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Indian Science, Technology and Engineering facilities Map (I-STEM) - Linking Researchers and Resources:
The New Paradigm in R&D Cooperation

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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 support 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 "inventory of R&D resources", so as to match users with the resources they need, and to do all this in an efficient and transparent manner online through single portal. This can lead to a leap in R&D productivity and greatly enhance the effectiveness of public investment. This will also save a lot the R&D budget and create avenue for the new job opportunities for the Scientific Community. This is the motivation behind the unique I-STEM program, initiated and funded by the Office of the Principal Scientific Adviser to the Govt. of India. I-STEM portal with online booking mechanism has now the need of an hour. Such efficient mechanism through one nation one portal will help every researcher (either from academia or industry) and change the scenario of R&D in coming years.

The I-STEM Web Portal, which will be launched by the Honourable Prime Minister, Govt. of India on 3rd January 2020, is the gateway through which researchers/user can 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 to them the soonest. Through a recent directive of the GoI, institutions that have procured and installed R&D facilities with funding from the agencies of the GoI are now required to list them on the I-STEM Portal (which is regularly updated). Through the I-STEM Portal, a user can make a reservation to use it, as per a mutually convenient schedule. To enable the running and maintenance of the resources, the host organization may prescribe a user fee. The fee, which is paid through a secure online payment gateway, goes directly to the host organization that may help in maintaining the equipment/facilities. A panel of "Domain Experts", to be assembled over time, can be consulted by users (via the portal) to make the most informed use of resources as well as expertise made available through I-STEM. The security of the web portal has been rigorously tested and certified, and will be constantly monitored.

- The idea invented by Dr. Sanjeev Kumar Shrivastava and team, Indian Institute of Science Bangalore, of enabling online access in systematic and transparent way to all public-funded facilities through a single homepage has been chosen as a Transformative Idea and made a part of the 100-days program of the Govt. of India. With the apt theme "*Linking Researchers and Resources*", **the I-STEM portal is in line with the "Make in India, Digital India and Stand-up India" ambitions.**

- The "single login facility" to the unique I-STEM portal is designed to avoid confusion among Users in the academia/industry as well as among Custodian Institutions. It is also designed to be updated constantly with the functional status of facilities and keep a record of their usage. I-STEM is expected

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- to minimise the duplication of efforts and wastage of resources in developing similar portals by the other agencies (if any).

- **The unique I-STEM portal has provision for providing customised dashboards for each Funding Agency and for each Custodian Institution so that they can readily obtain a comprehensive, up-to-date equipment inventory, the functional status of each, equipment usage statistics, outcomes of research, issues that arise if any, etc. The single-login facility to the I-STEM portal (with approved homogenous format for outcomes, such as, reports/publications/patents arises from funded projects) will provide appropriate statistics to the Govt. to enable achieving targeted objectives.**

- <u>**The payment gateway has been tested comprehensively and certified for its security.**</u>

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

- 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.

- The portal has a Dashboard for Regional Representatives too, so that they can have a live inventory of facilities in a region, their status, and their utilization.

- The I-STEM portal has a built-in secure payment gateway so that Users can pay the User Fee directly to the Custodian Institution, which prescribes the Fee to be paid.

- 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.

- Each "sharing event/job request" is assigned a unique 10-digit Facility Booking Record (FBR), such as, IRCTC PNR, 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/job request" 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 claim it with the parent institution (as per their institution norms).

- Users may fill the feedback form on their experience during the availing the services for their research needs.

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

- An Android Mobile App (available on the Google Play Store) has a Search facility; Custodians may also log on to the portal through the Mobile App. The i-OS App will be ready soon.

- 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.

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- A toll-free telephone connection (1800-425-3281) has been established at the Nodal Office so that Users and Custodian Institutions may seek help and clarification.

- 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. About 80 Experts in various domains are now registered on I-STEM.

- A mandate has been issued by MHRD, DST, UGC, and CSIR, and other GoI agencies, to all funded institutions requiring them to list all equipment and facilities procured with public funding on the I-STEM portal and to share them with needy researchers via I-STEM.

- To date, more than 17900 public-funded functioning equipment and facilities installed in nearly 425 organizations in the country have been listed on the I-STEM portal. A list of supplier and service/maintenance provider is available to the users.

- More than 800 researchers have registered themselves on the portal, awaiting the launch of the portal so that they can begin to use facilities shared through I-STEM.

- A PCT (patent) application has been filed to protect the IP generated in the conception and execution of the I-STEM portal. This may further give opportunities to the Govt. to extend the license to other developed and developing countries, who desires to optimise the use of funding for the growth of Science and Technology.

- To protect the distinctive service provided by the I-STEM web portal, the stylized I-STEM logo and the tagline "*Linking Researchers and Resources*", the Indian Patent Office has granted a Registered Trade Mark to the Indian Institute of Science (IISc), Bengaluru, which houses the Nodal Office of I-STEM.

- A Workshop conducted in early 2019 to receive feedback and input on the I-STEM portal from Public/Custodian Institutions was used to "tweak" the features of the portal to make them more useful. Such "tweaking" has also been done by obtaining feedback from prospective Users from around the country. The portal is being continually upgraded.

- Consistent with the objectives and goals of the I-STEM portal, the Office of the PSA has drafted guidelines for the web-based transparent sharing of public-funded R&D facilities, and circulated them to a number of relevant GoI ministries and agencies. The feedback received so far is strongly supportive of the I-STEM initiative

- Recognising the potential of the I-STEM initiative, various national newspapers have published articles on I-STEM over the last eighteen months. In August 2019, NatureAsia published a very positive report on I-STEM.

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Future Scope

The initiation of I-STEM has laid the groundwork for shared public funded R&D infrastructure. The next step is to leverage this equipment and researcher pool in the country to strengthen S&T research targeted towards commercial technology/product development in collaboration with industry. This will be done by inviting technology/product development requirements from industry and handholding with the institutions having domain experts and scientific equipment/tools to undertake the research activity. This will help industry to find the right people and institution to collaborate for solving their technological problems. I-STEM, with its database of infrastructure facilities, will facilitate this industry-academia collaboration effectively. A financial model built upon facility user charges and consultancy charges can be evolved to sustain I-STEM activity. This will be particularly helpful for the small start-up companies with innovative ideas to carry out development and commercialization of new products based on advanced technology. This will also help domestic industry to avoid significant upfront expenditure on R&D to develop products, an effort which the industry in this country generally avoids due to its high risk and fear of failure. Thus, I-STEM can become a "national nodal tool" for commercial product development in academic institutions for domestic industry, a culture that is so far not very prevalent in India.

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