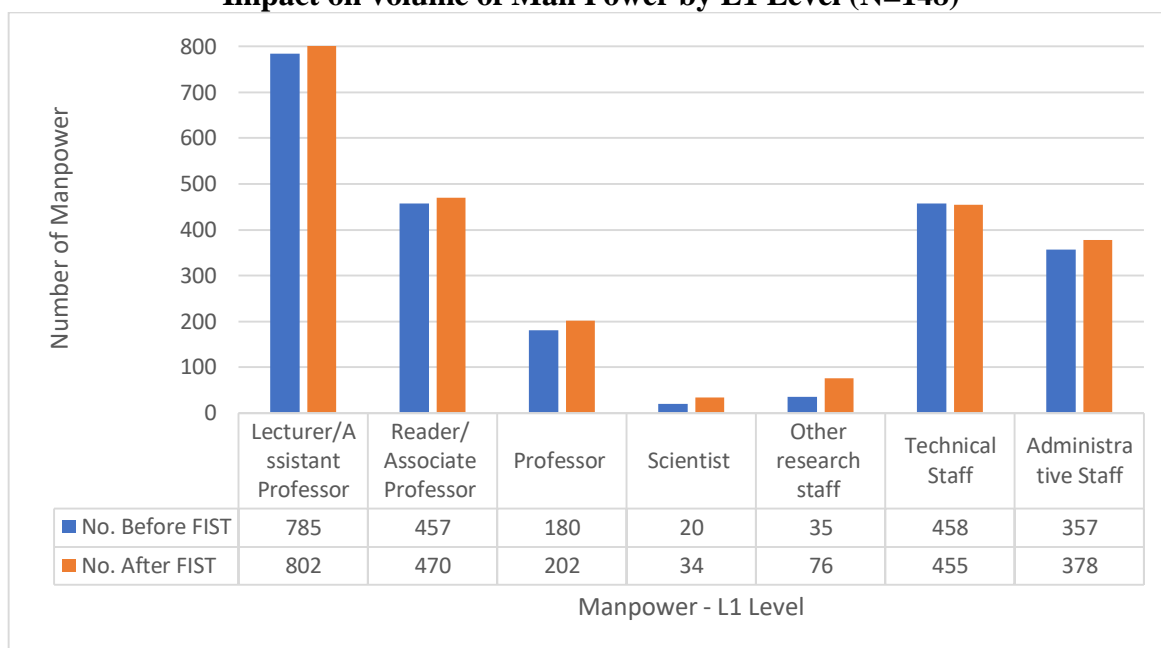
The impact of volume of man power can be seen from the above Graph. It is clear that the Scientist has increased in Deemed University, Autonomous Institution, Central Government, private Institution and State Government by 600, 380, 200, 133.3 and 84.2 percent respectively. Similarly, the post of Professor has also increased in Private Institution, Central Government, State Government Institution, Autonomous Institution and Deemed University by 118.2, 64.3, 33.5, 7.5 and 7.3 respectively but it is decreased in Constituent colleges by 40 percent. The post of Reader/ Associate Professor has decreased in Central Government Institutes, Private Institutes, Autonomous Institutes and Constituent Colleges by 66.7, 19.2, 6.3 and 5.6 percent respectively but it has increased in Deemed Universities and State Government Institutions by 58.3 and 9.3 percent respectively. The post of Lecturer/ Assistant Professor has increased in the Autonomous Institutions, Private Institutes and State Government Institutes by 43.4, 19.6 and 0.6 percent respectively whereas it has decreased in Central Government Institutions, Deemed Universities and Constituent Colleges by 86.7, 31 and 2.6 percent respectively.

The post of other research staff has also increased by 1000,533.3,48.6 and 42.9 percent in Private Institution, Deemed University, State Government Institution and Central Government Institution respectively but it is decreased for Autonomous Institution by 7.2 percent. The technical staff has increased in Deemed University, Autonomous Institution, Private Institution and Constituent Colleges by 74.4, 43.9, 4.7 and 4.2 respectively but decreased in Central Government Institution and State Government Institutions by 15.8 and 0.7 percent respectively. The technical as well as administrative staff man power have increased in all type of Institutes except for State Government Institutions and Constituent Colleges (Administrative only).

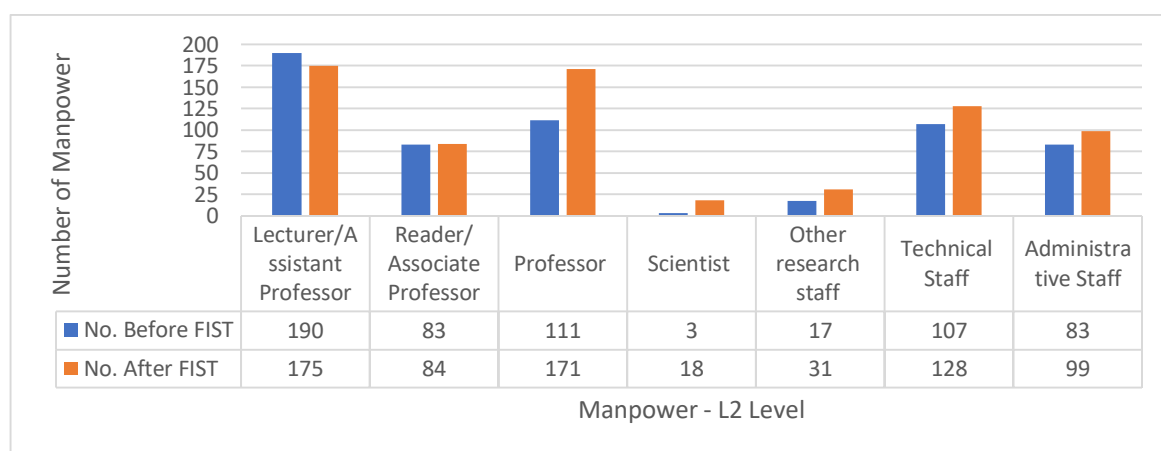
Graph 6.3
Impact on volume of Man Power by L0 Level (N=148)



Graph 6.3a
Impact on volume of Man Power by L1 Level (N=148)



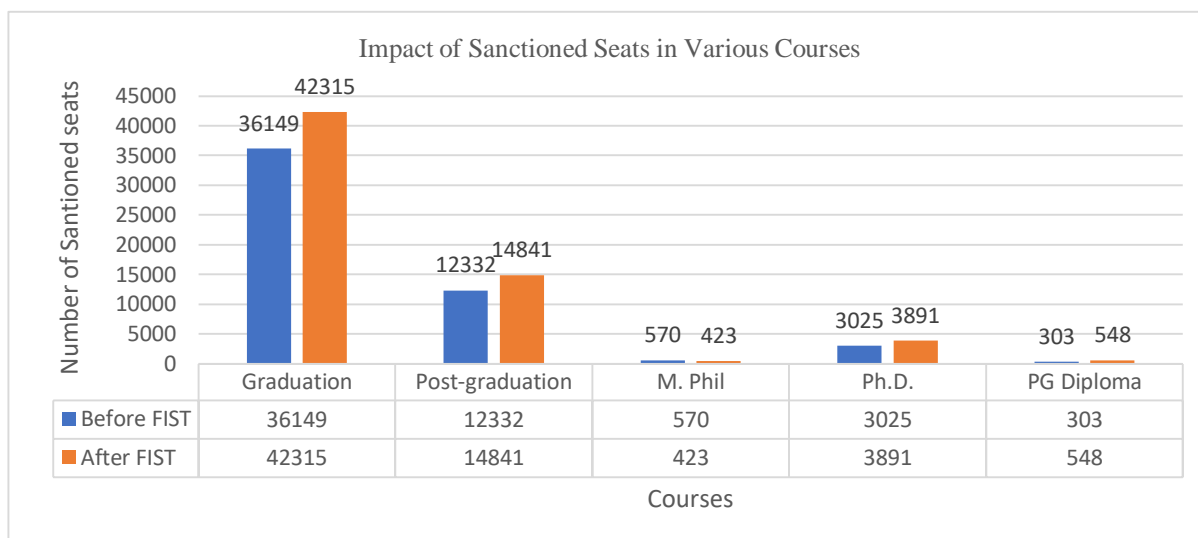
Graph 6.3b
Impact on volume of Man Power by L2 Level (N=148)



It is clear from above Graph that at the L0 level, all types of man power have increased except Reader/ Associate Professor and Other Research Staff and the post of scientists have increased maximum by 373.3 percent. At the L1 level Institutes, all types of man power have increased except Technical staff which has decreased slightly. The Institutes received L2 level grants have increased by all types of man power but the Lecturer/ Assistant Professor has decreased. The percent change in scientist after FIST support has increased in Level L2, L1 and L0 of grant by 500, 373.3 and 70 percent respectively. But, it also seen that after FIST support, it has decreased the Reader/ Associate Professor and Lecturer/Assistant Professor in the level L0 and level L2 of FIST grant by 20.3and 0.6 percent respectively.

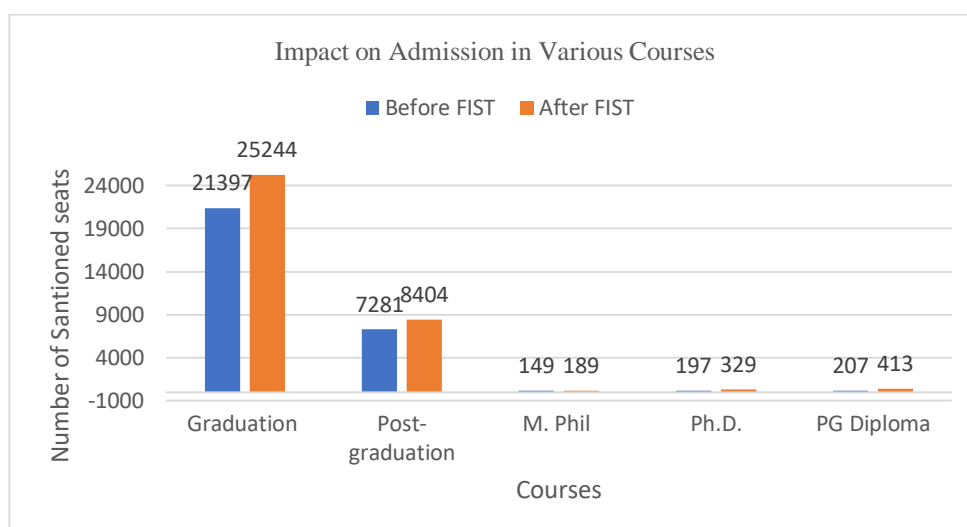
6.3: Impact on Academic program

Graph 6.4
Impact of Sanctioned Seats in Various Courses (N=148)



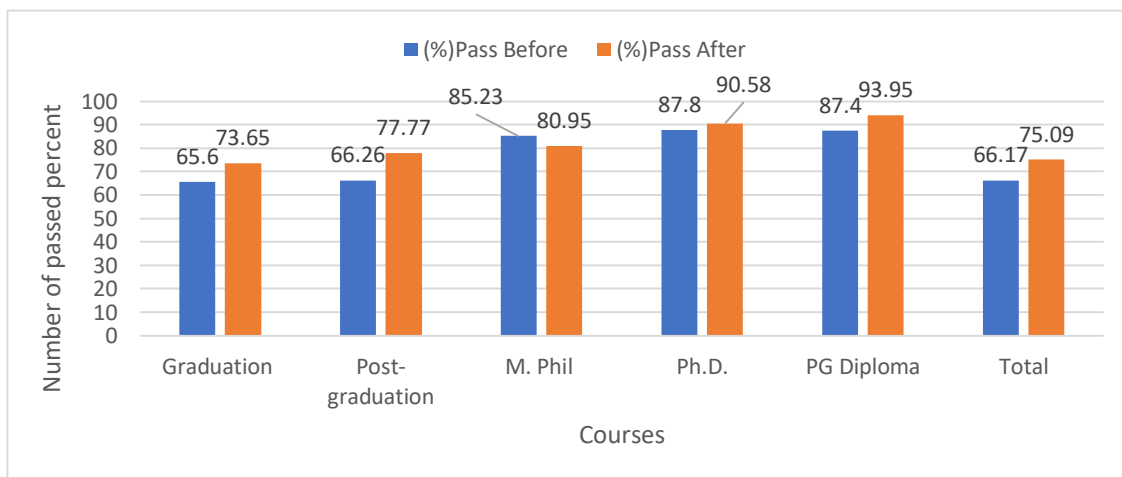
From above Graph and Table 6.4, it is seen that the percentage (positive impact) on PG Diploma and Ph.D. in sanctioned seats increased/improved by 80.2% (1.66) and 28.6 % (5.85) respectively and the negative impact on M. Phil seats i.e. decreased by 25.8% after support of grants. The impact of Sanctioned seats in various courses increased/improved except for M. Phil course. Thus, overall impacts of various courses on Sanctioned seats are positive and increased by 18.40 % after grant support.

Graph 6.5
Impact on Admission in Various Courses (N=148)



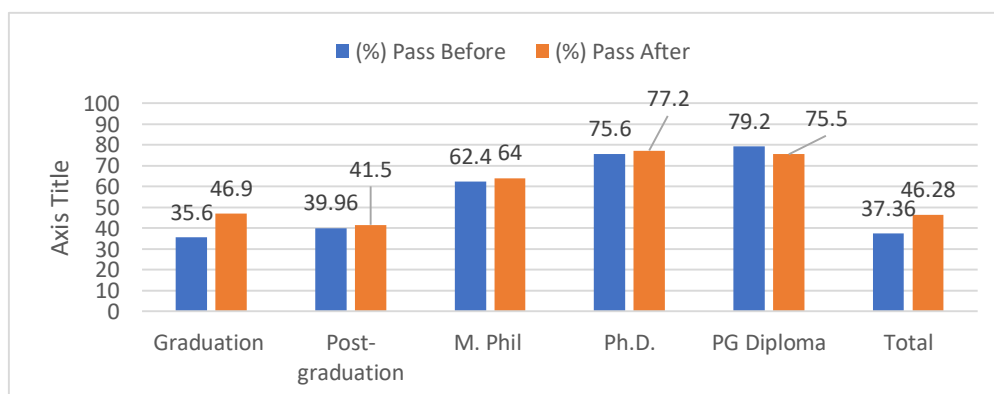
From above Graph and Table 6.5, it is seen that the impact on Admission seats in all courses increased/improved. The impact of FIST grants on admission of Graduation is 25.99 and followed by Post graduation admission i.e. 7.59. The percentage of change in PG Diploma and Ph.D. courses in admission seats were increased/improved by 99.52% and 67.01% after DST-FIST support respectively. Thus overall positive impact of various courses in the admission seats increased by 18.29 % after grant support of grants.

Graph 6.6
Impact on Pass Percent in Various Courses after FIST (N=148)



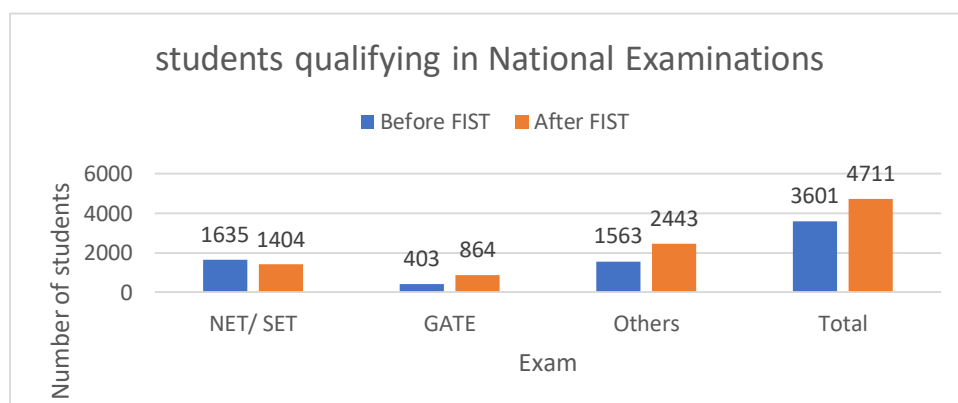
From above Graph 6.6 and Table 6.6, it is seen that the impact on passed students in various courses increased/improved. The percentage change in on pass students in PG Diploma and Ph.D. courses increased/improved by 93.95 and 90.58 after DST-FIST support. Thus, overall change on various courses of the passing is increased by 75.09% after grant support.

Graph 6.7
Students Passed with quality improved or First Div. after FIST (N=148)



From above table 6.7, it is seen that the quality of students passed in above courses improved or got First Division except for P G Diploma which is reduced by 3.7 percent. The percentage of passing of graduate students have increased by 11.3 and Post graduate students has also increased meagerly by 1.64 percent. The impact on quality improvement of various courses are positive.

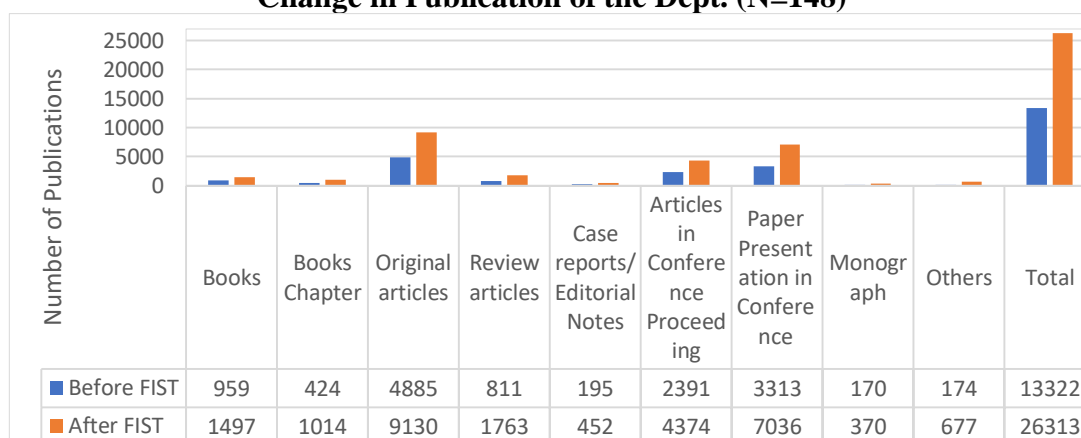
Graph 6.8
Change in number of students qualifying in National Examinations (N=148)



From the Graph 6.8, it is seen that after DST-FIST support the students qualified in National Examinations like Gate and Other Exams are improved by 114.39 and 56.3 percent respectively but NET/SET qualified students decreased by 14.13 percent.

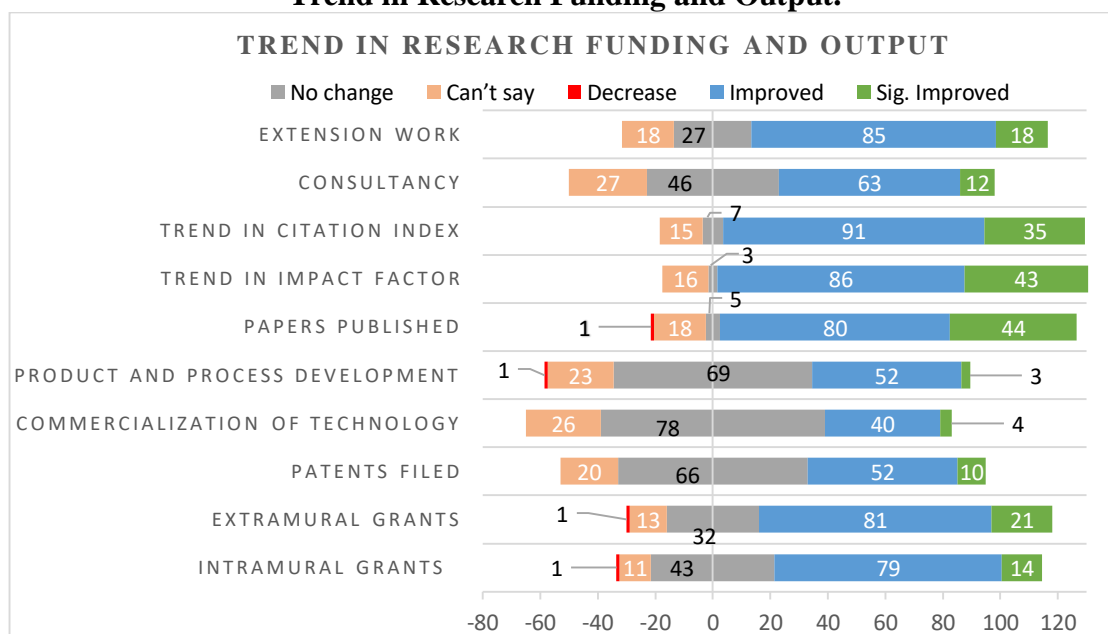
6.4: Impact on Volume or Quality of Research

Graph 6.8
Change in Publication of the Dept. (N=148)



From Graph 6.8, it is seen that a very high positive impact i.e. more than 100 percent increase of FIST grant is on Book chapters, Review articles, Case reports/Editorial Notes, paper presentation in conference, Monographs and others. Thus, overall the positive impact on publications in the Institutions/Department after DST-FIST supports. The Table 6.9 shows that the impact of FIST support is positive on various publications of the Department and it is 28.68 on publication of original articles and 25.16 is for paper presented in conferences.

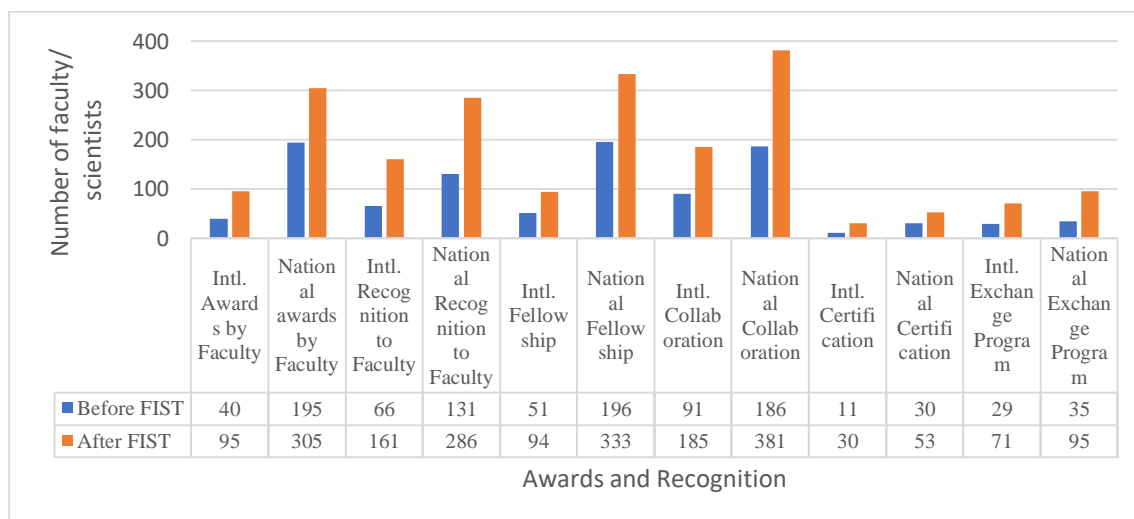
**Graph 6.9
Trend in Research Funding and Output.**



The Graph 6.9 presents the trend in different research funding such as Intramural Grants and Extramural Grants received (excluding FIST), and quality of research output e.g. patents filed, commercialization of technology and product and process development, Paper published in SCI/SCIE journals, Impact factor and Citation Index of published articles, Consultancy and Extension work/interaction with industries which are also graded on five point scale. When looking in the table 6.9 with respect to items for the improved column such as Intramural Grants and Extramural Grants, Paper published, Impact factor and Citation Index, Consultancy and Extension work/interaction lies in the range of 53% - 62% approximately and in commercialization of technology and product and process development, Patents filed, Consultancy are 27%-43% approximately. Significant improved was observed in approximately 23%-30% in the Paper published, Impact factor and Citation Index and Intramural Grants and Extramural Grants, Patent filed, commercialization of technology, Product and process development, Consultancy and Extension work/interaction are approximately 2%-15%. Similarly for the No Change column items Intramural Grants and Extramural Grants(excluding FIST), patents filed, commercialization of technology, product and process development Consultancy and Extension work/interaction with industries are ranges 18%- 47% approximately and in Paper published, Impact factor and Citation Index are 3.4%, 2% and 4.7% respectively. It can be seen that after the DST-FIST Grant paper published, Impact factor of published articles and Citation index of published articles are tremendously improved.

6.5: Awards and Recognitions

Graph 6.10
Awards and Recognitions by Faculty/ Scientists (N=148)



Graph 6.10 present information about the International and National Awards, Recognition, Fellowships received by faculty/scientists/scholars of the Department/ Centre/ Lab. Also about the International and National collaboration. From above table, it is seen that the Faculty/scientists got International Certification, International Awards by faculty are highly improved. Over all Awards and Recognitions by faculty/Scientists increases after FIST supports. The maximum Positive percentage change after FIST grant support, in International Awards by Faculty, International and National Recognition, International and National Collaboration, International Certification and International and National Exchange Program by 137.50, 143.94, 118.32, 103.30, 104.84, 172.73, 144.83 and 171.43 percent respectively. Overall the Impact on volume and quality of award and Recognition are positively by 96.89 percent. From Table 6.11, it is seen that the impact is very high on National recognition and National collaboration to faculty. Moreover, impact is positive on various awards and recognition to Faculty/ Scientists.

6.5. Conclusion:

The overall man power has increased due to FIST program by 13.69%. The major increase has been seen in the position of Scientists and followed by professors. Their search Staff has increased in Private and Deemed Universities/ Institutes and Scientists positions have increased highly at L0 and L2 level whereas other research staffs have increased highly at L1 level of FIST funding. There is positive impact on sanctioned intake capacity of PG Diploma, Ph.D., and PG and Graduation courses. The actual admission of all the courses i.e. PG Diploma, Ph.D., M.Phil. Graduate and PG have improved after FIST grant. The overall pass percentage of student's have increased by 75.09% and for

all the courses this pass percentage has increased after FIST grant. Similarly, first division pass outs has improved for all the courses ranging 44% to 75.5%. Also, overall passing percentage of national examination has increased but NET/SET passing has decreased. The sanction of FIST grant has improved the quality of all types of publications. The Books chapter, case report/editorial notes, monograph, review articles, and paper presentation have increased by more than 100%. The increase in original articles and articles in conference Proceedings are between 80% to 90% and publication of Books have increased by 56.10%. The FIST grant has improved the effect on quality of paper publication, Patents, Impact factor of published articles and citation index of published articles. The Impact on volume and quality of awards/ fellowship and recognition at National and International level of Faculties have improved. Also, collaboration, exchange at National and International level and Certification have increased by more than 100%. Due to this, the Universities/ Institutes/ Colleges have started getting more funds from other funding sources too.

Chapter 7

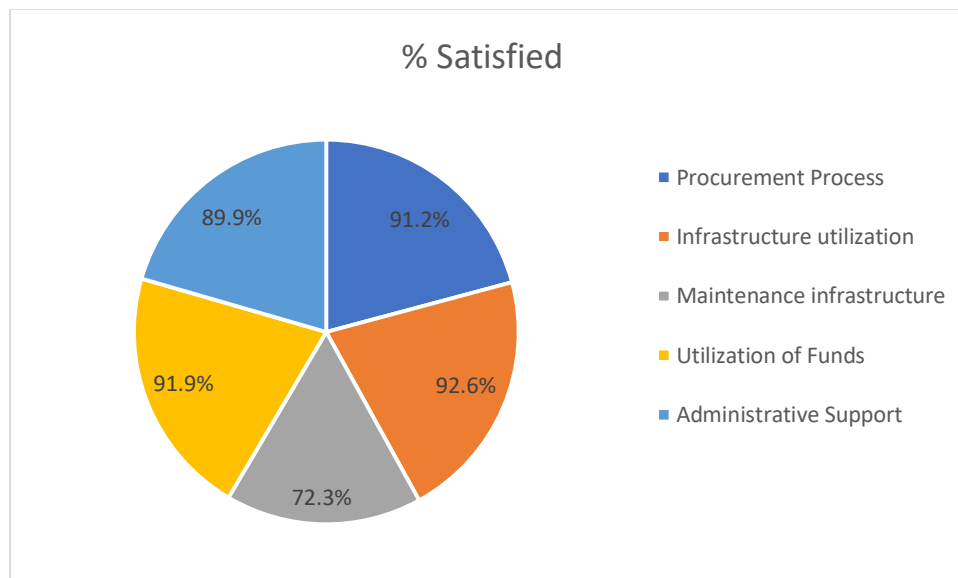
Best Practices for Procurement and Management of FIST program

7.1: Introduction

This chapter contains the analysis of best practices of the Department/ Institutes/ Colleges for Procurement and Management of FIST program. Here, it has been tried to find out the level of satisfaction with different administrative processes. Positive responses regarding the procurement processes and its required time and also the constraints faced during this. The suggestions of the respondents have also been taken into consideration. The positive responses and the constraints faced on the utilization of infrastructure and the services provided to users are also studied. The different suggestions of the respondents regarding this has also been analyzed. Then, the same points are studied for the criterion of maintenance of Infrastructure. The Utilization of Funds, Administrative support are analyzed using the same points i.e. positive responses, constraints faced and different suggestions.

7.2: Procurement Process

Graph 7.1
Level of Satisfaction with following Administrative Process (N=148)

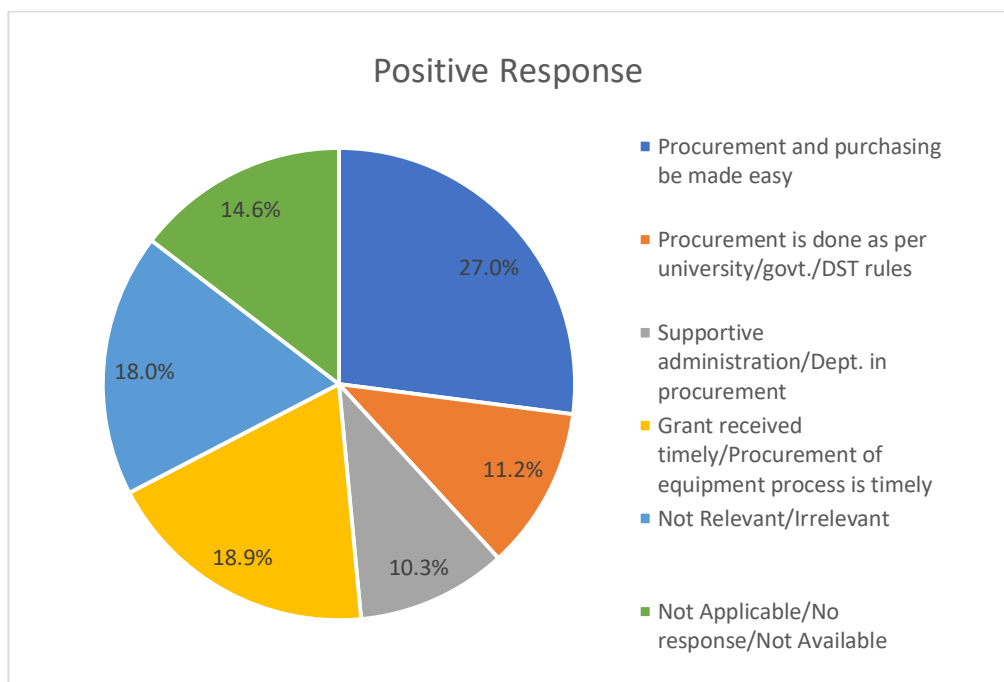


Graph 7.1 presents the Level of satisfaction with administrative process in College/Department/School/Centre after DST-FIST support. It can be seen that the respondents are satisfied with all the administrative processes i.e. procurement process, Utilization of Infrastructure, Maintenance of Infrastructure, Utilization of Funds and Administrative support have been satisfied.

Among all processes, 92.57% of 148 College/Department/School/Centre opined that they are satisfied with the utilization of infrastructure followed by Utilization of Funds, Procurement of process, Administrative support which ranges from 89.86% to 91.89% and 72.30% respondent satisfied with the Maintenance of Infrastructure.

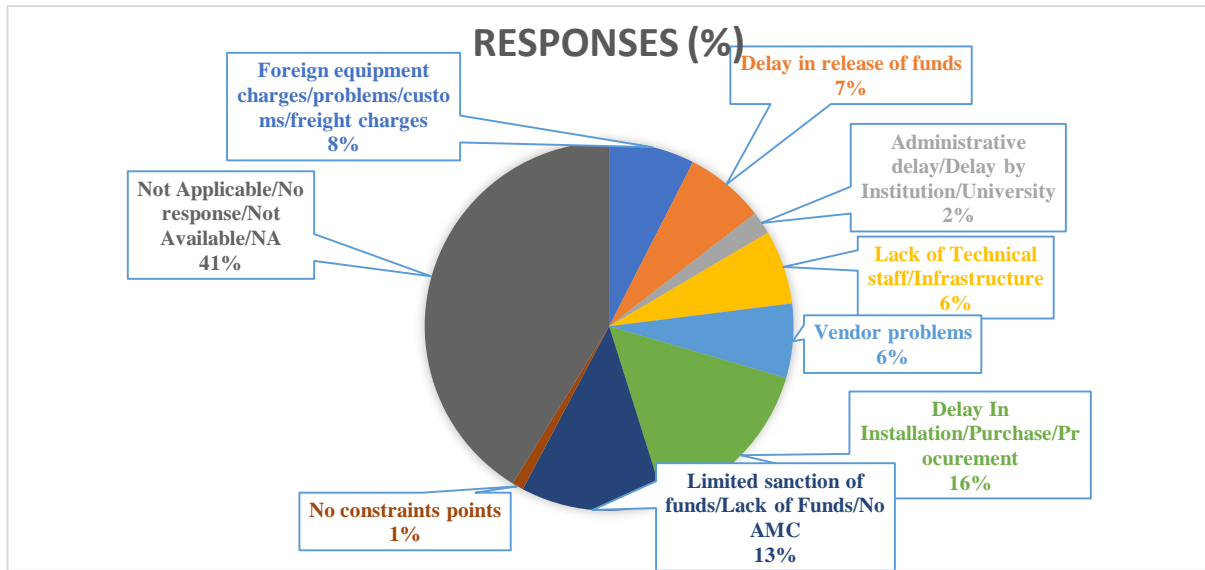
Graph 7.2

Positive response on Procurement Process and time



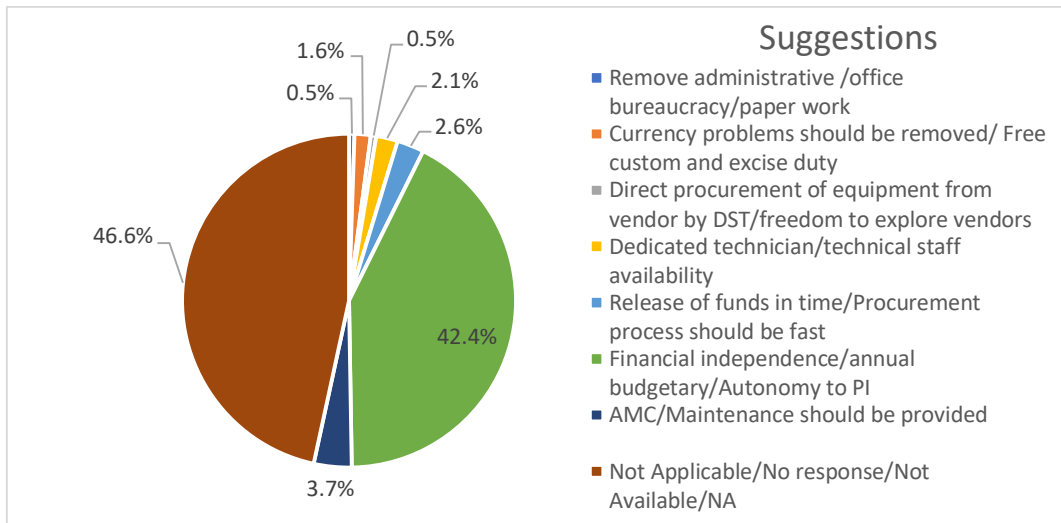
Graph 7.2 gives the positive statement with procurement of Equipment, process and time taken for process. All the College/Department/School/Centre have given multiple statements on procurement of Equipment process. It is seen that out of all positive statements some statements are more common, 27% stated that purchasing process be made easy, 18.9% stated that Grant and procurement was timely received. The 11.2% stated that was on procurement was done as per DST rules/University Guidelines and 10.3% stated that on the administration or Department was supportive in procurement of equipment process.

Graph 7.3
Constraints faced on Procurement Process and time (N=199)



Graph 7.3 gives the constraints faced on procurement process of Equipment and the time taken for process. It is seen that out of constraints faced, some constraints are more common. The 16% constraints faced were on delay in procurement of equipment/purchase and Installation of equipment, 13 percent stated that the constraints they faced were limited sanction of funds/ lack of funds/ no AMC, 8% said they faced the constraint of foreign equipment charges/ problems/ customs/ freight charges, 7% stated that faced delay in release of fund and same percentage of people faced vendor problems too. The other constraints that appeared were lack of technical staff/ infrastructure and administrative delay / delay by Institution/ University with very less percentage. The percentage of those who faced no constraints is just one percent. A very large percentage of respondents opted for NA/ no response/ not available.

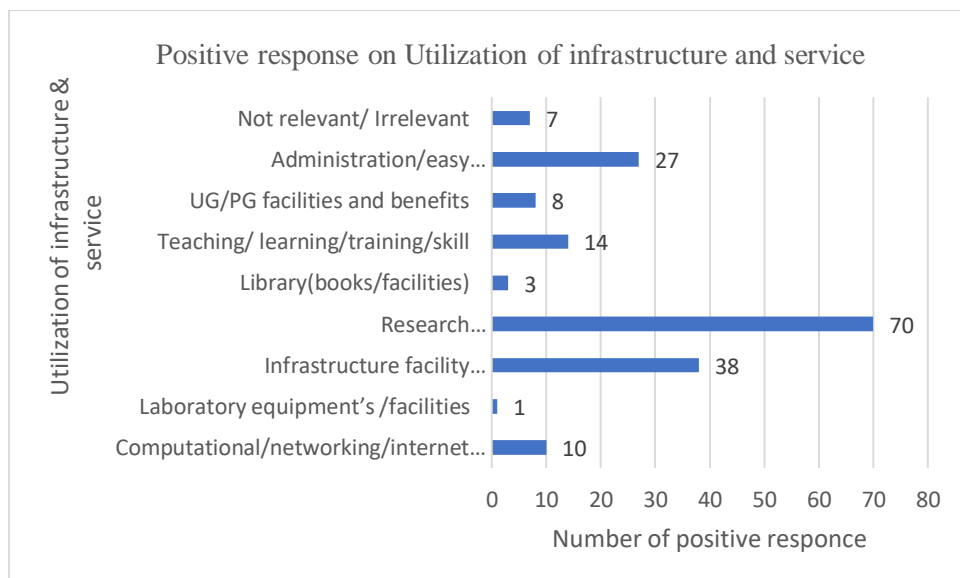
Graph 7.4
Suggestion based on Procurement Process and time (N=191)



Graph 7.4 gives the suggestion based on procurement of equipment process and time. The financial independence/annual budgetary/Autonomy to PI were expressed by maximum number of respondents i.e. 42.4 percent. Rest of the suggestions have very less percentage. 46.6 percent responses are of Not Applicable/Non-response/Not Available.

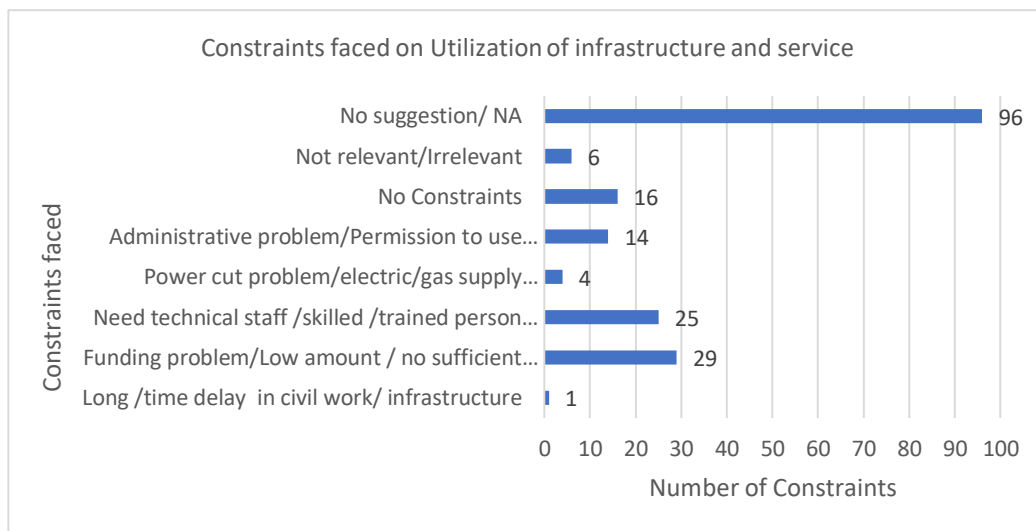
7.3: Utilization of Infrastructure

Graph 7.5
Positive response on Utilization of infrastructure & service provided to users (N=178)



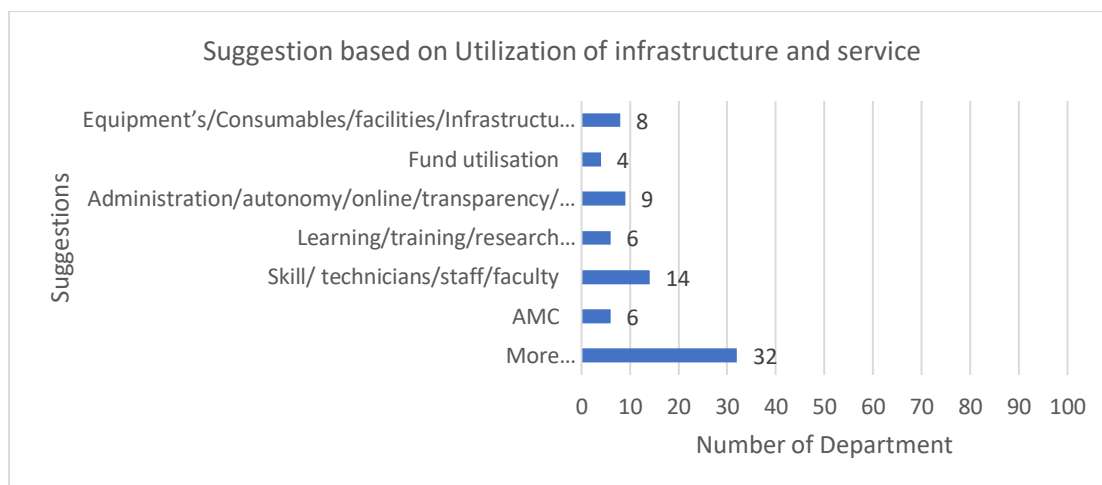
Graph 7.5 presents the positive response on Utilization of Infrastructure and service provided to users. The maximum 39.3 percent opined that utilization of infrastructure for Research quality/publications/environment/collaboration/working/recognition/awards. Followed by 21.3% who responded positively on infrastructure facility and 15.2% responded for administration/ easy working/ transparency/ on line/ funds/ financial/ utilization? The minimum 0.6 percent are of laboratory equipment/facilities. Therefore, the main positive response on utilization of infrastructure and services is Research quality/publications/environment/collaboration/working/recognition/awards.

Graph 7.6
Constraints faced on Utilization of infrastructure & service provided to users (N=191)



Graph 7.6 presents the constraints faced on Utilization of infrastructure and service provided to the user. 15.2 percent respondents replied about Funding problem/Low amount/ non-sufficient amount/ no easy funding/ delay in funding/ AMC/ next phase grant and 13.1 % said that they need technical staff/ skilled/ trained person technical staff/scholar. 8.4% responded as having no constraints and 7.3 % replied that they faced administrative problems/ permission to use facility. The very big respondents i.e. 96 percent have No suggestions. Therefore, the main constraint faced was on utilization of infrastructure and service provided to users are Funding problem/Low amount/ no sufficient amount/ no easy funding/ delay in funding/ AMC/ next phase grant.

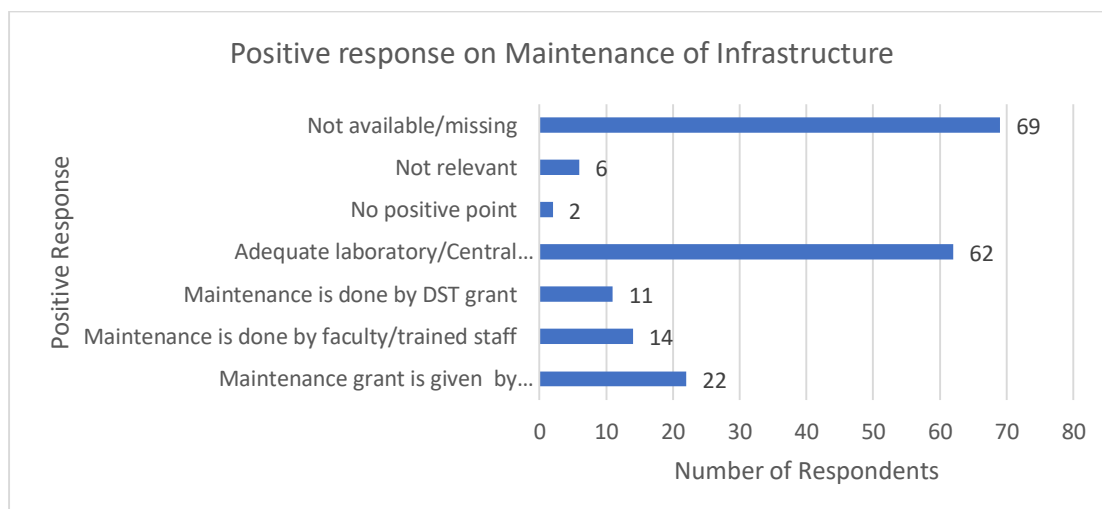
Graph 7.7
Suggestion based on Utilization of infrastructure & service provided to users (N=79)



Graph 7.7 presents the suggestions based on utilization of infrastructure and service provided to user. The maximum 40.5 percent have said that they want more funds/labs/computers/equipment/infrastructure/manpower. 17.7 percent have replied that they want skill/technicians/staff/faculty, 11.4 percent opined that administration/autonomy/on line/transparency/technical queries. Therefore, the main suggestion based on utilization of infrastructure and service provided to users are for more funds/labs/computers/equipment/infrastructure/manpower.

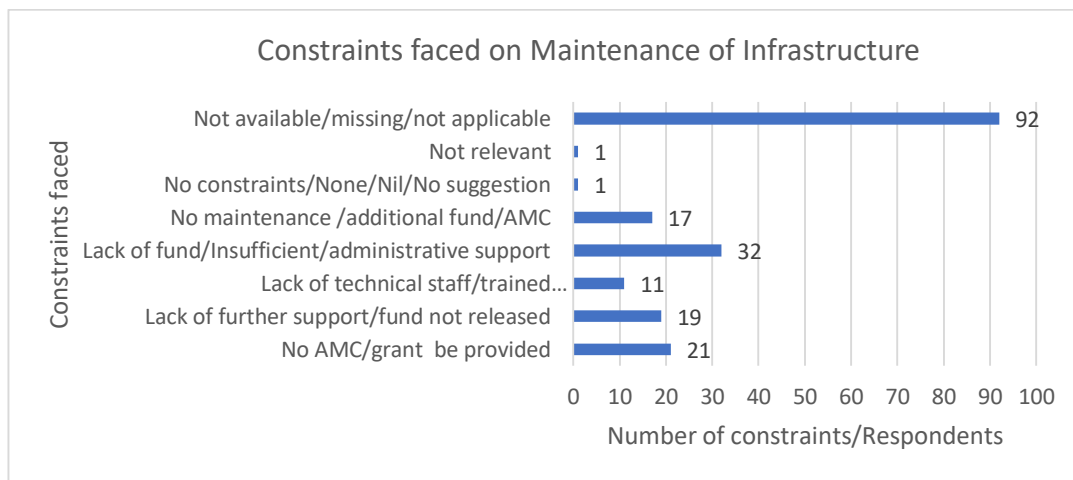
7.4: Maintenance of Infrastructure

Graph 7.8
Positive response on Maintenance of Infrastructure (N=186)



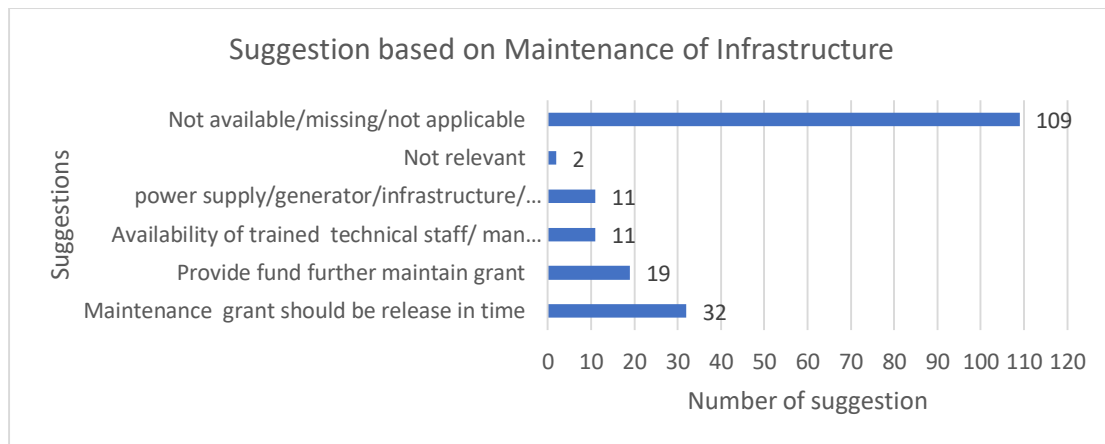
The Graph 7.8 presents the positive response on maintenance of infrastructure. 33.3 percent respondents have positive response on adequate laboratory/central research/ equipment/ academic/ lab. 11.8 percent have responded that the maintenance grant is given by institute/University/College. A big number i.e. 37.1 percent responses are not available. Therefore, the most positive response is for adequate laboratory/central research/ equipment/ academic/ lab.

Graph 7.9
Constraints faced on Maintenance of Infrastructure (N=194)



Graph 7.9 presents the constraints faced on maintenance of Infrastructure. A 16.5% respondents have responded of Lack of fund/Insufficient/administrative support/Inadequate space/delayed in payment and also 10.8 percent responded of No AMC/grant provided. The considerably big i.e. 47.4% responses are of no constraints faced/not applicable. Therefore, it can be seen that the main constraints are lack of fund/Insufficient/administrative support/Inadequate space/delayed in payment.

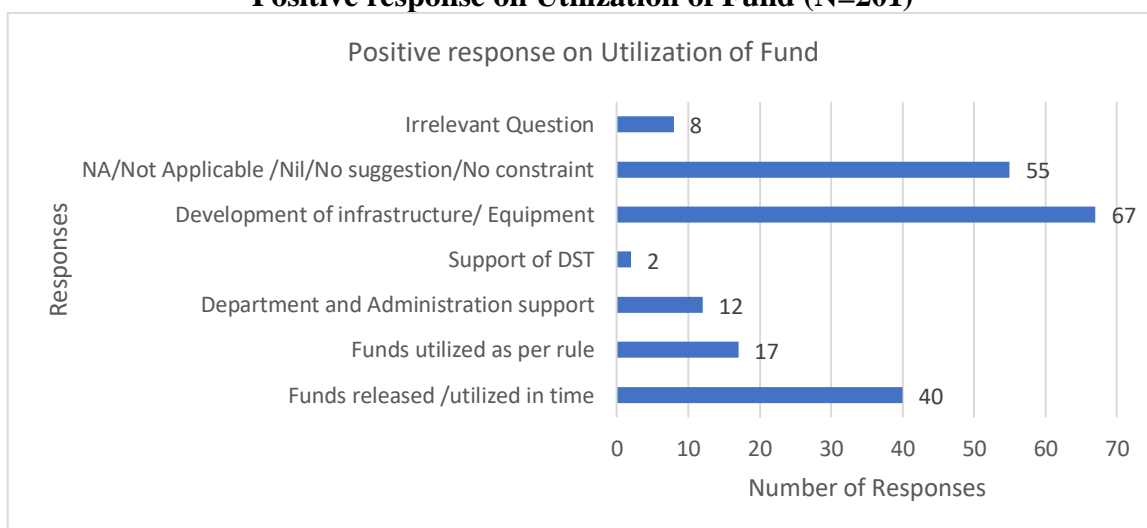
Graph 7.10
Suggestion based on Maintenance of Infrastructure (N=216)



Graph 7.10 presents the suggestions based on Maintenance of Infrastructure. 17.3 percent responses are of Maintenance grant should be released in time and 10.3 percent are for provide fund further maintain grant and 5.9 percent are of both availability of trained technical staff/man power/student and also of power supply/infrastructure/laboratories/administration support. A big i.e. 59.2 percent responses are of no suggestion/not applicable. Therefor the main suggestion is that the grant should be released timely.

7.5: Utilization of Funds

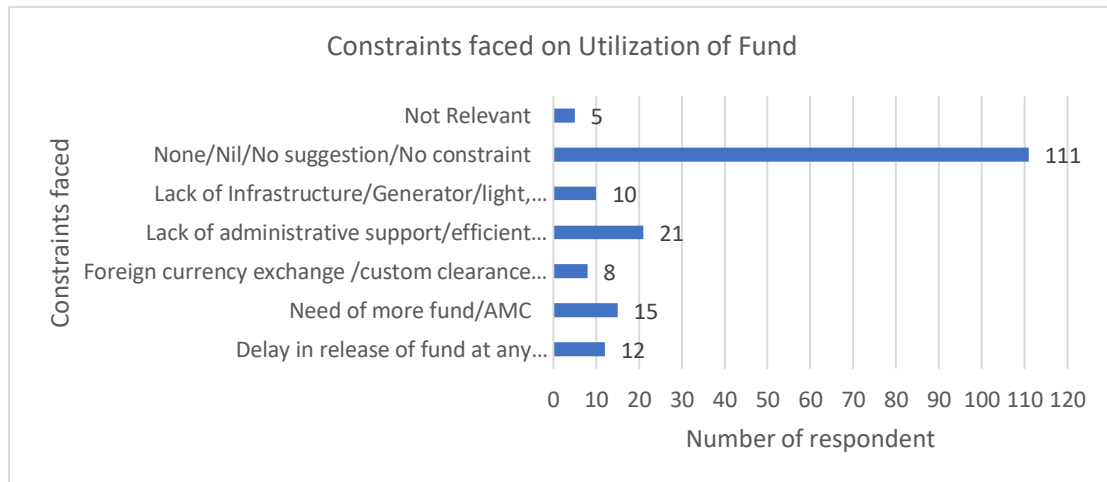
Graph 7.11
Positive response on Utilization of Fund (N=201)



The Graph 7.11 presents the positive response on Utilization of Funds. The maximum i.e. 33.3 percent have expressed positive response about development of

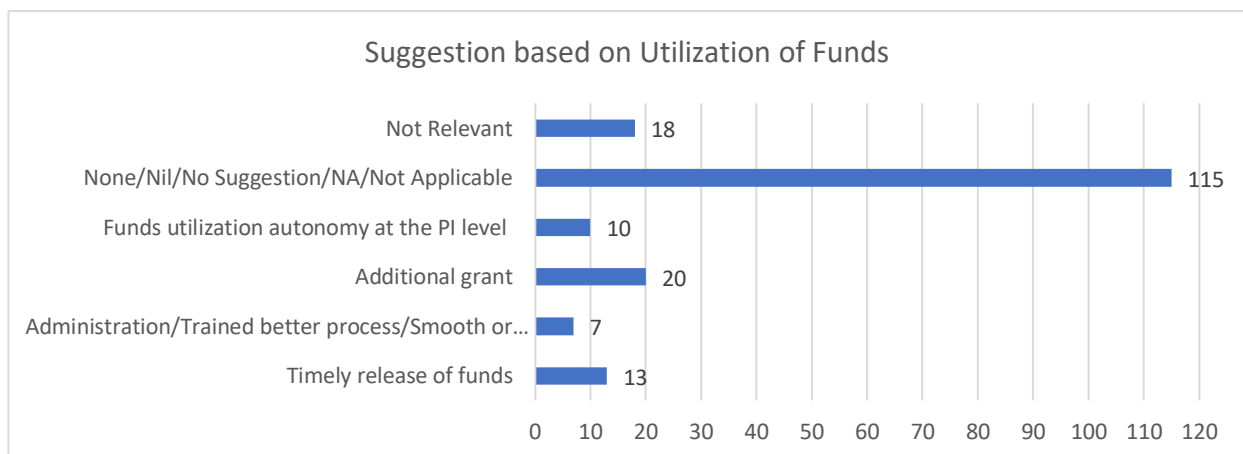
Infrastructure/Equipment due to this grant. 19.9 percent responses are of funds released/utilized in time. 27.4% respondents had no suggestions that means they were satisfied with the way of utilization of funds. Therefore most positive response is development of Infrastructure/Equipment.

Table 7.12
Constraints faced on Utilization of Fund (N=182)



Graph 7.12 presents the constraints faced on Utilization of Funds. 11.5 percent responded, lack of administrative support/efficient staff/faculty. 8.2% have said about the need of more funds/ AMC and 6.6% have said about the delay in release of funds at any level (DST/ Administration). The considerably big i.e. 61 percent responses are of no constraint faced on utilization of funds. Therefore, the main constraint is lack of administrative support/efficient staff/faculty.

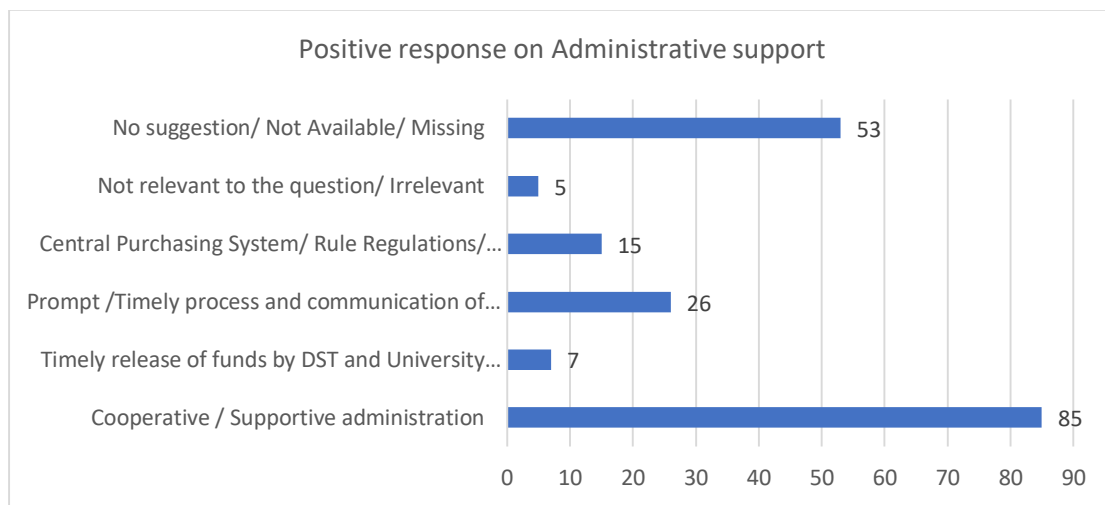
Graph 7.13
Suggestion based on Utilization of Funds (N=183)



Graph 7.13 presents the suggestions based on Utilization of Funds. 62.8 percent are for no suggestions on the Utilization of Funds and 10.9 percent have suggested for Additional grant. Many have also suggested for fund utilization autonomy at the PI level. Therefore, the main suggestions area additional grants needed or funds utilization autonomy at the PI level.

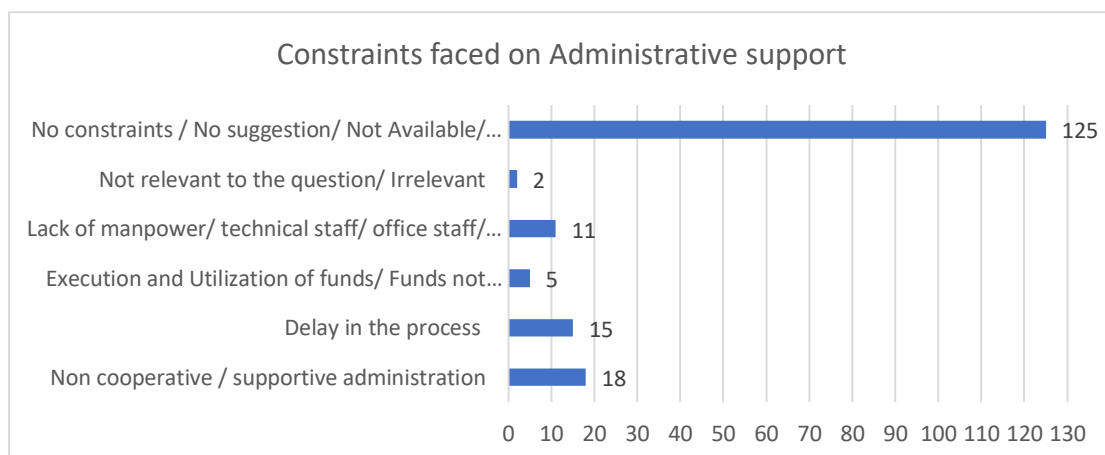
7.6: Administrative Support

Graph 7.14
Positive response on Administrative support (N=191)



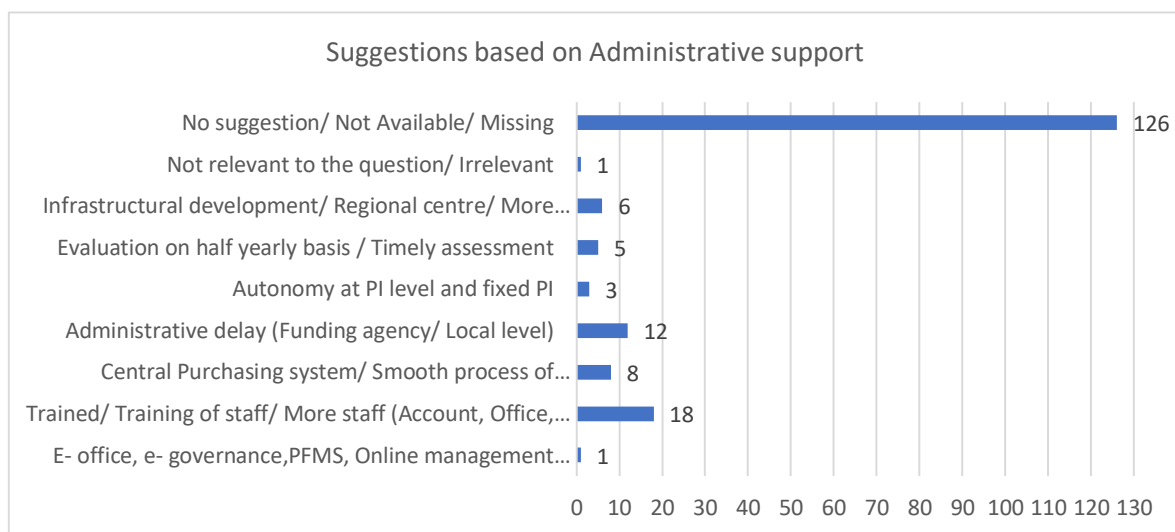
This Graph 7.14 presents the positive response on Administrative support. The maximum 44.5 percent responses are of cooperative/ supportive administration, 27.7 percent are of No suggestion/Not available/missing i.e. they are having nothing to say. 13.6 percent are of prompt/timely process and communication of administration. But, the most positive response is Administrative staff cooperative/supportive while processing of the funds.

Graph 7.15
Constraints faced on Administrative support (N=176)



Graph 7.15 presents the constraints faced on Administrative support. 71.0 percent responses are of No constraints/No suggestion/ not available/missing i.e. they did not face any problem and smooth execution could be done by them.10.2 percent are of Non cooperative/ non supportive administration and 8.5 percent responses are of delay in the process. A significant number have also responded as lack of man power/ technical staff/ office staff/ frequent transfer as constraints. Therefore, the main constrained is non cooperative/supportive administrative while the project process.

Graph 7.16
Suggestions based on Administrative support (N=177)



Graph 7.16 provides suggestions on administrative support. The maximum 70 percent are of No suggestion/not available/Missing on administrative support. 10 percent suggested for trained/training of staff/more staff needed of accounts, official and technical. 6.7 percent opined of administrative delay (funding agency/local level). Therefore, the main suggestion is, trained/training of staff/more staff such as Account, Office and Technical needed while implementing FIST program.

7.6 Conclusion:

More than 90% respondents opined that they are satisfied with procurement process, utilization of infrastructure as well as fund and approximately 90% expressed for administrative support. The opinion of 72.3% respondents are satisfied with maintenance of Infrastructure. Respondents expressed that the procurement and purchasing be made easy and they faced the problem of purchase/ procurement/ delay in installation. Their next difficult is, limited sanction of funds/ lack of funds/ no AMC. 42.4% respondents have suggested for financial independence/ annual budgetary/ autonomy to coordinators. 39.3% respondents expressed that utilization of infrastructure for research quality/ publication/ environment/ collaboration/ working/ recognition/ awards. In view of respondents, funding problem/ low amount/ no sufficient amount/ no easy funding/ delay in funding/ AMC/ next phase grant are constraints faced in utilization of infrastructure and provided services to users. Major suggestion is the demand of more funds, labs, computers, equipment, infrastructure and manpower. Respondents have expressed that they are, satisfied/ with adequacy of lab/ central research/ equipment/ academic/ lab. Major constraints while implementing the FIST scheme are lack of fund/ insufficient administrative support/ inadequate space/ delay in payment. In the opinion of respondents, maintenance grant should be released in time. Respondents have opined that the development of infrastructure and equipment are the major gain due to FIST program. While utilizing the grant, the major faced problems are lack of administrative support/ efficient staff & faculty. The timely release of funds and additional grant are the two main suggestions for better implementation of this scheme. 44.5% respondents said that the administrative staffs are cooperative/ supportive. Also, 10.2% said that they faced the constraints of Non cooperative/ non supportive administration.

Respondents suggested need of trained staff/ training of staff/ more staff of account, office and Technical.

Chapter 8

Success Story

8.1 Introduction:

This study has been carried out in 148 University/ Institute/ Colleges and the information of 173 FIST projects have been collected. During the process of collecting the information, all the Department/ Institute/ colleges of Western region were visited and their facilities created, Laboratory, equipment and classrooms etc. were observed. It has been noticed that many Departments/ colleges have implemented this program very effectively, excellent facilities are created and a lot of output have been generated which are already presented in previous chapters. Some of them have extraordinarily implemented this program and given remarkable results, so five such Department/ colleges are selected and being presented here to see, what extra efforts they have taken to achieve such extraordinary result.

8.2 Success stories

1. Department of Chemistry **M. K. Bhavnagar University, Bhavnagar**

1) About Department:-

Department of Chemistry is a part of M. K. Bhavnagar University, Bhavnagar, and Gujarat. This Department is funded by the State Government of Gujarat. Department was established in the year 1968 and PG course was started in 1968 itself and Ph.D. course in 1970.

Address for communication: - Prof. Nicety C. Desai (HOD), Department of Chemistry, M.K. Bhavnagar University, Bhavnagar, dnisheeth@gmail.com

2) DST-FIST Grant

This Department received DST-FIST grant in the year 2010 at L1 level and the amount sanctioned was 36.50 lakh.

3) **Details of the equipment purchased.**

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

4) **Research output:-**

i. Research Publication:

After DST support, 01 book chapter, 35 original articles, 2 review articles, 20 articles in conference proceedings, 25 paper presentation in conference, 3 any others (Patent's) were the research publications from the Department.

ii. Activity/ Knowledge sharing.

- National seminar/conferences – 20
- International seminar/conferences- 10
- Workshop – 7
- Faculty Development program-2

5. **Impact:**

As a district with limited resources and ample small and medium businesses including the Along Ship recycling industries, dehydration industries of onion in Mahuva, Antacid and Fine Chemicals of the Chitra Industrial estate, using the financial assistance of FIST program, Department purchased some instruments like hydrogenator, microprocessor based pH and conductivity meter, five digit analytical balance, refractometer, air and nitrogen gas generators etc. The aim was to improve the student's exposure to these instruments, thereby helping them get placements in the local industries and across the country. The Department developed the entire instrumentation center with the help of FIST grant and our own endowment fund.

Today, this center is not just fully functional but also provides support to the MSME's of the surrounding areas of Bhavnagar. Department has regular collaborations with large scale industries such as Sumitomo India (P) Ltd, Acrylic Limited and Jenburkt Pharmaceuticals Ltd.

The state-of-art experimentation facilities developed due to the funding from DST-FIST helped our Ph.D. students and faculties to publish 75+ research papers in leading national and international journals.

The hands-on experience of working with instruments of international standards has contributed to developing the students' scientific exposure and insights. The world of possibilities has expanded, the result being students can opt for scientific careers in research, industries and enterprises.

The computer laboratory established because of the DST funding is instrumental in making the students digital-ready to compete with the world. In the near future, with the COVID-19 pandemic, this lab is going to host webinars and virtual conferences so that students will no longer face the location barriers in gaining knowledge.

Students from all walks of life and economic backgrounds are getting placements in pharma and fin Chem. industries situated around Ahmedabad, Vadodara, Vapi and Ankleshwar right after their M. Sc.

Due to the DST-FIST reorganization, the Department is now considered a thought leader in the field of Chemistry among the stalwarts. We could create a lasting impression on the National Assessment and Accreditation Council (NAAC) and Academic & Administrative Assurance (AAA), Government of Gujarat. Summarizing, the DST-FIST grant has enabled us to reach new places of success.

- Due to the establishment of the computer lab, M.Sc. and Ph.D. students are well equipped with the computational program and computational skill.
- The purchase of instruments from the FIST program had helped to establish the analytical ability of M.Sc. and Ph.D. students.
- The faculty members of the Department are in a position to publish more than 75 research papers in National and International Journals of repute.
- The cumulative impact factor of the faculties is more than 100.
- Established the hydrogenator and due to this set up the students are exposed to the hazardous free reactions.
- The overall impact of the department in the NAAC is also recognized and as a whole, the grade of a university is increased.
- The recognition of the Department as DST – FIST is highly useful for the placement of the students in Pharma, Fine-Chem and Research institutes.

2. Department of Bioscience **Sardar Patel University, Anand, Gujarat**

1) About Department:-

Department of Bioscience was a part of Sardar Patel University, Anand. This department is funded by Gujarat state Government. Department was established in the 1960 and moved ahead with PG and Ph.D. courses in 1961.

Address for communication: - Prof. K. C. Patel, Department of Bioscience, Sardar Patel University, Anand.Kc_patel@spuvvn.edu

2) DST-FIST Grant: -

This Department received support of DST-FIST grant in the year 2000 at L1 level and 2008 at L1 level. The amount sanction in 2000 is 20.00 lakh and in 2008 is 71.00 lakh. Also, they have received DST-FIST in the year 2019.

3) Details of Equipment purchased.

SL. No.	Year of Sanction	Name of the Equipment	Cost in Rs.	Status
1	2000	Fermenter Access	1000000.00	Non-Working
2	2008	Thermal Cycler	300661.00	Working

4) Output of Department:-

i. Research Publication:

After DST support, 10 books chapters and 208 original articles, 16 review articles, 14 articles in conference proceedings are research publications of the Department.

5) Impact:-

The department proposed the facility under the FIST programs considering the existing infrastructure available at that time and future research plans of the faculty members.

The FIST program enabled us to procure equipment, which we could not have been able to get under any other funding scheme. The availability of molecular biology equipment and sophisticated microscopes enabled us to strengthen our M. Sc. as well as Research program and upgrade as per the contemporary developments.

Department's central facility and routine training was provided to all the stakeholders. It was ensured that the equipment was accessible to researchers and well utilized. The facility was also extended to researchers from other institutes. The maintenance Grant under FIST helped department to procure spare parts and maintain the equipment in our central facility and research laboratories.

The department could successfully establish the central computer laboratory with internet and networking. This enabled all the students and faculty members to acquire computational and bioinformatics skills. It has also been used to conduct practical in Biostatistics and Bioinformatics for our M. Sc. students.

The laboratory infrastructure also could be improved utilizing the FIST grant. The department could subscribe to leading research journals as well as procure reference books under the FIST grant for the purpose. The achievements of the department with DST-FIST support enabled us to gain financial assistance and recognition from UGC and DBT.

3. Department of Botany Savitribai Phule Pune University, Pune

1) About Department:-

Department of Botany was a part of Savitribai Phule Pune University Pune. This department is Maharashtra state Government. Department was established in the 1952 and PG and Ph.D. course also in 1952.

Address for communication: - Dr.N.P. Malpathak, Head, Department of Botany, Savitribai Phule Pune University Pune.hodbotany@unipune.ac.in

2) DST-FIST Grant:-

This Department received DST-FIST in the year 2011 at L1 and the amount sanction was 38.00 lakh.

3) Details of the equipment purchased.

Sr. No.	Name of the Equipment	Cost in Rs.	Status
1	Water and soil analysis system	183433.00	Working
2	Growth Chambers	751272.00	Working
3	UV-VIS Spectrometer	660000.00	Working
4	Refrigerator Centrifuge	349353.00	Working
5	Water Distillation Units	346548.00	Working

4) Utilization of the facilities created/Available after DST-FIST support:-

a) Research Publication:

After DST support, 8 book, 11 book chapter, 245 original articles, 10 articles in conference proceedings, 150 paper presentation in conference were research publication increased from the Department.

b) Activity/ Knowledge sharing.

- i. National seminar/conferences – 4
- ii. International seminar/conferences- 1
- iii. Workshop – 4
- iv. Short term training for scientist up-gradation – 6
- v. Faculty Development program- 2

5) Steps taken:-

The project implementation was done with certain key elements. The discussions were regularly held with faculty and stakeholders (students) regarding the objectives and scope of project based on deliverables. The assignment of tasks and budget for each head were planned and shared this information with everyone. A roadmap was prepared with specific, time based milestones to monitor the progress of the project. The progress report was prepared on monthly basis and Feedback sessions were arranged to understand the difficulties and problems.

**4. New Arts, Commerce and Science College
Ahmednagar**

1) About Department:-

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

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

2) DST-FIST Grant:-

This Department support DST-FIST in the year 2008 at L1 and the amount sanction was 36.50 lakh.

1st Installment: SR/FST/CSI-180/2008 Amount: 24, 50, 000/-

2nd Installment: SR/FST/CSI-180/2008(C) Amount: 8, 79. 625/-

3rd Installment: SR/FST/CSI-180/2008(G) Amount: 90, 411/-

Total Amount Received: 34, 20,036/-

3) Details of Equipment purchased:-

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

4) Output of Department:-

After DST support, 22 books Chapters and 88 original articles, 78 articles in conference proceedings, 27 paper presentation in conference were research publications of the Department.

5) Impact:-

The department has sufficient number of advanced and sophisticated instruments for conducting practical's, project work and research. Under this funding, Department has established a well-furnished Instrumentation Laboratory with FTIR, AAS, TGA, and GC. And UV Visible Spectrophotometer as well as they have established 15 computerized lab with internet facility.

Considering the need of today's' era and the requirement of students, College has organized various workshop. The technical experts have also conducted the research activities. Other faculty members have supported the Head for Fund Utilization in various manner.

Faculty members have facilitated to guide the students in SET, NET and GATE examinations. About 100 students passed SET/NET/GATE examination.

Department of Chemistry is recognized center for M. Phil. and Ph.D. Department of Chemistry is in collaboration with National Chemical Laboratory, Pune, Department of Chemistry, Savitribai Phule Pune University, Pune, and Agharkar Research Institute Pune. C-MET, Pune, for research and other academic activities.

Department has a separate placement Cell. Department of Chemistry arranges campus interviews for B.Sc. and M.Sc. students. Different companies like Calyx pharmaceuticals, Bombay, Orchid pharmaceuticals, Aurangabad, MacLeod's pharmaceuticals, Mumbai, Lupin Pharmaceuticals, Mumbai, Gharda chemicals Ltd, Ratanagiri. Sun pharmaceuticals, Ahmednagar. Canpex Pvt. Ltd. Ashti, Beed. Frequently visit the department for conducting campus interviews. Department has a separate Departmental Library. Department has computer lab with internet facility.

Important Factors

- Online Test, Growth in Research, Students Could Handle Instruments.
- Freedom of Choice of Dealers and Exemption on Custom Duty
- Creates Interest in Research area, Got Benefit to research Students and Staff and Increased in Ph.D. Students
- Sufficient Grant Maintenance
- Released Amount in Two Instalments due to which Instrument Purchase is Easy

Extra efforts taken by college for successful implementation of DST – FIST Program

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

1. S. S. Jain Subodh P.G. College

Jaipur

1) About the college:-

. The S. S. Jain Subodh P.G. College, Jaipur was established in the 1954 and PG courses were started in 1954 and Ph.D. course also in 1999. This college is funded by Rajasthan state Government. The DST-FIST Grant is given to all Departments of this college.

Address for communication: - Dr. K. B. Sharma, Principal, S.S. Jain Subodh P.G. College, Jaipur. drkb_sharma@rediffmail.com

2) DST-FIST Grant:-

This college received DST-FIST Grant in the year 2011 at L0 and the amount sanctioned was 90.00 lakh.

3) Details of the Equipment purchased.

Sr. No.	Name of the Equipment	Cost in Rs.	Status
1	AAS	1122900.00	Working
2	Gas chromatography	786600.00	Working
3	MW MXG signed generator	1995000.00	Working

4) Output of College: -

i. Research Publication:

After DST support, 167 book, 215 book chapter, 208 original articles, 172 review articles, 328 case reports/ editorial notes, 800 articles in conference proceedings, 928 paper presentation in conference, 70 Monographs, 425 any others (Patent's) were research publication from the Department.

ii. Activity/ Knowledge sharing:

- National seminar/conferences – 5
- International seminar/conferences- 6
- Workshop – 4
- Short term training for scientist up-gradation – 3
- Faculty Development program- 4
- Up gradation of technical staff- 9

Research Activities

- Students are motivated to participate in “Science project competition”, University level research competitions.
- Faculties are motivated to participate in “INNOVATION”, University level research Project competitions. During the tenure of DST FIST support, faculty members applied for research grants to different funding agencies. (Details are already mentioned in the report).
- Proposals for setting up three new research centers, viz. Computer Science, Physics, and Mathematics already approved by University and established, also Proposals for starting three new research centers viz. Chemistry, Botany and Zoology are submitted to University of Rajasthan Jaipur.
- Some of the staff members have shown their interest in pursuing their research work for Ph.D., and many of them have completed Ph.D. in last three years.
- Women Scientist Scheme is promoted in the Science Departments. One of the staff members awarded a project in women science scheme in the Department of Physics.
- Every Research Centre of the college has initiated the activity of publishing Research work in SCI indexed and Scopus indexed journal as well as in the form of Research Annual with ISSN number.

5) Impact:-

The availability of funds provided the opportunity to enrich the resources of the college for the development of teaching basic science education. The college has great advantage in fulfilling the current need of a class room (and Laboratories) with computing facility. Impact of FIST scheme in carrying out new research projects is reflected by applying Minor/Major research schemes to different funding agencies by staff members. Many Graduate students appeared for PG entrance test of University and get through admission for the post-graduation. Some of the post graduate students appeared for Ph. D. entrance tests and few succeed in the same. Department of Botany conducted two days’ National workshop on identification of plants and pathogens for PG and research students. Department of mathematics has developed as a Research Centre where the fund is utilized for installing 8 Desktop PC in the department with internet connectivity. This facility provided support for students to learn “C” programming as well as reference materials. Department of Geography conducted training program for surveying of the area. Theodolite is the best suited instrument

for this purpose. Traditional Theodolite is not handy and contouring is time consuming and tedious process. With the help of Digital Theodolite, preparation of map is easy and quick during study tours and village surveys. Readings for maps are taken accurately and automatically by this instrument. Department of computer science conducted Virtual Laboratory Demonstrations for students, On-line examination for Post Graduate students were conducted in the computer facility created. Online e-learning study materials are made available through this facility. Department of Physics conducted program on “Science through Experiments” Familiarization of Industrial Electronic Components and testing” for Science students. Students offering subject in science have greatly benefitted due to the hands on experience with some of the equipment available in the college. Some of the equipment like AAS, thin films coating unit, Gas chromatography, Flow transducer, etc., which normally are available only in the industry, are now available at college level. Demonstration of experiments on elemental analysis, design of thin films for characterization of various parameters for fabrication of a solar cell etc., has helped the teachers teaching at PG. level to explain the concepts of materials science to the students. New experiments were set up at PG & UG level some of these are Millikon’s oil drop, Stefan’s constant, Bragg’s diffraction, flame photometer, Magnetic susceptibility by quincke method, Michelson interferometer, Gamma ray spectrometer, Four probe method to study the conductivity of semiconductor etc. Some projects at PG & UG. Level were carried out which would be a pilot project for major/minor scheme for industry. Post Graduate courses in Microbiology & Biotechnology were proposed. In general, the outcome of this scheme is increase in the number of faculty with PhD. number of Research Guides, Major/Minor projects funded by UGC, DST, DRDO, BRNS, ICSSR, book publications, publication of Research Journals and intake of scholars for research programs.

Policy imperative for strengthening of the FIST scheme

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

8.3 Conclusions:

All the five Departments/ Colleges presented here have used the DST –FIST grant effectively. They have purchased the best of the equipment of high standards that have high usability in their respective subjects. They have developed high class computer laboratory with internet facility. They also have a very good study of their regions and they have made a study to understand the applicability of their subjects to their regions. They have trained their students using the equipment as well as given them good knowledge of handling. This helped the students to get employment and the region in return got good and skilled manpower. They have also used these acquired instruments to solve the problems and help the industries.

Chapter 9

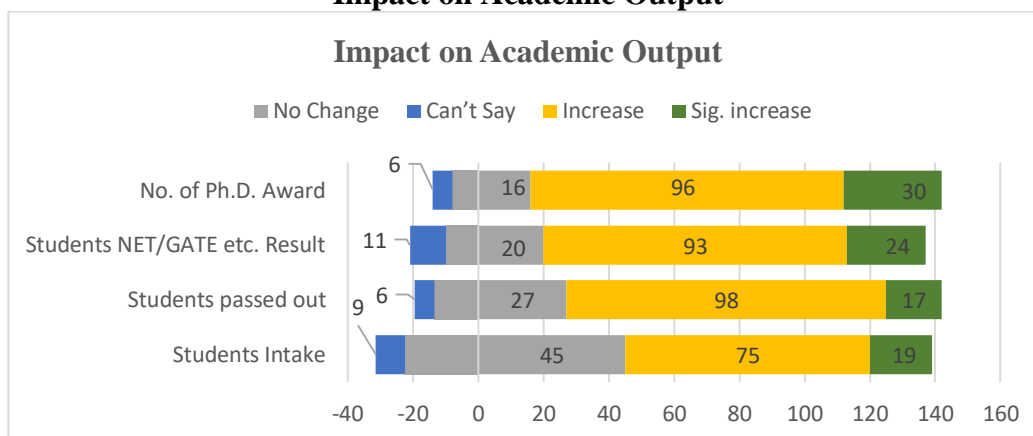
Conclusions and Recommendations

9.1 Introduction

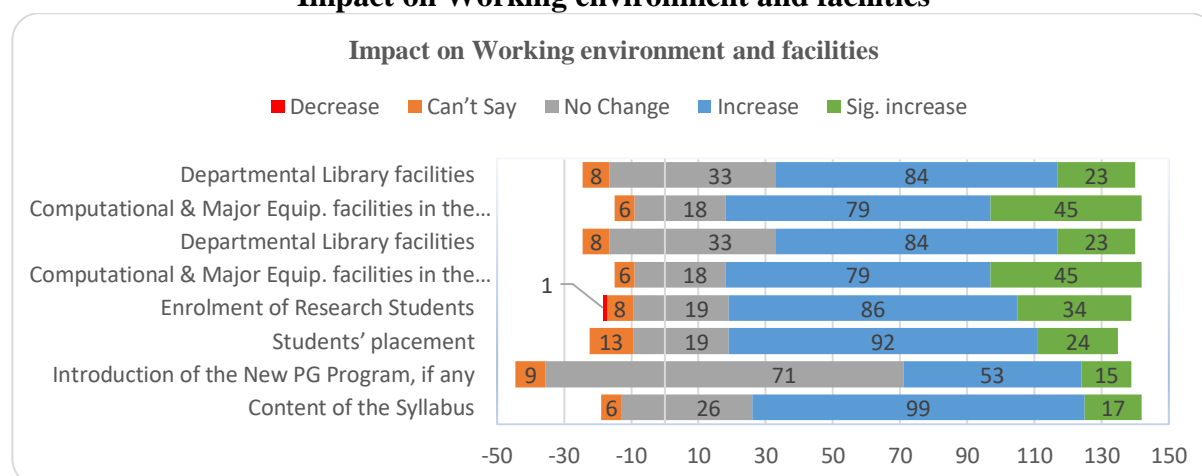
This chapter presents the overall impact of DST-FIST support. It contains the impact on Academic output, impact on working environment and facilities and also impact on Quality Research. The suggestions of the respondents for improvement in the Science and Technology of the Western region with special reference to the efforts, being made by the Department of science and Technology, are analysed here. Finally, the Conclusions and Recommendations are given at the end of this Chapter.

9.2 Overall Impact of DST-FIST support

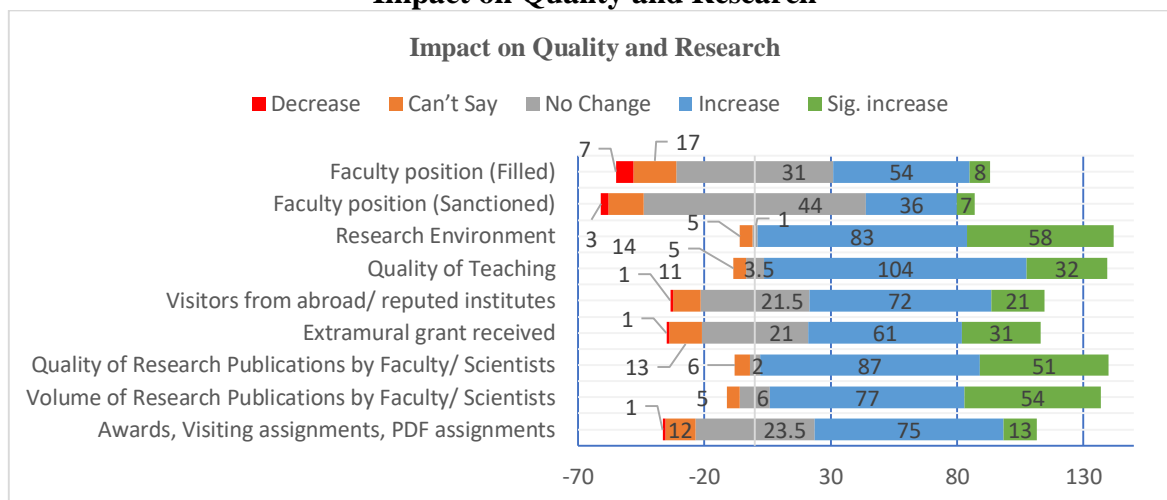
Graph 9.1a
Impact on Academic Output



Graph 9.1b
Impact on Working environment and facilities



Graph 9.1c
Impact on Quality and Research



From above Graph present the overall impact on various characteristics such as Students Intake, Students passed out, and Students NET/GATE etc., Result, Content of the Syllabus, Introduction of the New PG Program, if any, Students' placement, Enrolment of Research Students, No. of Ph.D. Awarded, Faculty position (Sanctioned), Faculty position (Filled), Awards, Visiting assignments, PDF assignments, Volume of Research Publications by Faculty/ Scientists, Quality of Research Publications by Faculty/ Scientists, Extramural grant received, Computational & Major Equip. facilities in the department, Departmental Library facilities, Accreditation level by the NAAC/NBA/UGC/MCI peer review team, Academic reputation and visibility, Community/ outreach program, Attracting talent to organization, Visitors from abroad/ reputed institutes, Quality of Teaching, Research Environment after DST-FIST support all these factors measured in five point scale. This Table shows that distribution of impact on the various items of all the 148 College/Department/School/Centre supported under DST-FIST program. It is evident from the table that none of the topics shows decrease in their percentage, only faculty position (filled) is showing a very meagre decrease but here it can be concluded that filling of faculty positions is not actually related to the FIST, it depends on the administrative and the government norms. Also we can see a very less percentage of people i.e. 10 – 12 % are unsure or can't say, whether they have seen improvement (sanctioned and filled).

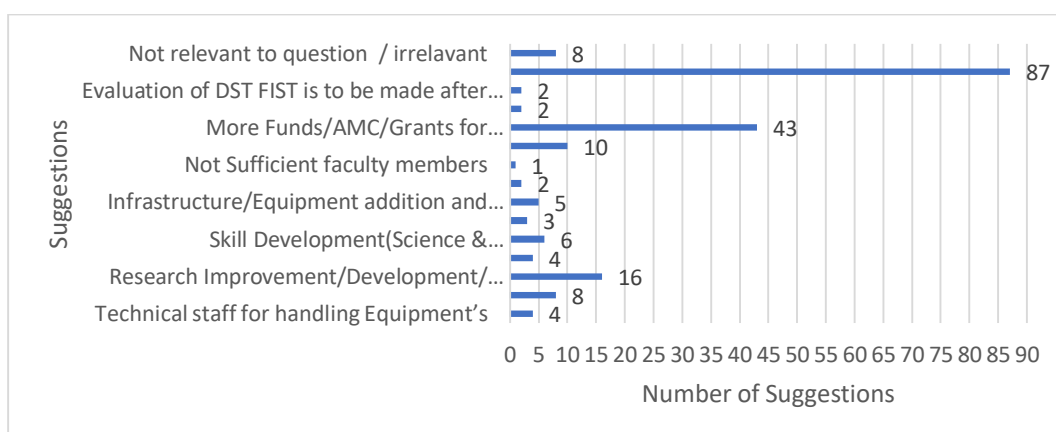
It has been mentioned earlier that faculty position sanctioning and filling is dependent on the administrative and the related government policy. Increase and significant increase in all the overall topics has been observed by approximately 80% of the respondents. This is a big

achievement in itself. The highest improvement i.e. increase and significant increase is seen in

1. Quality of teaching (91.8%)
2. Academic reputation and visibility (89.8%)
3. Research environment (89.1%)
4. Volume of research publication by faculty/ scientists (88.4%)
5. Number of Ph. D. Awarded (85%)
6. Enrolment of research students (81%)

9.3 Suggestion for improvement in the Science and technology of the Western Region.

Graph 9.2
Suggestion for improvement in the science and technology of the western region with special reference to the efforts being made by the Department of Science and Technology.



From the Graph, it is clear that 21.4% opined for more fund/ AMC/ Grants for Technicians/ funds for School level. Also, the suggestions for research Improvement/ Development/ Environment of University/ education Policy/ Collaboration are given by 8% respondents. Moreover, maximum 43.3% shown inability to give any suggestions.

9.4 Conclusions

- Laboratories are improved due to purchase of sophisticated equipment and maintenance of these equipment became easy and fast.
- Facilities of good infrastructure like library, Computer lab, and computational facility, Internet in Library, Internet for faculty, student and office are developed.
- Computerized admission is started and lab safety measures are taken.
- Placement cell, IPR and Incubation centre are established.
- More classrooms and smart classrooms became available.
- Motivation for innovation, Personal development opportunities, Communication facility and up gradation of teaching staff are visibly improved.
- Organization of National and International Seminar/ conference, Short term training programs, Workshops, and FDP have increased.
- Research publications in National and International journals, Books, Chapters in Books, articles, case reports, monographs, review articles in conference proceedings, editorial notes are increased.
- Improvement in Awards, fellowships, Collaborations and recognition at National & International level.
- Increase in overall manpower i.e. Scientists, Professors, Other research staff and Technical staffs in all type of Universities/ Institutions or except few.
- Sanctioned post and Intake capacity of number of students' admission are increase for PG Diploma, Ph.D., PG and UG courses.
- Overall passing percentage as well as first division passing percentage have improved.
- Department/ Institutes/ Colleges started getting funds from other sources and from consultancy.

9.5 Best Practices:

- Costly and good quality equipment are purchased and therefore facilities are enhanced.
- Optimum use of equipment, computer and Internet.
- Large number of Internal and External users per week for equipment.
- Publication in high Impact factor and Citation Index Journals.
- Availability of Computational facility and computerized admission procedures implemented.

9.6 Impediments:

- Delay in fund release.
- Insufficient grant.
- Lack of Financial independence and budgetary autonomy.
- Lack of manpower and technical staff.
- Inadequate space.
- Inefficient or untrained staff.
- Non cooperative staff.

9.7 Recommendations:

- Fast and timely release of fund.
- More funds for equipment, computer and manpower are required.
- Financial independence/ budgetary autonomy is required.
- Purchase/ procurement and installation of costly equipment may be made faster.
- AMC grant may be provided.
- Trained staff/ training to staff is required.

Appendix-A

Evaluation of Impact of DST-FIST Program (Western Region)

Tables

Chapter 3

Table 3.6

Distribution of Grants and total amount according to institutions type (In lakhs)

Institution Type	No. of Grants (%)	Total Amount Received in Rs. Lakhs (%)
Central Government Institution	3(4.61)	969.2(10.8)
State Government Institution	33(50.76)	5307.8(59.2)
Autonomous Institution	10(15.38)	912.4(10.2)
Deemed University	4(6.15)	950.4(10.6)
Constituent college	2(3.07)	79.5(0.9)
Private Institution	13(20)	750.6(8.4)
Total	65(100)	8969.8(100)

Table 3.7

Distribution of University/College/Institute according to source of funding

Source of Financial Support	No. of Institutions (%)
Central Government	4(6.15)
State Government	56(86.15)
Others	5(7.69)
Total	65(100)

Table 3.8

State wise distribution of grant /project in according to level

State	Level wise no. of grants			
	L0	L1	L2	Total (%)
Goa	0	11	2	13(7.51)
Gujarat	0	23	8	31(17.91)
Maharashtra	6	55	31	92(53.18)
Rajasthan	1	24	12	37(21.39)
Total	7	113	53	173(100)

Table 3.9
Level wise distribution of sanctioned grants/projects during 2000-2011

Years	Level wise no. of sanctioned grants/projects			
	L0	L1	L2	Total (%)
2000	N.A.	6	11	17(9.8)
2002	N.A.	10	4	14(8.1)
2003	N.A.	12	6	18(10.4)
2004	N.A.	13	4	17(9.8)
2005	N.A.	12	4	16(9.2)
2006	N.A.	14	1	15(8.7)
2007	N.A.	15	4	19(11.0)
2008	N.A.	14	3	17(9.8)
2009	N.A.	4	3	7(4.0)
2010	2	7	2	11(6.4)
2011	5	6	11	22(12.7)
Total	7	113	53	173

Table 3.10
Year wise commencement of academic programs in departments/school/Centre (N =148)

Year of Commencement	PG Program		Ph.D. Program	
	N	%	N	%
1930-1939	0	0.00	0	0.00
1940-1949	8	6.15	4	3.42
1950-1959	20	15.38	16	13.68
1960-1969	41	31.54	21	17.95
1970-1979	15	11.54	20	17.09
1980-1989	20	15.38	14	11.97
1990-1999	18	13.85	22	18.80
2000-2009	7	5.38	15	12.82
2010-2019	1	0.77	5	4.27
Total	130*	100	117*	100.00

*130+01(Not applicable) +17(Not available) =148

*117+01(Not applicable) +30(Not available) =148

Table 3.11a
Gender of Respondent

Gender of PI	N	N %
Male	124	84
Female	24	16
Total	148	100.0

Table 3.11b
Working Status of First Project Coordinator

Status	N	%
Working	61	35.26
Superannuated	98	56.65
Joined other Inst.	7	4.05
Any Other	7	4.05
Total	173	100.00

Table 3.11d
State-wise working status of first PI

State	Working (%)	Superannuated (%)	Joined other Inst. (%)	Any other (%)	Total (%)
Goa	6(0.46)	7(0.53)	0(0)	0(0)	13(1)
Gujarat	9(0.29)	18(0.58)	3(0.096)	1(0.032)	31(1)
Maharashtra	35(0.38)	54(0.58)	2(0.021)	1(0.01)	92(1)
Rajasthan	11(0.29)	19(0.51)	2(0.054)	5(0.13)	37(1)
Total	61(0.35)	98(0.56)	7(0.04)	7(0.04)	173(1)

Table 3.12
Distribution of sanctioned and received amount among different level during 2000-2011

Years	Level wise no. of sanctioned and received amount in lakh								
	L0		L1		L2		Total		
	Sanctioned	Received	Sanctioned	Received	Sanctioned	Received	Sanctioned	Received	Received%
2000	0	N.A.	296.6	211.8	735.4	714.8	1032.0	926.6	89.8
2002	0	N.A.	338.0	309.8	249.0	219.8	587.0	529.6	90.2
2003	0	N.A.	363.8	328.9	224.0	205.8	587.8	534.7	91.0
2004	0	N.A.	395.4	345.7	156.0	150.5	551.4	496.2	90.0
2005	0	N.A.	306.9	253.9	510.5	462.4	817.4	716.4	87.6
2006	0	N.A.	695.3	629.5	74.9	69.0	770.2	698.5	90.7
2007	0	N.A.	728.9	596.4	790.0	638.6	1518.9	1235.0	81.3
2008	0	N.A.	706.2	558.9	357.6	206.8	1063.8	765.7	72.0
2009	0	N.A.	243.5	171.9	406.0	336.9	649.5	508.8	78.3
2010	92.5	71.5	305.0	243.9	218.5	182.1	616.0	497.5	80.8
2011	390.0	352.0	428.0	329.9	1622.5	1379.0	2440.5	2060.9	84.4
Total	482.5	423.5	4807.5	3980.6	5344.4	4565.6	10634.4	8969.8	84.3

Table 3.13
State wise distribution of sanctioned amount in Western region states (N=173)

States	Level wise sanctioned amount in Lakhs			
	L0 (%)	L1 (%)	L2 (%)	Total Amt. in Lakhs (%)
Goa	Nil	570.5	228.0	798.5(7.5)
Gujarat	Nil	1300.6	331.5	1632.1(15.3)
Maharashtra	392.5	1995.4	3705.5	6093.3(57.3)
Rajasthan	90.0	941.0	1079.4	2110.4(19.8)
Total	482.5 (4.54)	4807.5 (45.20)	5344.4 (50.26)	10634.4(100)

Chapter 4

Table 4.12
Distribution of present infrastructure in Departments/School/Centre (N=148)

Facilities	No. of response (%)
Dept. Library	134(90.54)
Internet faculty/Scientist	144 (97.30)
Internet students/staff	143 (96.62)
Internet Library	139 (93.92)
Internet Office/Admin	142 (95.95)
Computerized Admission	137 (92.57)
Computerized Exam	107 (72.30)
Computational facilities	140 94.59)
Res Labs Biology	70 (47.30)
Res Labs Chemistry	88 (59.46)
Res Labs Physics	75 (50.68)
Lab safety	135 (91.22)

Table 4.13
Infrastructure in University/Institute/College. (N=65)

Facilities	No. of response (%)
Placement cell	56(86.15)
IPR Cell	32(49.23)
Incubation Centre	24(36.92)

Table 4.14
Infrastructure available at Institutes level where institute has academic, Autonomy Institutes at the time of survey (N=65)

Facilities	Academic status (Institutions)						Total (%)
	Central Govt. (n=3)	State Govt. (n=33)	Autonomous (n=10)	Deemed University (n=4)	Constituent college (n=2)	Private Institution (n=13)	
Placement cell	2	29	8	4	2	11	56(86.15)
IPR Cell	2	19	5	2	1	3	32(49.23)
Incubation Centre	1	13	3	2	1	4	24(36.92)

Table 4.15
Infrastructure available in the institutes, where institutes got financial autonomy either From Central/State/Other govt. /sources Institutes at the time of survey (N=65)

Facilities	Organization Wise			
	Central(n=4)	State(n=56)	Other(n=5)	Total (%)
Placement cell	3	49	4	56(86.15)
IPR Cell	3	27	2	32(49.23)
Incubation Centre	2	20	2	24(36.92)

Table 4.16
Infrastructure available in the Institutes Level Wise (N=65)

Facilities	Level			
	L0(n=4)	L1(n=51)	L2(n=10)	Total (%)
Placement cell	4	45	7	56(86.15)
IPR Cell	2	23	7	32(49.23)
Incubation Centre	3	17	4	24(36.92)

Table 4.17
Infrastructure available in the Institutes State Wise (N=65)

Facilities	State				Total (%)
	Goa (n=2)	Gujarat (n=8)	Maharashtra (n=39)	Rajasthan (n=16)	
Placement cell	2	6	36	12	56(86.15)
IPR Cell	2	3	19	8	32(49.23)
Incubation Centre	1	3	16	4	24(36.92)

Table 4.18
Expenditure on Infrastructure created under FIST

Description	Total Amount in Lakhs	Total Amount (%)
Cost Equipment	8630.31	80.24
Cost Books	132.50	1.23
Cost Internet	509.53	4.74
Cost Renovation	293.12	2.73
Cost Air condition	28.413	0.26
Cost Equipment repairs	1093.31	10.17
Cost other works	68.30	0.63
Total	10755.47	100.00

Table 4.19
Current Status of Equipment procured under FIST

Year of Equipment Purchased	No. of Items Purchased (N)	% of Items Purchased (N)	Status of Equipment			
			Working		Non-Working	
			N	%	N	%
2000-2004	179	13.7	105	58.65	74	41.34
2005-2009	568	43.4	441	77.64	127	22.35
2010-2014	531	40.6	503	94.72	28	5.27
2015-2019	31	2.4	31	100	0	0
Total	1309	100.0	1080	82.50	229	17.49

Table 4.20
Distribution of Equipment's procured under FIST according Current Status and AMC

Year of Equipment Purchased	No. of Equipment	% No. of Equipment	Working		AMC	
			n	%	N	%
2000-2004	179	13.7	105	58.65	4	2.23
2005-2009	568	43.4	441	77.64	23	4.04
2010-2014	531	40.6	503	94.72	17	3.2
2015-2019	31	2.4	31	100	3	9.6
Total	1309	100.0	1080	82.50	47	3.5

Table 4.21
Gap between Purchase and Installation of Equipment

Gap(Month)	Number of Equipment's (N)	N%
0-1	704	53.8
2-3	266	20.3
4-5	127	9.7
6-12	147	11.2
12+	65	5.0
Total	1309	100

Table 4.22
Gap between Purchase year of equipment and Sanction year of grant.

Gap(Year)	Number of Equipment's (N)	N (%)
0-1	640	48.9
2-3	557	42.6
4-5	100	7.6
6-12	12	0.9
Total	1309	100

Table 4.23
Utilization of Equipment procured under FIST Internal user

No. of Users per week	Number of Equipment's	% of Number of Equipment's
1-4	207	24.29
5-9	157	18.42
10-14	68	7.9
15+	420	49.29
Total	852	100.0

*852+457 (equipment information not available) =1309 equipment.

Table 4.24
Utilization of Equipment procured under FIST by External Users

No. of Users per week	No. of Equipment's	% of Number of Equipment's
1-4	345	26.4
5-9	67	4.9
10-14	10	0.7
15+	53	4.0
Total	475	100.0

*457+834 (equipment information not available) =1309 equipment.

Table 4.25
Percent Utilization of Equipment

Purchase Year	No. of Equipment	76-100 Percent	51-75 Percent	26-50 Percent	<=25 Percent	No information
2000-2004	179(133.7)	106(59.2)	12(6.7)	0(0)	0(0)	61(34.1)
2005-2009	568(43.4)	307(54)	27(4.8)	16(2.8)	29(5.1)	189(33.3)
2010-2014	531(40.6)	207(39)	38(7.2)	21(4)	14(2.6)	251(47.3)
2015-2019	31(2.4)	15(48.4)	3(9.7)	4(12.9)	0(0)	9(29)
Total	1309(100)	635(48.5)	80(6.1)	41(3.1)	43(3.3)	510(39)

Chapter 5

Table 5.1
Impact on Working Environment after DST-FIST support Department wise. (N=148)

Factors	Decrease N (%)	Can't say N (%)	No change N (%)	Improved N (%)	Sig. Improved N (%)
Cleanliness	0(0)	5(3.38)	24(16.22)	100(67.22)	19(12.84)
Room Temp. , Light & Ventilation	1(0.68)	6(4.05)	38(25.68)	76(51.35)	27(18.24)
Sufficient Working Space	1(0.68)	3(4.05)	48(25.68)	65(51.35)	31(18.24)
Communication: Internet, Telephone, etc.	0(0)	4(2.7)	21(14.19)	58(39.19)	65(43.92)
Personnel Development Opportunities	0(0)	3(2.03)	5(3.38)	78(52.7)	62(41.89)
Administrative and Office Support	0(0)	5(3.38)	52(35.14)	69(46.62)	22(14.86)
Motivation for innovation	0(0)	3(2.03)	2(1.35)	76(51.35)	67(45.27)

Table 5.2
Impact on Capacity Building at Department level (N=148)

Activities	Before FIST	After FIST	% Change	Impact
National Seminar/ Conf.	263	535	103.42	1.83
International Seminar/ Conf	189	200	5.82	0.07
Workshops	249	691	177.51	2.98
Short term training Program	60	169	181.67	0.73
Faculty Development Program	127	262	106.30	0.91
Management Development Program	61	66	8.20	0.03
Up gradation of Technical staff	48	202	320.83	1.04
Others	68	211	210.29	0.96
Total	1065	2336	119.34	

Table 5.3
Summary of responses (Item) on Improvement of the Working Environment due to DST-FIST grant in west regions (N=334).

Item*	Responses N (%)
Research Publication & Collaboration	115(34.4)
Lab Facility (Equipment, Instruments) and its maintenance.	64(19.2)
Computation(Computer) and Internet(Networking) Facility	43(12.9)
Classroom, Lab and working space Renovated	32(9.6)
Teaching and Learning Environment	23(6.9)
Student's (UG , PG and PhD) facility improved	13(3.9)
Library (Increase in number of books)	12(3.6)
Receiving other extramural grants	6(1.8)
Addition of Faculty /tech Staff/ Admin Staff.	2(0.6)
Irrelevant to the question	3(0.9)
NA/ No Response/ Not applicable	21(6.3)

*Factors obtained by Text Data Analysis

Table 5.4
Summary of responses (Item) on Impediments of working environment due to DST-FIST support in western regions. (N=213)

Item*	N (%)
Delay in Funds release/ more funds needed/ Annual maintenance grants.	59(27.7)
Lack of Infrastructure /lack of Space/lack of equipment or Instrument/lack of books in library	22(10.3)
Lack of faculty/Trained Manpower/Staff/ Administrative Staff	14(6.6)
Lack of Administrative and Office support	3(1.4)
Computation and Networking facility not provided	5(2.3)
No Significance/ No impediments	9(4.2)
Irrelevant to question	8(3.7)
NA/Not Applicable/No response	93(43.7)

*Factors obtain by Text Data Analysis

Chapter 6

Table 6.1
Impact on volume of Man Power department wise. (N=148)

Manpower	No. Before FIST		No. After FIST		% Change	Impact
	Σ	Mean \pm SD	Σ	Mean \pm SD		
Lecturer/Assistant Professor (N=146)	1474	10.1 \pm 19.0	1647	11.3 \pm 26.5	11.74	1.16
Reader/ Associate Professor (N=146)	742	5.0 \pm 9.1	715	4.9 \pm 7.7	-3.64	-0.18
Professor (N=146)	311	2.1 \pm 2.9	398	2.7 \pm 3.6	27.97	0.58
Scientist (N=146)	38	0.3 \pm 1.3	123	0.8 \pm 5.3	223.68	0.57
Other research staff (N=146)	241	1.6 \pm 15.3	273	1.9 \pm 12.8	13.28	0.21
Technical Staff (N=145)	777	5.3 \pm 10.5	859	6 \pm 11.8	10.55	0.55
Administrative Staff (N=145)	728	5.0 \pm 13.3	886	6.1 \pm 18.2	21.70	1.06
Total Category	4311		4901		13.69	

Table 6.2
Impact on volume of Man Power by Institutions wise (N=148)

Manpower		No. Before FIST		No. After FIST		% Change	Impact
		Σ	Mean \pm SD	Σ	Mean \pm SD		
Central Government Institution	Lecturer/Assistant Professor (N=5)	30	6 \pm 11.8	4	1 \pm 2	-86.7	-8.67
	Reader/ Associate Professor (N=5)	9	1.8 \pm 2.5	3	0.8 \pm 1	-66.7	-2.00
	Professor (N=5)	14	2.8 \pm 4.4	23	5.8 \pm 7.6	64.3	3.00
	Scientist (N=5)	0	0 \pm 0	2	0.5 \pm 1	200.0	0.67
	Other research staff (N=5)	7	1.4 \pm 3.2	10	2.5 \pm 3.7	42.9	1.00
	Technical Staff (N=5)	19	3.8 \pm 3.5	16	4 \pm 4.7	-15.8	-1.00
	Administrative Staff (N=4)	11	2.75 \pm 1.9	8	2.7 \pm 2.3	-27.3	-1.00
State Government Institution	Lecturer/Assistant Professor (N=89)	464	5.2 \pm 5	467	5.2 \pm 5.8	0.6	0.09
	Reader/ Associate Professor (N=89)	300	3.3 \pm 5.2	328	3.6 \pm 5.6	9.3	0.85
	Professor (N=89)	182	2 \pm 2.5	243	2.7 \pm 3.6	33.5	1.85
	Scientist (N=89)	19	0.2 \pm 0.9	35	0.4 \pm 1.2	84.2	0.48
	Other research staff (N=89)	35	0.3 \pm 1.6	52	0.6 \pm 1.6	48.6	0.52
	Technical Staff (N=89)	274	3 \pm 5.7	272	3 \pm 5.2	-0.7	-0.06
	Administrative Staff (N=89)	176	1.9 \pm 2.9	187	2.1 \pm 2.7	6.3	0.33
Autonomous Institution	Lecturer/Assistant Professor (N=15)	357	23.8 \pm 41.1	512	32 \pm 58.5	43.4	15.50
	Reader/ Associate Professor (N=15)	112	7.4 \pm 10.2	105	6.6 \pm 8.1	-6.3	-0.70
	Professor (N=15)	53	3.5 \pm 4.4	57	3.6 \pm 4.2	7.5	0.40
	Scientist (N=15)	15	1 \pm 3.4	72	4.5 \pm 15.7	380	5.70
	Other research staff (N=15)	195	13 \pm 47.6	181	11.3 \pm 38.2	-7.2	-1.40
	Technical Staff (N=15)	141	9.4 \pm 12.3	203	12.7 \pm 20.9	43.9	6.20

Manpower		No. Before FIST		No. After FIST		% Change	Impact
		Σ	Mean \pm SD	Σ	Mean \pm SD		
	Administrative Staff (N=15)	211	14 \pm 28.6	316	19.8 \pm 41.7	49.8	10.50
Deemed University	Lecturer/Assistant Professor (N=14)	126	9 \pm 8.4	87	6.2 \pm 6.3	-31	-9.75
	Reader/ Associate Professor (N=14)	24	1.7 \pm 1.7	38	2.7 \pm 2.5	58.3	3.50
	Professor (N=14)	41	2.9 \pm 3.2	44	3.1 \pm 3.5	7.3	0.75
	Scientist (N=14)	1	0 \pm 0.3	7	0.5 \pm 1.1	600	1.50
	Other research staff (N=14)	3	0.2 \pm 0.9	19	1.4 \pm 3	533.3	4.00
	Technical Staff (N=14)	39	2.7 \pm 4.9	68	4.9 \pm 6.1	74.4	7.25
	Administrative Staff (N=14)	31	2.2 \pm 3.3	47	3.4 \pm 5.5	51.6	4.00
Constituent college	Lecturer/Assistant Professor (N=2)	38	19 \pm 9.9	37	18.5 \pm 12	-2.6	-0.50
	Reader/ Associate Professor (N=2)	36	18 \pm 4.2	34	17 \pm 2.8	-5.6	-1.00
	Professor (N=2)	10	5 \pm 7.1	6	3 \pm 4.2	-40	-2.00
	Technical Staff (N=2)	48	24 \pm 11.3	50	25 \pm 12.7	4.2	1.00
	Administrative Staff (N=2)	45	22.5 \pm 17.7	44	22 \pm 17	-2.2	-0.50
Private Institution	Lecturer/Assistant Professor (N=21)	459	21.8 \pm 29.2	549	26.1 \pm 39.8	19.6	6.92
	Reader/ Associate Professor (N=21)	261	12.4 \pm 17.4	211	10 \pm 13.5	-19.2	-3.85
	Professor (N=21)	11	0.5 \pm 1.7	24	1.1 \pm 1.5	118.2	1.00
	Scientist (N=21)	3	0.2 \pm 0.4	7	0.3 \pm 0.9	133.3	0.31
	Other research staff (N=21)	1	0.1 \pm 0.2	11	0.5 \pm 1	1000	0.77
	Technical Staff (N=21)	256	12.2 \pm 20.1	268	12.8 \pm 19.2	4.7	0.92
	Administrative Staff (N=21)	254	12.1 \pm 21.3	295	14 \pm 26.7	16.1	3.15

Table 6.3
Impact on volume of Man Power by Level wise (n=148)

Manpower		No. Before FIST		No. After FIST		% Change	Impact
		Σ	Mean \pm SD	Σ	Mean \pm SD		
L0	Lecturer/Assistant Professor (N=7)	499	71.3 \pm 51.4	670	95.7 \pm 78.1	34.3	24.43
	Reader/ Associate Professor (N=7)	202	28.9 \pm 16.2	161	23 \pm 4.7	-20.3	-5.86
	Professor (N=7)	20	2.9 \pm 6.7	25	3.5 \pm 6	25.0	0.71
	Scientist (N=7)	15	2.2 \pm 4.9	71	10.1 \pm 23.5	373.3	8.00
	Other research staff (N=7)	189	27 \pm 69.7	166	23.7 \pm 57.6	-12.2	-3.29
	Technical Staff (N=7)	212	30.3 \pm 16.4	276	39.4 \pm 21.9	30.2	9.14
	Administrative Staff (N=7)	288	41.2 \pm 32.7	409	58.4 \pm 53.9	42.0	17.29

L1	Lecturer/Assistant Professor (N=104)	785	7.7±8.6	802	7.7±10.6	2.2	0.15
	Reader/ Associate Professor (N=103)	457	4.4±7.9	470	4.5±7.5	2.8	0.12
	Professor (N=103)	180	1.8±2.2	202	1.9±2.4	12.2	0.19
	Scientist (N=103)	20	0.2±0.9	34	0.3±1.1	70.0	0.12
	Other research staff (N=103)	35	0.3±1.4	76	0.7±1.9	117.1	0.36
	Technical Staff (N=103)	458	4.4±9.2	455	4.4±8.8	-0.7	-0.03
	Administrative Staff (N=102)	357	3.5±9.5	378	3.7±9.9	5.9	0.19
L2	Lecturer/Assistant Professor (N=36)	190	5.3±6.4	175	4.8±5.5	-7.9	-0.28
	Reader/ Associate Professor (N=36)	83	2.3±3.1	84	2.3±2.2	1.2	0.02
	Professor (N=36)	111	3.1±3.3	171	4.7±4.9	54.1	1.13
	Scientist (N=36)	3	0.1±0.3	18	0.5±1.1	500.0	0.28
	Other research staff (N=36)	17	0.3±1.5	31	0.8±1.9	82.4	0.26
	Technical Staff (N=36)	107	3±5.4	128	3.5±5.3	19.6	0.40
	Administrative Staff (N=36)	83	2.3±2.7	99	2.7±3.8	19.3	0.30

Table 6.4
Impact of Sanctioned Seats in Various Courses (N=148)

Courses	No. Before FIST		No. After FIST		% Change	Impact
	∑	Mean ± SD	∑	Mean ± SD		
Graduation (N=73)	36149	495.1±895.9	42315	579.6±1012.3	17.1	41.66
Post-graduation (N=115)	12332	107.2±266.7	14841	129±293.3	20.34	16.95
M. Phil (N=24)	570	23.7±44.5	423	17.6±10.4	-25.8	-0.99
Ph.D. (N=85)	3025	35.5±117.62	3891	45.7±140.5	28.6	5.85
PG Diploma (N=10)	303	30.3±27.56	548	54.8±61.3	80.2	1.66
Total	52379		62018		18.40	

Table 6.5
Impact on Admission in Various Courses (N=148)

Courses (n)	Before FIST		After FIST		% Change	Impact
	∑	Mean ± SD	∑	Mean ± SD		
Graduation (N=50)	21397	427.9±710.4	25244	504.9±782.6	17.98	25.99
Post-graduation (N=85)	7281	85.6±198.4	8404	98.8±171.4	15.42	7.59
M. Phil (N=10)	149	14.9±8.6	189	18.9±13.4	26.85	0.27
Ph.D. (N=14)	197	14.1±8.2	329	23.5±15.4	67.01	0.89
PG Diploma (N=8)	207	25.9±27.6	413	51.6±70.5	99.52	1.39
Total	29231		34579		18.29	

Table 6.6
Impact on Pass Percent in Various Courses after FIST (N=148)

Courses	Before FIST			After FIST			Impact (No. of passed)
	No. Admission	No. Passed	(%)Pass	No. Admission	No. Passed	(%)Pass	
Graduation (N=50)	21397	14045	65.6	25244	18592	73.65	30.72
Post-graduation (N=85)	7281	4825	66.26	8404	6536	77.77	11.56
M. Phil (N=10)	149	127	85.23	189	153	80.95	0.18
Ph.D. (N=14)	197	173	87.8	329	298	90.58	0.84
PG Diploma (N=8)	207	181	87.4	413	388	93.95	1.40
Total	29231	19344	66.17	34579	25967	75.09	

Table 6.7
Students Passed with quality improved or First Div. after FIST (N=148)

Courses	Before FIST			After FIST			Impact (Grade)
	No. Admission	No. Passed (Grade A)	(%) Pass	No. Admission	No. Passed (Grade A)	(%) Pass	
Graduation (N=50)	21397	7607	35.6	25244	11840	46.9	28.60
Post-graduation (N=85)	7281	2910	39.96	8394	3478	41.5	3.84
M. Phil (N=10)	149	93	62.4	189	121	64.0	0.19
Ph.D. (N=14)	197	149	75.6	329	254	77.2	0.71
PG Diploma (N=8)	207	164	79.2	413	312	75.5	1.00
Total	29231	10923	37.36	34579	16005	46.28	

Table 6.8
Change in number of students qualifying in National Examinations (N=148)

Exam	Before FIST (N)	After FIST (N)	% Change	Impact
NET/ SET	1635	1404	-14.13	-1.56
GATE	403	864	114.39	3.11
Others	1563	2443	56.30	5.95
Total	3601	4711	30.82	

Table 6.9
Change in Publication of the Dept. (N=148)

Publications	Before FIST	After FIST	% Change	Impact
Books	959	1497	56.10	3.64
Books Chapter	424	1014	139.15	3.99
Original articles	4885	9130	86.90	28.68
Review articles	811	1763	117.39	6.43
Case reports/ Editorial Notes	195	452	131.79	1.74
Articles in Conference Proceeding	2391	4374	82.94	13.40
Paper Presentation in Conference	3313	7036	112.38	25.16
Monograph	170	370	117.65	1.35
Others	174	677	289.08	3.40
Total	13322	26313	97.52	

Table 6.10
Trend in Research Funding and Output.

Items	Status of DST-FIST Support N=148				
	Decrease N (%)	Can't say N (%)	No change N (%)	Improved N (%)	Sig. Improved N (%)
Intramural Grants	1(0.7)	11(7.4)	43(28.9)	79(53)	14(9.4)
Extramural Grants	1(0.7)	13(8.7)	32(21.5)	81(54.7)	21(14.1)
Patents Filed	0(0)	20(13.4)	66(44.3)	52(34.9)	10(6.7)
Commercialization of Technology	0(0)	26(17.4)	78(52.7)	40(27)	4(2.7)
Product and Process Development	1(0.7)	23(15.4)	69(46.6)	52(34.9)	3(2)
Papers Published	1(0.7)	18(12.1)	5(3.4)	80(54)	44(29.7)
Trend in Impact Factor	Nil	16(10.7)	3(2)	86(58)	43(29)
Trend in Citation Index	0(0)	15(10.1)	7(4.7)	91(61.4)	35(23.6)
Consultancy	0(0)	27(18.1)	46(31.8)	63(42.6)	12(8)
Extension Work	0(0)	18(12.1)	27(18.1)	85(57)	18(12)

Table 6.11
Awards and Recognitions by Faculty/ Scientists (N=148)

Items	Before FIST	After FIST	% Change	Impact
Intl. Awards by Faculty	40	95	137.50	0.37
National awards by Faculty	195	305	56.41	0.74
Intl. Recognition to Faculty	66	161	143.94	0.64
National Recognition to Faculty	131	286	118.32	1.05
Intl. Fellowship	51	94	84.31	0.29
National Fellowship	196	333	69.90	0.93
Intl. Collaboration	91	185	103.30	0.64
National Collaboration	186	381	104.84	1.32
Intl. Certification	11	30	172.73	0.13
National Certification	30	53	76.67	0.16
Intl. Exchange Program	29	71	144.83	0.28
National Exchange Program	35	95	171.43	0.41
Total	1061	2089	96.89	

Chapter 7

Table 7.1
Level of Satisfaction with following Administrative Process (N=148)

Process	N	Number Satisfied	% Satisfied
Procurement Process	148	135	91.22
Infrastructure utilization	148	137	92.57
Maintenance infrastructure	148	107	72.30
Utilization of Funds	148	136	91.89
Administrative Support	148	133	89.86

Table 7.2
Positive response on Procurement Process and time (N=233)

Items	N(%)
Procurement and purchasing be made easy	63 (27)
Procurement is done as per university/govt./DST rules	26 (11.2)
Supportive administration/Dept. in procurement	24(10.3)
Grant received timely/Procurement of equipment process is timely	44(18.9)
Not Relevant/Irrelevant	42(18)
Not Applicable/No response/Not Available	34(14.6)
Total	233(100)

Table 7.3
Constraints faced on Procurement Process and time (N=199)

Item*	N (%)
Foreign equipment charges/problems/customs/freight charges	15(7.5)
Delay in release of funds	14(7)
Administrative delay/Delay by Institution/University	4(2)
Lack of Technical staff/Infrastructure	13(6.5)
Vendor problems	13(6.5)
Delay In Installation/Purchase/Procurement	31(15.6)
Limited sanction of funds/Lack of Funds/No AMC	25(12.6)
No constraints points	2(1)
Not Applicable/No response/Not Available/NA	82(41.2)
Total	199(100)

Table 7.4
Suggestion based on Procurement Process and time (N=191)

Item*	N (%)
Remove administrative /office bureaucracy/paper work	1(0.5)
Currency problems should be removed/ Free custom and excise duty	3(1.6)
Direct procurement of equipment from vendor by DST/freedom to explore vendors	1(0.5)
Dedicated technician/technical staff availability	4(2.1)
Release of funds in time/Procurement process should be fast	5(2.6)
Financial independence/annual budgetary/Autonomy to PI	81(42.4)
AMC/Maintenance should be provided	7(3.7)
Not Applicable/No response/Not Available/NA	89(46.6)
Total	191(100)

Table 7.5
Positive response on Utilization of infrastructure & service provided to users (N=178)

Item*	N (%)
Computational/networking/internet facilities improved	10(5.6)
Laboratory equipment's /facilities	1(0.6)
Infrastructure facility(construction/renovation of class/library/lab etc.)	38(21.3)
Research quality/publications/environment/collaboration/working/recognition/awards	70(39.3)
Library(books/facilities)	3(1.7)
Teaching/ learning/training/skill	14(7.9)
UG/PG facilities and benefits	8(4.5)
Administration/easy working/transparency/online/funds/financial/utilization	27(15.2)
Not relevant/ Irrelevant	7(3.9)
Total	178

Table 7.6
Constraints faced on Utilization of infrastructure & service provided to users (N=191)

Item*	N (%)
Long /time delay in civil work/ infrastructure	1(0.5)
Funding problem/Low amount / no sufficient amount /no easy funding/delay in funding/AMC/next phase grant	29(15.2)
Need technical staff /skilled /trained person technical staff/scholar	25(13.1)
Power cut problem/electric/gas supply limitation/Internet	4(2.1)
Administrative problem/Permission to use facility	14(7.3)
No Constraints	16(8.4)
Not relevant/Irrelevant	6(3.1)
No suggestion/ NA	96(50.3)
Total	191(100)

Table 7.7
Suggestion based on Utilization of infrastructure & service provided to users (N=79)

Item*	N (%)
More funds/labs/computers/equipment/infrastructure/manpower	32(40.5)
AMC	6(7.6)
Skill/ technicians/staff/faculty	14(17.7)
Learning/training/research staff/seminar/research up gradation	6(7.6)
Administration/autonomy/online/transparency/technical queries	9(11.4)
Fund utilisation	4(5.1)
Equipment's/Consumables/facilities/Infrastructure	8(10.1)
Total	79(100)

Table 7.8
Positive response on Maintenance of Infrastructure (N=186)

Item*	N(%)
Maintenance grant is given by institute/University/ college	22(11.8)
Maintenance is done by faculty/trained staff	14(7.5)
Maintenance is done by DST grant	11(5.9)
Adequate laboratory/Central research/equipment/Academic/lab	62(33.3)
No positive point	2(1.1)
Not relevant	6(3.2)
Not available/missing	69(37.1)
Total	186

Table 7.9
Constraints faced on Maintenance of Infrastructure (N=194)

Item*	N (%)
No AMC/grant be provided	21(10.8)
Lack of further support/fund not released/expensive facilities /not allowed/ fist support/long term support /equipment were obsolete /costly	19(9.8)
Lack of technical staff/trained manpower/apparatus /maintenance staff/student	11(5.7)
Lack of fund/Insufficient administrative support/Inadequate space/delayed in payment	32(16.5)
No maintenance /additional fund/AMC	17(8.8)
No constraints/None/Nil/No suggestion	1(0.5)
Not relevant	1(0.5)
Not available/missing/not applicable	92(47.4)
Total	194

Table 7.10
Suggestion based on Maintenance of Infrastructure (N=216)

Item*	N(%)
Maintenance grant should be release in time	32(17.3)
Provide fund further maintain grant	19(10.3)
Availability of trained technical staff/ man power/student	11(5.9)
Power supply/generator/infrastructure/laboratories/administration support	11(5.9)
Not relevant	2(1)
Not available/missing/not applicable	109(59.2)
Total	184

Table 7.11
Positive response on Utilization of Fund (N=201)

Item*	N(%)
Funds released /utilized in time	40(19.9)
Funds utilized as per rule	17(8.4)
Department and Administration support	12(5.9)
Support of DST	2(0.9)
Development of infrastructure/ Equipment	67(33.3)
NA/Not Applicable /Nil/No suggestion/No constraint	55(27.4)
Irrelevant Question	8(4)
Total	201

Table 7.12
Constraints faced on Utilization of Fund (N=182)

Item*	N (%)
Delay in release of fund at any level(DST/Administration)	12(6.6)
Need of more fund/AMC	15(8.2)
Foreign currency exchange /custom clearance problems	8(4.4)
Lack of administrative support/efficient staff/faculty	21(11.5)
Lack of Infrastructure/Generator/light, ventilation, etc.	10(5.5)
None/Nil/No suggestion/No constraint	111(61)
Not Relevant	5(2.7)
Total	182

Table 7.13
Suggestion based on Utilization of Funds (N=183)

Item*	N(%)
Timely release of funds	13(7.1)
Administration/Trained better process/Smooth or simplified at university level	7(3.8)
Additional grant	20(10.9)
Funds utilization autonomy at the PI level	10(5.5)
None/Nil/No Suggestion/NA/Not Applicable	115(62.8)
Not Relevant	18(9.8)
Total	183

Table 7.14
Positive response on Administrative support (N=191)

Item*	N(%)
Cooperative / Supportive administration	85(44.5)
Timely release of funds by DST and University account section	7(3.7)
Prompt /Timely process and communication of administration	26(13.6)
Central Purchasing System/ Rule Regulations/ Proper utilisation of funds	15(7.9)
Not relevant to the question/ Irrelevant	5(2.6)
No suggestion/ Not Available/ Missing	53(27.7)
Total	191

Table 7.15
Constraints faced on Administrative support (N=176)

Item*	N (%)
Non cooperative / supportive administration	18(10.2)
Delay in the process	15(8.5)
Execution and Utilization of funds/ Funds not released	5(2.8)
Lack of manpower/ technical staff/ office staff/ Frequent transfer	11(6.2)
Not relevant to the question/ Irrelevant	2(1.1)
No constraints /No suggestion/ Not Available/ Missing	125(71.0)
Total	176

Table 7.16
Suggestions based on Administrative support (N=177)

Item*	N (%)
E- office, e- governance, PFMS, Online management required	1(0.6)
Trained/ Training of staff/ More staff (Account, Office, Technical) needed	18(10)
Central Purchasing system/ Smooth process of procurement	8(4.4)
Administrative delay (Funding agency/ Local level)	12(6.7)
Autonomy at PI level and fixed PI	3(1.7)
Evaluation on half yearly basis / Timely assessment	5(2.8)
Infrastructural development/ Regional centre/ More funds	6(3.3)
Not relevant to the question/ Irrelevant	1(0.6)
No suggestion/ Not Available/ Missing	126(70)
Total	180

Chapter 9

Table 9.1
Overall Impact of DST-FIST Support (N=148)

Items	Decrease N (%)	Can't Say N (%)	No Change N (%)	Increase N (%)	Sig. increase N (%)
Students Intake	0(0)	9(6)	45(30.4)	75(50.6)	19(12.8)
Students passed out	0(0)	6(4)	27(18.2)	98(66.2)	17(11.4)
Students NET/GATE etc. Result	0(0)	11(7.4)	20(13.5)	93(62.8)	24(16.2)
Content of the Syllabus	0(0)	6(4)	26(17.5)	99(66.8)	17(11.4)
Introduction of the New PG Program, if any	0(0)	9(6)	71(47.9)	53(35.8)	15(10.1)
Students' placement	0(0)	13(8.7)	19(12.8)	92(62.1)	24(16.2)
Enrolment of Research Students	1(0.6)	8(5.4)	19(12.8)	86(58.1)	34(22.9)
No. of Ph.D. Award	0(0)	6(4)	16(10.8)	96(64.8)	30(20.2)
Faculty position (Sanctioned)	3(2)	14(9.4)	88(59.4)	36(24.3)	7(4.7)
Faculty position (Filled)	7(4.7)	17(11.4)	62(41.8)	54(36.4)	8(5.4)
Awards, Visiting assignments, PDF assignments	1(0.6)	12(8.1)	47(31.7)	75(50.6)	13(8.7)
Volume of Research Publications by Faculty/ Scientists	0(0)	5(3.3)	12(8.1)	77(52)	54(36.4)
Quality of Research Publications by Faculty/ Scientists	0(0)	6(4)	4(2.7)	87(58.7)	51(34.4)
Extramural grant received	1(0.6)	13(8.7)	42(28.3)	61(41.2)	31(20.9)
Computational & Major Equip. facilities in the department	0(0)	6(4)	18(12.1)	79(53.3)	45(30.4)
Departmental Library facilities	0(0)	8(5.4)	33(22.2)	84(56.7)	23(15.5)
Accreditation level by the NAAC/NBA/UGC/MCI peer review team	4(2.7)	16(10.8)	19(12.8)	70(47.2)	39(26.3)
Academic reputation and visibility	0(0)	6(4)	8(5.4)	97(65.5)	36(24.3)
Community/ outreach program	0(0)	12(8.1)	36(24.3)	85(57.4)	15(10.1)
Attracting talent to organization	0(0)	8(5.4)	25(16.8)	91(61.4)	24(16.2)
Visitors from abroad/ reputed institutes	1(0.6)	11(7.4)	43(29)	72(48.6)	21(14.1)
Quality of Teaching	0(0)	5(3.3)	7(4.7)	104(70.2)	32(21.6)
Research Environment	0(0)	5(3.3)	2(1.3)	83(56)	58(39.1)