Launched and Dedicated to the Nation by the Hon'ble Prime Minister of India on
January 3, 2020

Indian Science, Technology and Engineering facilities Map (I-STEM)

Supported by the Office of the Principal Scientific Adviser, Govt. of India

www.istem.gov.in

Chosen by the Govt. of India as one of the "Transformative Ideas"

Centre for Nano Science and Engineering,
Indian Institute of Science, Bengaluru, India

The Vision 👁

It has always been the basic tenet of the Government of India, in generously funding R&D efforts at academic institutions over the years, that facilities established through such supports be made available to those needing them and qualified to make use of them for their own research work.

However, this was never easy or straightforward for, among other reasons, there was no ready source of information of what facility was available and where. Thanks to the Web, it is much easier today to have a national and regional as well as global "inventory of resources", so as to match users with the resources they need, and to do all this in an efficient and transparent manner.

This can lead to a leap in R&D productivity and greatly enhance the effectiveness of public investment. This is the motivation behind I-STEM.

The Mission ◈

The I-STEM Web Portal is the gateway for users to locate the specific facility (ties) they need for their R&D work and identify the one that is either located closest to them or available the soonest.

Through a recent GoI directive, institutions with R&D facilities funded by agencies of the GoI are now required to list them on the I-STEM Portal. Through the I-STEM Portal or the web site of the organization where the desired facility is located, one can make a reservation for using it.

To enable the running and maintenance of the resources, the organization may charge a fee, which depends on whether the user is from the academia, a public institution, or from industry. A panel of Experts is being formed over time to help users make the most informed use of resources available through I-STEM.

The Idea of Indian Science Technology and Engineering facilities Map (I-STEM) 💡

The rewarding experience of sharing the sophisticated facilities at CeNSE with researchers from around the country prompted the thought that today's tools of the Web can enable every aspiring researcher in the country to have access to and benefit from R&D facilities which have been established elsewhere through public investment.

The idea of sharing will lead to the growth and promotion of Science and Technology for solving the societal issues.

A big opportunity for Startups, Researchers, and Industries

I-STEM
Linking Researchers and Resources

An Initiative of the Office of the PSA, Govt. of India

Researchers & Resources

https://www.istem.gov.in/

National Agencies
MHRD, CSIR, ICAR, MoHFW
DBT, DST, ICMR, DAE, ISRO, etc.

Circle labels:
- 18 SAIF DST Centre
- 23 IITs
- 31 NITs
- 07 IISERs
- 20 DST Centre
- 399 State Universities
- 29 DAE Res. Centre
- 126 Deemed Universities
- 23 ISRO labs
- 48 Centre Universities
- 50 DRDO labs
- 330 Pvt. Universities
- 38 CSIR labs
- 38051 Colleges

Source: Google website

Status of Researchers & Resources

No. of colleges: 38051
60.48% Colleges are located in Rural Areas
Majority of the Colleges (78%) are privately managed of which 64.7% are privately unaided and 13.3% are privately aided and the remaining 22% are Government Colleges in the country

Students Enrolment (women students 47.59%)
During the academic year 2017-18, there had been 366.42 lakhs (provisional) students enrolled in various courses (Regular & Distance Education Program) at all levels in Universities /Colleges/Stand alone institutions of higher education (AISHE/UGC Report 2017-18)
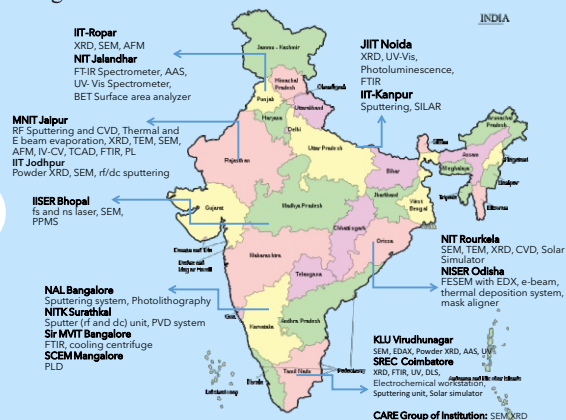
Ph.D/M.Phil Enrolment : 2017-18
(All subjects)
PhD: 1,61,412
M Phil: 34109
Source: UGC Report 2017- 18

Networking and Collaboration

In the current scenario, the higher education institutes (HEIs) are required to promote the networking of R&D resources as well as and collaborative projects for their researchers at each level.Collaborative research can draw on diverse expertise, promote creativity and innovation and therefore lead to scientific breakthroughs.

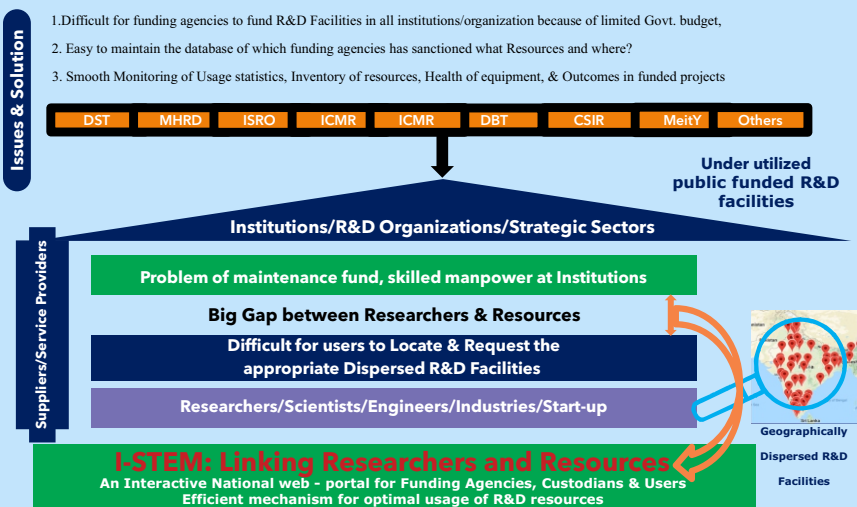### Networking of Research Infrastructure in India

INDIA

IIT-Ropar
XRD, SEM, AFM
NIT Jalandhar
FT-IR Spectrometer, AAS, UV- Vis Spectrometer, BET Surface area analyzer

MNIT Jaipur
RF Sputtering and CVD, Thermal and E beam evaporation, XRD, TEM, SEM, AFM, IV-CV, TCAD, FTIR, PL
IIT Jodhpur
Powder XRD, SEM, rf/dc sputtering

IISER Bhopal
fs and ns laser, SEM, PPMS

NAL Bangalore
Sputtering system, Photolithography
NITK Surathkal
Sputter (rf and dc) unit, PVD system
Sir MVIT Bangalore
FTIR, cooling centrifuge
SCEM Mangalore
PLD

JIIT Noida
XRD, UV-Vis, Photoluminescence, FTIR
IIT-Kanpur
Sputtering, SILAR

NIT Rourkela
SEM, TEM, XRD, CVD, Solar Simulator
NISER Odisha
FESEM with EDX, e-beam, thermal deposition system, mask aligner

KLU Virudhunagar
SEM, EDAX, Powder XRD, AAS, UV
SREC Coimbatore
XRD, FTIR, UV, DLS, Electrochemical workstation, Sputtering unit, Solar simulator

CARE Group of Institution: SEM, XRD

http://www.cense.iisc.ernet.in/
Started in July 2016

Linking and Monitoring of Geographically Dispersed R&D Facilities

There are abundant R&D resources available in India. In the era of the IoT and e-Governance, it is very much required that Govt. agencies have "on hand" up-to-date data of the R&D resources they have funded (or in their ambit), at all times, without any human intervention.

I-STEM addresses this need by connecting Institutions/organizations, and by providing direct access to the outcomes of R&D efforts through the portal. This will enable the formulation of new policies, as well as establishing targets for the growth and promotion of the Science and Technology.

Issues & Solution

1. Difficult for funding agencies to fund R&D Facilities in all institutions/organization because of limited Govt. budget,

2. Easy to maintain the database of which funding agencies has sanctioned what Resources and where?

3. Smooth Monitoring of Usage statistics, Inventory of resources, Health of equipment, & Outcomes in funded projects

| DST | MHRD | ISRO | ICMR | ICMR | DBT | CSIR | MeitY | Others |

Under utilized public funded R&D facilities

Suppliers/Service Providers

Institutions/R&D Organizations/Strategic Sectors

Problem of maintenance fund, skilled manpower at Institutions

Big Gap between Researchers & Resources

Difficult for users to Locate & Request the appropriate Dispersed R&D Facilities

Researchers/Scientists/Engineers/Industries/Start-up

I-STEM: Linking Researchers and Resources
An Interactive National web - portal for Funding Agencies, Custodians & Users
Efficient mechanism for optimal usage of R&D resources

Geographically Dispersed R&D Facilities

Benefits of I-STEM:

- Live, up-to-date Inventory of Eqpt./ Facilities for Custodian Institution
- Transparency in booking/usage statistics of the equipment
- Generation of funds for Maintenance and Manpower support
- So, Eqpt. down time will be reduced, Equipment life will be enhanced
- Empanelment of experts, List of manufacturers, Suppliers/Service Providers - to achieve greater collaboration
- Fruitful research outcomes, more startups may be seeded, Job Opportunities will be created
- Database of Researchers/Scientists on Regional basis will help in addressing Societal Problems
- Young faculty can begin R&D right away, w/o waiting for start-up grants or for their own lab to be set up
- **Capital Expenditure will be reduced, enabling Govt. to support many researchers by providing funds for Consumables/Maintenance, Manpower, Travel, and Contingencies**

Just Think
If the capital cost of **5 TEM's** i.e., Rs. 8 Cr x 5 = **Rs. 40 Cr** is saved,
200 Researchers can be given 3 -year research grants of **Rs. 20 Lakhs** each
(1 Project Assistant -Salary Rs. 9 Lakhs, Contingencies Rs. 5 Lakhs,
Consumables - Rs.5 Lakhs, Travel : Rs. 3 lakhs)

The Mechanics

- CeNSE, IISc, as the Nodal Centre, responsible for operating and maintaining the I-STEM Web Portal with adequate Security
- Registration of Institutions/Organisations
- Registration of Eqpt/ Facility by the Departments/Organisations
- Registration of Faculty-in-Charge/Facility-in-Charge
- Registration of Users/Equipment Technologists/Operators
- Following Registration, User can search and identify required facility, its status, schedule of availability; then make a reservation for using it, get confirmation; make payment, use facility, provide feedback; acknowledge use appropriately, and submit their achievement (Scientific reports publications and patents for citations)

I-STEM Web Portal

- Listing on the Portal mandated by the funding agencies/GoI
- A Searchable Repository of R&D equipment and facilities acquired with public funding, and functioning in various institutions/organisations in the country
- Reservation by External Users to use a desired facility, enabled through the Portal
- Payment, if any, through a Gateway that is already provided on the Portal
- Panel of Experts being formed for Users to consult
- Toll free number to assist Organisations/Custodians/Users
- Mobile access through Android and IoS App
- Awareness Program/Workshop/Conference in different regions of the country to help Users and Custodians of Facilities
- "Microsite" for each Institution/Organisation
- Access to Panel of Experts for consultation
- Forum for interaction among Users (moderated)
- Provision on the Home Page to announce/advertise technical events
- List of Manufacturers, Suppliers, and Service Providers

Security audit of the I-STEM Portal by STQC, MeitY

The National Portal, I-STEM is audited by the STQC (an Organization of MeitY) to ensure that information available on the Portal (database) is secure.
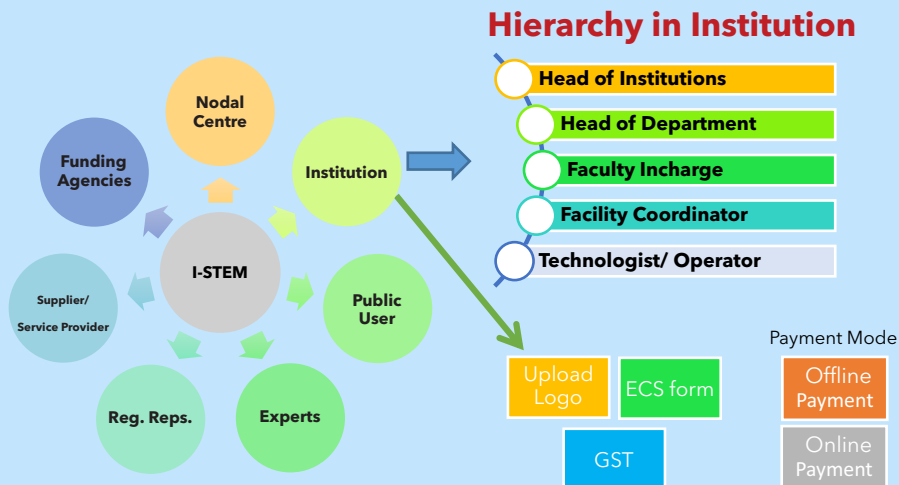
Youtube Video
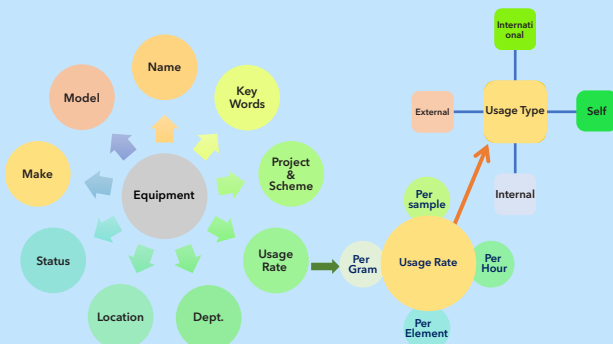
How to make use of the I-STEM portal ?

The I-STEM portal is built with a hierarchy of access – by the Nodal Office, Head of the Institution(custodian), Head of the Department, Faculty-in-charge, Facility-in-charge, and Equipment Operator/Technologist.

I-STEM Web Portal: Registration in Different Role & Activities

Hierarchy in Institution

Head of Institutions

Head of Department

Faculty Incharge

Facility Coordinator

Technologist/ Operator

Nodal Centre

Funding Agencies

Institution

I-STEM

Supplier/ Service Provider

Public User

Reg. Reps.

Experts

Upload Logo

ECS form

GST

Payment Mode

Offline Payment

Online Payment
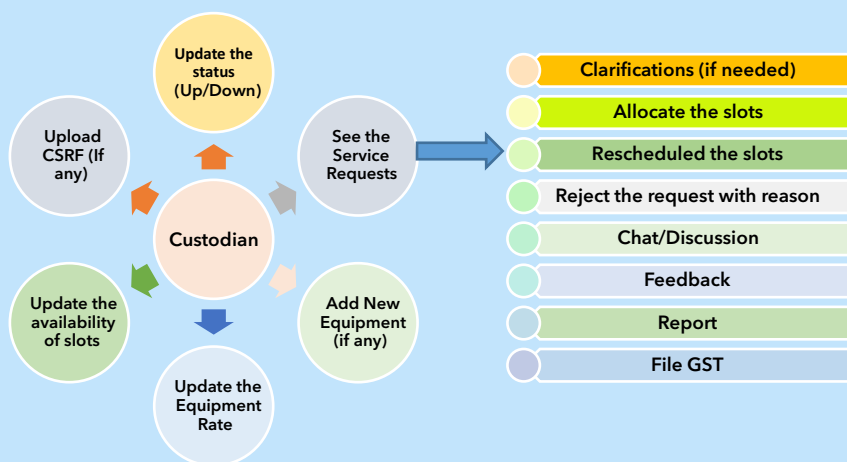
Sharing the Facility Information

Institution may decide the Usage fee (as per UoM) for different categories of the users, including the other charges required to run the facilities. They may also upload instruction such as "how to prepare samples", specific (sample) requirement etc., so that users have all relevant information prior to making a service request.

Name

Key Words

Model

Make

Equipment

Project & Scheme

Status

Usage Rate

Location

Dept.

Per Gram

Usage Rate

Per sample

Per Hour

Per Element

International

External

Usage Type

Self

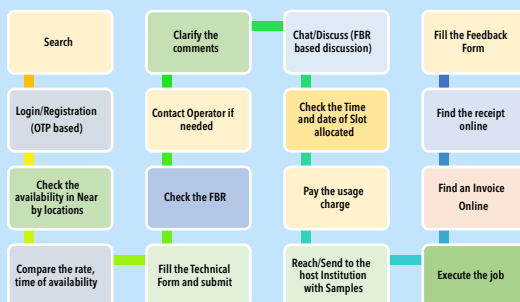Internal

Custodian of Equipment

The Custodian (the Registrar/Head of Dept./Faculty-in-charge/Facility In-charge/Technologist/Operator defined as "custodian") may create login for their subordinates, and admin assistants etc. After execution of a service request, Custodian can keep the record of the usage equipment-wise, user-wise, in addition to generating yearly, monthly, and weekly report on usage statistics and can maintaining the record of the funds received from different sources. Finally, as per the rules of the Income Tax department, they need to file GST of behalf of the Institution.

Custodian Role

Update the status (Up/Down)

Upload CSRF (If any)

See the Service Requests

Custodian

Update the availability of slots

Add New Equipment (if any)

Update the Equipment Rate

Clarifications (if needed)

Allocate the slots

Rescheduled the slots

Reject the request with reason

Chat/Discussion

Feedback

Report

File GST

Guidelines for the Users (Academia & Industry)

Any Research scholar/Student/Scientist/Engineer/Employee of Academia and Industry is defined as a "User".

Search

Clarify the comments

Chat/Discuss (FBR based discussion)

Fill the Feedback Form

Login/Registration (OTP based)

Contact Operator if needed

Check the Time and date of Slot allocated

Find the receipt online

Check the availability in Near by locations

Check the FBR

Pay the usage charge

Find an Invoice Online

Compare the rate, time of availability

Fill the Technical Form and submit

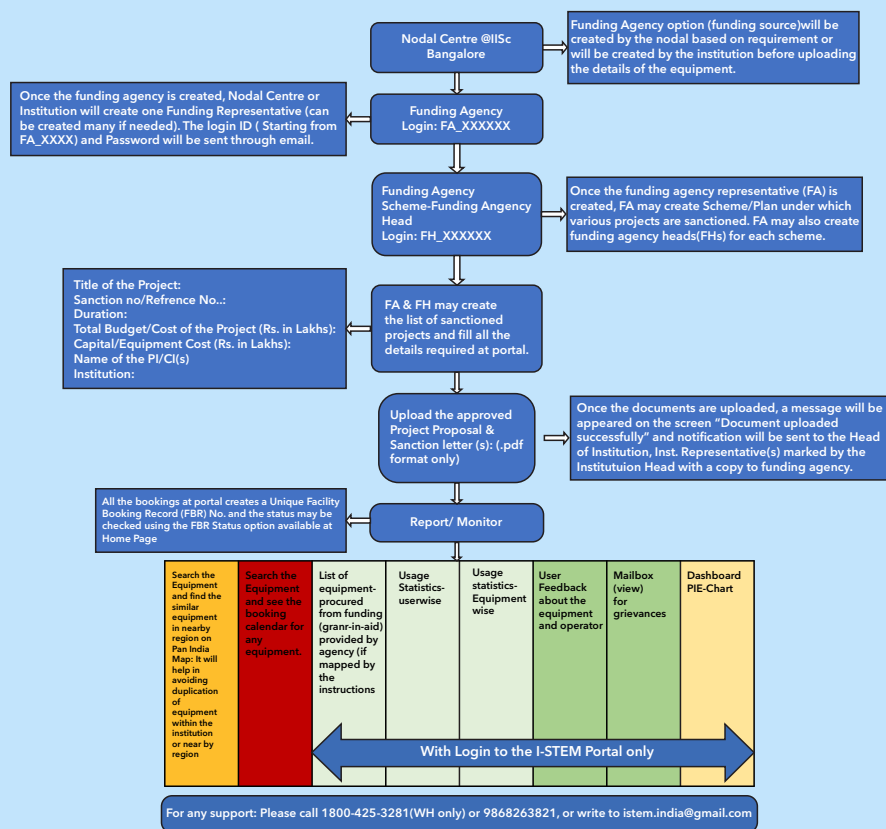Reach/Send to the host Institution with Samples

Execute the job

Submit: Scientific Reports, Patents, Publications for more visibility

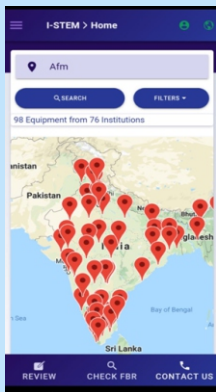# Roles and Activities of Funding Agencies through I-STEM

The provision for funding agencies is available to upload the sanction letter and approved proposal copy to the I-STEM portal, so that I-STEM can link monitoring agencies and Institution.

The I-STEM portal has been designed to provide a Dashboard for GoI funding agencies so that they can (a) obtain a live-inventory of all equipment funded by them; (b) monitor the functional status of the equipment; (c) monitor the usage of equipment both by researchers of the custodian institution and by external researchers.
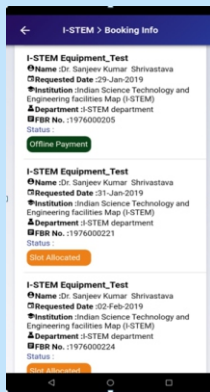
Nodal Centre @IISc Bangalore

Funding Agency option (funding source)will be created by the nodal based on requirement or will be created by the institution before uploading the details of the equipment.

Once the funding agency is created, Nodal Centre or Institution will create one Funding Representative (can be created many if needed). The login ID (Starting from FA_XXXX) and Password will be sent through email.

Funding Agency Login: FA_XXXXXX

Funding Agency Scheme-Funding Angency Head Login: FH_XXXXXX

Once the funding agency representative (FA) is created, FA may create Scheme/Plan under which various projects are sanctioned. FA may also create funding agency heads(FHs) for each scheme.

Title of the Project:
Sanction no/Refrence No..:
Duration:
Total Budget/Cost of the Project (Rs. in Lakhs):
Capital/Equipment Cost (Rs. in Lakhs):
Name of the PI/CI(s)
Institution:

FA & FH may create the list of sanctioned projects and fill all the details required at portal.

Upload the approved Project Proposal & Sanction letter (s): (.pdf format only)

Once the documents are uploaded, a message will be appeared on the screen "Document uploaded successfully" and notification will be sent to the Head of Institution, Inst. Representative(s) marked by the Instituion Head with a copy to funding agency.

All the bookings at portal creates a Unique Facility Booking Record (FBR) No. and the status may be checked using the FBR Status option available at Home Page

Report/ Monitor

Search the Equipment and find the similar equipment in nearby region on Pan India Map: It will help in avoiding duplication of equipment within the institution or near by region	Search the Equipment and see the booking calendar for any equipment.	List of equipment-procured from funding (granr-in-aid) provided by agency (if mapped by the instructions	Usage Statistics-userwise	Usage statistics-Equipment wise	User Feedback about the equipment and operator	Mailbox (view) for grievances	Dashboard PIE-Chart

With Login to the I-STEM Portal only

For any support: Please call 1800-425-3281(WH only) or 9868263821, or write to istem.india@gmail.com

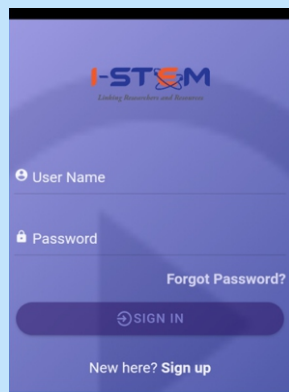## Android/ iOS App "I-STEM" in Play Store
(Search I-STEM IISc)

- Custodian and user friendly Mobile Applications (Android & iOS)
- Search and booking facility for researchers/users
- Monitoring of job requests and allocations of slots for users by custodians
- Users may provide feedback through apps.

SEARCH   SELECT   LOGIN & EXECUTE

Advanced Features of I-STEM Portal

The I-STEM Web Portal, developed entirely indigenously by a team at the Indian Institute of Science (IISc), Bengaluru, is fully functional, has been tested rigorously for security and is certified by an agency approved by the GoI

The I-STEM portal has a Dashboard for the Custodian institution to provide a live inventory of all public-funded equipment in house, the functional status of the same, and the usage and sharing of the equipment. Every custodian and user will have individual login and password,

The I-STEM portal is built with a hierarchy of access – by the Nodal Office, Head of Institution, Head of the Department, Facility-in-charge, and Equipment Operator/Technologist

The facilities/equipment shared by the institutions are carry a specific code

Registered Users can search and locate for the equipment/facility they need and correspond directly with the Operator/Technician to reserve it for use in a mutually convenient manner

There is an option to contact the Operator so that Users may send a message related to the service request the User has made

Each "sharing event" is assigned a unique 10-digit Facility Booking Record, through which a User and the Custodian/Operator are aware of the status of a particular request for sharing a facility. The FBR is "closed" only after the "sharing event" is completed to mutual satisfaction. The FBR makes the process of sharing transparent and fully accounted for

Users will receive the online receipt for the payment s/he has made as well as bills/invoice to enable the parent institution to complete the financial transaction (as per their institution norms)

Users may fill the feedback form on their "experience during the availing the services" through I-STEM.

The portal has made provision for Users to upload project reports, publications, patent filings so as to benefit other Users. Many related features will be available in the near future.

As required on all GoI - related functions, I-STEM has provisions for Grievances to be raised by Users so that Custodian Institutions may address them appropriately.

Press briefing by the PSA, GoI

Empanelment of Experts

The I-STEM portal is built to empanel Experts in various domains of science and technology, from whom Users can seek to plan their work and/or to understand the results obtained. Such consultation will be confidential unless the parties wish to reveal the discussion to the benefit of other Users.

Online Status of Facility Booking Record (FBR)

The following status after the FBR creation can be checked/tracked through the service available as "FBR Status" at:

https://www.istem.gov.in/equipments/bookings/fbr_status

Pending Status, Clarification Required, Slot allocated, Slot Re-scheduled
Offline Payment, Online Payment done, Request Rejected,
Slot cancelled by the use, and FBR executed.

Senior Scientists have said on Setting up I-STEM

- "There is no individual ownership. The nation is the owner of these devices and these should be accessible to all." **- Dr. R. Mashelkar, Former DG, CSIR, NatureAsia: 8thAugust 2019**

- "It has been felt for some time that facilities in our academic institutions and national labs, acquired or established through government funding, should be made available to a wider community through a web portal." **– Dr. R. Chidambaram, Former PSA to the GoI**

- "I-STEM aspires to provide all the researchers access to public-funded facilities." **- Prof. K VijayRaghavan, PSA to the GoI**

- "I urge all institutions and researchers to abide by the Government's mandate to list R&D facilities in their labs, groups, and centres on the I-STEM portal, and to share them for the benefit of all the stakeholders of S&T in the nation." **- Prof. Ashutosh Sharma, Secretary to the Government of India, Department of Science and Technology**

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