Report of the Peer Review Committee for IIT Madras

Constituted by the Chairman, IIT Council

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Review Schedule; 12th May to 14th May 2014

High-level Observations

The Peer Review Committee would like to place on record its sincere appreciation of the positive alignment towards the aspirational goal of becoming a World Class Institution. This is reflected in the leadership, the work culture and environment at IIT Madras.

There are of course challenges towards achieving these aspirational goals. The Peer Review committee has made detailed observations based on the Terms of Reference, which are summarized in this report. A few examples to illustrate this:

a. Physical Infrastructure

- Achieving IIT's stated goal of transformation into a world-class research institution will require additional infrastructure. Present constraints in building construction are going to severely slow down IITs infrastructure development. Many academic and research buildings are old and outdated. For example, it would have been wiser to construct a brand new building for micro-fabrication (clean rooms) rather than retrofit an existing old building. Present plan of retrofitting the old labs for clean rooms will pose problem for continued growth in the near future. Many advanced laboratories need clean spaces with central air conditioning. There is also an international trend to build laboratories in an open format to allow many teams to work together in a common area. These buildings should also include many meeting rooms to facilitate and encourage discussions.
- A second campus should certainly be considered. Ease of mobility between the two campuses should be ensured, taking the local traffic, present and future, into consideration. A well-planned advanced research campus that meets international standards is a must for propelling IIT into becoming a global leader in high quality research and innovation.

b. Research Career Paths for Senior Faculty

- It is an excellent idea to initiate higher ranks for exceptional professors. Creating something similar to Regents Professor rank is an excellent idea. In addition, other distinctions such as Institute Professor, Professor of Eminence, Excellence Research Chairs, Research Chairs, Industrial Research Chairs, etc. also are attractive. IIT should also start endowed chairs funded by private citizens, alumni, and industry.
- The post of Professor of Practice for industrial researchers with years of experience who would like to start an academic career at IIT can attract many highly qualified scientists with industrial experience.
- The Committee was very happy to see the inclination of the Senior faculty members to participate in the larger purpose of the Institute. This must be encouraged, and will enhance a sense of ownership and pride so necessary for the transformation from an Institute to Institution.

c. Attracting and Building World Class Talent

- Attracting exceptional foreign students to IIT campus will bring international flavor to the research atmosphere at IITM. These students should have the same fee structure as the Indian students.
- Attending international conference by the faculty should be encouraged. However, it should not be an entitlement. Instead, funding for such travel should be on a competitive basis. For example, Keynote talks, invited talks, and contributed talks in major international conferences should be given priority.
- Access to major international journals can be obtained through a consortium arrangement to decrease the cost
- Attracting foreign post-docs to the IIT campus can enrich the research atmosphere.
- Research scholars and post-docs should be compensated adequately to reflect the cost of living and inflation.

Detailed Observations based on Terms of Reference

1) Performance of the Institute with reference to the charter specified in the Sarkar Committee Report and other IIT system review committee reports of 1972, 1986, and 2004, and most recently, the Kakodkar Committee Report of 2012

The performance of the Indian Institute of Technology Madras (IITM), is in keeping with its Charter according to the Sarkar Committee Report and the IIT system review committee reports of 1972, 1986, and 2004. With reference to the Kakodkar committee report of 2012, a detailed action plan, with 34 specific action items, is being implemented. Of these, 13 are in progress, 1 is near complete, and 5 are completed. The remaining recommendations are under consideration by the IIT Council.

While it is laudable that the institution has performed in a manner in keeping with its Charter and all the subsequent reports, with a goal toward being an institutional asset to India and a source of undergraduate students that are second to none, it has not yet achieved its potential to be a world-class research institution. It is heartening to note that appropriate measures are being taken in this regard by the recruitment of both faculty and graduate students of high caliber and the development of the necessary infrastructural facilities. Efforts are presently underway to promote a culture of excellence in research by initiating many new academic programs and multiple new research centers.

However, there should be no complacency in this regard and due vigilance should be exercised to ensure that IITM becomes a world-class research institution.

2) *Performance of the Institute with respect to its own Strategic Plan for the past decade*

IITM seems to be following the strategic plan that it has laid out for itself. It is definitely meeting its goal with regard to addressing the technological needs of the nation by being the first institution to put into place a research park that incubates and nurtures technology start-ups as well as providing research support for established industrial companies, and by producing well trained engineers that meet the needs of industry and educational institutions in the country.

The goal of becoming a global top 50 in all the disciplines is in progress with many departments already achieving that ranking. Unlike the demonstrated excellence in UG education, excellence in PG education and research is still lagging behind. PG education should be strengthened by incorporating emerging areas that are interdisciplinary in nature, for example nanoscience and engineering, nanomanufacturing, digital manufacturing, etc.

Several new research activities of strategic importance to the nation in areas of emerging technology such as biotechnology, nanotechnology, clean water development technology, energy, telecommunications, etc. have been put into place that are world class, in keeping with the strategic plan.

Many challenges to execution have been identified – higher quality physical infrastructure like buildings and research facilities, improvement of safety facilities and culture, faculty numbers in general, and quality faculty in specific areas, systematic participation of industry and alumni in the activities and plans of the institute.

3) *Review of the goals outlined in the Strategic Plan for the next decade, and adequacy of the strategies proposed to meet them*

The institution has outlined an ambitious strategic plan with 12 specific target areas for 2014-2020. The goals that have been outlined in the plan are achievable and good groundwork has been laid towards achieving the same. The institute leadership may like to explicitly articulate and include an 'audacious' goal in an explicit way in the strategic plan. It will also be a good practice to apply tools like Risk Analysis, Theory of Constraints or others, to identify the likely risks and constraints to the plan. The top-level issues are known, like Quality and Quantity of Faculty and Research Students, Availability of Facilities, the enabling culture and leadership – but some of the more subtle linkages could be discovered through a more formal exercise.

It is necessary to pay careful attention to certain issues that can become impediments to implementing the strategic plan, the most important ones being lack of space and the inadequacy of infrastructure that needs to be put into place in order to realize the goals.

One possible serious obstacle is the lack of building space and the resulting constraints with regard to the construction of new buildings for state-of-the-art laboratories and research facilities. The strategy of a satellite campus could greatly alleviate the scarcity of space, but this has to be carried out with some sense of urgency. The specific strategic plan on expanding the campus facilities either on the existing campus (e.g. by growing vertically) or in the proposed satellite campus has to be carefully created and implemented.

Adequate thought seems to have been given to the recruitment and retainment of faculty, the raising of funds for supporting the activities of faculty and students, development of research initiatives in emerging areas and international collaborative research programs, facilities to improve the teaching skills such as the faculty development center for learning, initiating joint doctoral programs with other international institutions and student exchange programmes, being an international leader in the development of distance learning, etc.

IIT should make every effort to make its graduate education to achieve the same quality as its excellent undergraduate education program. Masters and doctoral programs should be focused more on innovation. Research by IIT Masters students should be made into a priority by allowing more time for research.

The institute may like to consider strategic leadership focus on brand building, Human Resources Development as well as Regulatory compliance management. On a more tactical note, the institute must build strong and scaled-up international linkages with the global academic community through visits, sabbaticals, post-doctoral programs, semesters-abroad and conferences.

4) ***The performance of the academic departments in light of the review reports, the Action Planned, and the Strategic Plan's objectives. Academic course programmes, quantity and quality of research, doctoral programme, industrial consulting, and engagement with entrepreneurship are to be assessed***

An overall positive academic climate exists at IIT Madras, and the areas for improvement identified in different reviews are being worked on in a positive mindset. A noteworthy 'Best Practice' is the creation and adoption of a formal document on 'Faculty Performance – What do we Expect from Ourselves', and several forums for mentoring and guiding young faculty. Availability of seed grants and incubation grants are good practices to foster entrepreneurship.

The positive aspect with regard to the performance of the academic departments is that in all of them the recruitment of both faculty and students is ever improving.

On the academic front, the Institute may like to motivate more cross-disciplinary interactions and forums to discover opportunities for joint research, e.g. Mathematics, Computer Science, Chemistry, Physics, Management Studies and other departments could actively participate and contribute to the work of other departments and centers.

By and large, there seems to be a reasonable balance between the research activities and industrial consulting. Academic course programmes that are in place have been well thought through. However, in view of the new breakthroughs being made in science and technology, there is a need to constantly reassess the course programmes and make additions and deletions. A review committee for each of the programmes should meet regularly and make annual recommendations to the appropriate Dean.

Individual faculty member ought to decide whether he/she should engage in industrial consulting and entrepreneurship or in fundamental research. It is not for the institution to impose its views on the faculty member. Whatever the decision might be, the work should be of the highest quality.

Care should be taken to ensure industrial consulting does not degenerate into making IIT Madras laboratories cheap testing facilities for industrial corporations. A lot of routine certifications are being carried out which while bringing in a lot of money to the Institution do not in any manner enhance the reputation of the institution. Also, some of the consulting can be passed off as being service to the nation, but such service can be provided by lesser engineering institutions. The faculty at IIT Madras should pursue research at the highest level, whether it is fundamental work or industrial consulting.

On the entrepreneurship and industrialization end of the spectrum – the institute may like to study formal methods for transitioning basic research to applied or translational research, to commercialization. Many such methodologies exist, and most of them have strong ecosystem partnerships, going beyond conventional technology transfer and IP licensing.

5) The strategy of the Institute with respect to quantitative and qualitative growth in funded research, industrial consulting, IP generation and commercialization

Unlike other institutions of higher learning in the United States and elsewhere, the Indian Institutes of Technology have a national mission and obligation. Thus, their strategy towards research, industrial consulting, IP generation and commercialization are somewhat different. However, being an institution of higher learning, IIT Madras has to recognize that it will be judged by how it fares against peer institutions the world over. Thus, it has to ensure that its growth as a research institution is consonant with those of the best institutions elsewhere. While facilities like the Research Park are excellent support facilities for technology

development, it is imperative that there is equal emphasis placed on the development of the scientific backbone of such technological development and the various research initiatives that the institution is taking with regard to research in emerging areas is a good start which needs to be built upon.

There is good institutional support for collaboration in terms of MoUs, legal frameworks and IPR support. Some of the recent innovations like a Social-Media, like interface into IITM Research, are positive steps. The strategic plan for 2020 is well thought out and feasible.

As the institute scales the extent of funded research and industry consulting, it will be important to define different models for IP ownership, commercialization methods, and exchange of human resource. IITM should look at its internal expertise and also take external help from its ecosystem like Alumni and existing partners to define these models.

It will also be important to create the human resource for the life cycle of Research to Commercialization. The current model of 'Research Staff' of around 1000 people on a super-numerary, temporary basis may not scale well, and IITM will need to develop the capability in faculty and students towards this.

6) Technology development of relevance to national priorities, both strategic and societal, and thought leadership at national level

IIT Madras is taking a leadership role in the development of the technological needs of the nation. The IITM Research Park is a prime example of IIT Madras' leadership role. Several needs of the nation with regard to energy, telecommunications, biotechnology, etc., have been addressed by developing state-of-the-art centres in combustion, non-destructive testing, tire research, photonics, clean water technology, nanotechnology, biotechnology, preservation of heritage structures, etc. Other initiatives like the 'Visionary Leadership in Manufacturing', NPTEL, QEEE, MOOCs are aligned with the national agenda for human capability building. The development of NPTEL is not just a national resource but is proving to be a global resource and a tremendous source of global recognition. NPTEL is also developing distance learning technology around the Coursebuilder MOOC platform which has the potential to revolutionize distance learning. As mentioned previously, the quality of research should not be sacrificed for the sake of research that has societal relevance.

Areas of improvement include an overall strategic view of the areas where IITM chooses to make an impact at the National Level, and guidance, governance and support processes to ensure the success of the initiative. Some of the missions need to have strong internal and external linkages – for example, all the initiatives related to education and capability building

could achieve a lot more in a coordinated manner. The policy centers (China studies, Technology and Policy) need a lot more internal and external linkages and visibility.

Another aspect of 'Thought Leadership' is individual recognition through awards – this has been recognized and many faculty are being nominated as well as are winning national awards. Alumni are an important component of this as well, and while the Distinguished Alumnus award is there at an Institute level, there should be a process to identify and publicize alumni achievements in a more systematic manner.

7) State and adequacy of infrastructure, and plans for expansion/ upgradation

The institute's strategic plan 2014-2020 seems to be a well thought document that addresses how the institute will approach the infrastructural needs to keep up with upgradation and expansion.

Many new facilities have come up at the institute, including new centers, hostels, sports and recreation facilities, and the IITM Research Park. By and large, these are of good quality – the new Computer Center is world class in its ambience and facilities. There is good intent to put in access for disabled people, and a focus on safety. The areas for immediate improvement, like some fire and safety constraints in the older buildings, maintenance quality of the current and older buildings have been recognized.

The longer-term challenges that need some attention are on the specific plans for the satellite campus. While a satellite campus can go a long way towards providing vital space for expansion and creating an excellent ambience for advanced multi-disciplinary teaching and research, specific steps need to be taken to run the two campuses such that they function as one organic entity. At the same time, the new campus should not merely be an add-on, but must attempt focus to provide infrastructure to a few selected areas where the present situation is sub-critical and where substantial impact can be made by IITM. Lessons from recent examples like IIM Ahmedabad, Cambridge University and Imperial College have to be examined. An Alternative plan e.g. vertical growth on the existing campus should be kept ready – many urban universities like NYU, University of Toronto, University of Southern California have adopted this method. IIT Madras should look at how such institutions manage the space that they have as well as add a satellite campus to ameliorate the problems that arise from lack of space.

Also, significant funds have to be raised to set up new research facilities in emerging areas and upgradation of the library, hostel, hospital, cafeterias, and various other facilities for the faculty and students. Also, given the conditions in Chennai, an effective means of climate-control in indoor spaces could be a viable research challenge!

Some of the buildings are in very poor condition and need immediate attention. Many buildings are old. Continued maintenance appears to be lacking. The quality of the

construction is also poor as there is a general lack of paying attention to the fine details. Precision in construction is very poor. Focus appears to be in the functional aspect rather than perfection. It is practically impossible to instill a precision oriented thinking in design and engineering when the surroundings are far from it. In general precision and quality of research are affected by the general ambiance and expectations. To become a world-class research institution, IITM should change the thinking.

Despite the presence of many custodial staff, the cleanliness of the place is very poor. This is partly due to the lack of appropriate cleaning tools and methods, and lack of training for custodial staff. It looks like expectations from custodial and maintenance staff is minimal. ***Better maintenance and upkeep of the facilities such as the toilets, hostel cafeterias, as well as the buildings and the grounds will provide a positive image of the institution.***

8) Academic culture, Learning environment, ambience and opportunities for multi-dimensional growth for UG, PG and research scholars

The Peer Review Committee had multiple interactions with the student community, in formal presentation and discussion sessions, informal interactions over dinner, visits to the hostels, sports and recreation facilities, and the Innovation center. There was also a formal presentation on the 'MITR' initiative for mentoring of students at the leadership meeting.

The academic culture and learning environment are very conducive to the growth of the UG, PG and research scholars. IIT Madras has always had an excellent learning environment for UGs. The development of the numerous research centres and the Research Park, and the hiring of faculty that have been trained in the best universities abroad, will create a learning environment in which PG and research scholars can thrive. The student involvement in the innovation center (C-Phi) and the IITMSAT projects is laudable. The IIT Honour Code is a 'best practice' as are the avenues to participate in social and societal initiatives. Exchange programmes with top-notch foreign institutions which IIT Madras is putting into place will also enhance the intellectual experience of UG, PG and research scholars.

Given the strategic directions of the IIT System towards more post-graduate and Research students, the quality and extent of support for student activities will need to adapt. The ambience at the IIT campus should be converted into that which promotes creativity. There should be more places for faculty and students to engage in discussions, for example more coffee places, places with white boards, etc. Facilities that are conducive for casual discussions among students and faculty members will ultimately improve the research culture at the IITM. More events like the Research Scholar day at the recent 'Shastra' festival will be needed. Unlike UG students, the academic profiles of PG and Research Students tends to be much more department or lab-centric, so more avenues for cross-discipline interaction should be defined and implemented. More support for semesters abroad, conference travel, post-

doctoral programs, industry internships and sabbaticals are being looked at – this is not just a fund-raising challenge but also needs sustained relationships. Alumni could help in both these aspects.

Masters program at the IIT needs to be more research oriented and research activity should last at least two semesters. This will create Master's graduates who are well-trained research. Peer-reviewed publication from Masters students should be encouraged. Inter-departmental collaborations should be encouraged. There exist many opportunities at the interface between conventional disciplines.

Special scholarships, honors and awards to recognize student achievement would also improve the ambience.

There seems to be a latent desire among UG students to explore multiple disciplines or a change in discipline. This could be based on the fact that "they discover themselves" after reaching the IIT campus and the consequent varied exposure. This needs to be considered carefully and channelized through mentorship, guidance and possible academic or administrative changes.

9) Quality of library infrastructure and services

While great strides have been made in improving the library infrastructure it is far from being on par with the facilities available at top academic institutions abroad. Funds have to be raised to improve the library facilities. Access should be provided to more journals, not just journals from the dominant publishing houses. Also, journals that are not necessarily in engineering but related areas including medicine should be made available, especially in view of the efforts being made in biotechnology.

Data on usage of library system shows a lot of positives – the quality and quantity of physical and electronic content is very good. The usage statistics are very good – an average of 3-4 electronic download and nearly one physical visit per week, per student or faculty. Coupled with the facilities in the department libraries, it is clear that these facilities are adequate in meeting the academic and research need of students and faculty.

Two suggestions of a generic nature: One related to building the culture to read broader journals like Nature, Science – helps in inter-disciplinary thinking. The other on more content in Indian languages – could the library become the focal point for 'crowd-sourced translation' projects?

10) Quality and diversity of Job placement of students

Based on anecdotal evidence the undergraduate students are being very well-placed. The committee was not able to get a clear picture concerning the quality and diversity of job placements of the students.

In general, the perception of placement at IITM, like many other IITs and IIMs, is on the 'salary package'. The institute is doing well from a percentage of placement perspective, as well as the 'popular benchmarks' like the top salary offers, with the peer group. The institute is also putting in measures to improve the value to PG and Research students with career and non-curricular counseling.

A generic suggestion for improvement would be related to strategic shift in the placement process, from mentoring, establishing the right value systems in students, developing role models through alumni interactions, encouraging entrepreneurship, and contacting potential employers, to the improving the actual placement exercise. A focused effort in this area involving students, faculty, alumni and potential employers will enable IITM to set new benchmarks.

11) Quality and rate of faculty recruitment, coverage of emerging areas, career growth and performance assessment

Over the past fifteen years, the hiring of faculty has been steadily improving with outstanding candidates being hired from the best institutions the world over. It is also reassuring to note that the young faculty members that have been hired from within India are performing as well as those that have been hired from abroad. While the environment in IIT Madras is a nurturing one for young faculty, it needs to be streamlined and a clear mentoring procedure. Young faculty need to be informed about their progress in a timely manner. The faculty should be made aware of the annual assessment procedure, norms for evaluation, feedback mechanisms, etc.

The overall culture for mentoring and nurturing new faculty is in place, with senior and award-winning faculty (e.g. Bhatnagar awardees) playing a significant role. Awards and recognition for young faculty, for both teaching and research, as well as avenues for entrepreneurship through the IITM Research Park, and industrial consulting and sponsored research through IC&SR are all positives. The range of new areas covered by young faculty could be the seeds for new research centers in the future – like Rainfall prediction, Venture finance, social responsibility, Composites and materials, Biomaterials and Biomimetics, Self assembly of macro molecules, Public policy and gender equality.

IITM is in an extremely competitive marketplace, with not just other peer Indian Institutions, but with a global scope – companies, universities and research institutions are all vying for the same talent pool. The institute will need to innovate constantly – for example, dual appointments with Industry for faculty with international credentials, short-to-medium term

sabbatical arrangements with partnering institutions, adjunct and visiting professorships especially with star alumni, will all need to be examined and applied on a case to case basis.

A systemic intervention, in the form of a formal HR function to assist the leadership and academic departments with the entire process, will need to be seriously considered. This will need to be focused on not just the talent acquisition phase, but the entire life cycle of talent management, rewards and recognition, talent retention and knowledge transfer. The Department of Management Studies is likely to have the expertise to set up this function.

12) Career paths and growth opportunities for non-teaching staff, efficiency of staff deployment in technical and ministerial cadres, performance evaluation

The comments of the non-technical staff during the meeting with the review committee suggest that they are pleased with their treatment and the growth opportunities that are available to them.

The HR processes for non-teaching staff, and actual implementation of these processes seem to be in excellent shape. Informal interactions with the non-teaching staff indicate a lot of pride and sense of engagement with the job, and a sense of belonging to the institute. This is very laudable.

The effort to improve the self-development culture and deployment is a positive step. Adherence to all governmental norms for affirmative action are in place.

From an improvement perspective, the institute may like to continually benchmark its HR processes with other institutions and continue the culture of continuous improvement. The institute may also like to consider ways by which the Project Staff, who are hired for R&D roles in sponsored and industrial research projects, are looked at as a source of long term talent for either Research, or for support functions. As of now, they seem to be outside of any formal HR governance.

13) Governance structures, administrative efficiency, automation, quality assessment, transparency in decision making, procurement, infrastructure development and public disclosure

The governance structures that are in place seem adequate. The meetings with the Registrar and her team give cause to conclude that the efficiency of their functioning has been enhanced by the various decision processes that have been set in place. There seem to be no immediate concerns, and the structures, processes, systems are satisfactory. Service levels to internal stakeholders are being put in place, and good monitoring will ensure that the quality improves in each area. Informal benchmarking with peer institutions is in place, and IITM is seen to be in a good position.

At a systemic level, there seems to be a large volume of statutory as well as legal and compliance requirements, that take up a large amount of time, energy and resources from the senior leadership, especially the Director, Deans and Registrar. For example there are a large number of court cases at various levels including 3 with the Supreme Court, and a fairly large number of interactions with the statutory bodies, local bodies, RTI queries and so on.

Improvements could be made to the governance of the institution by setting up a team to specifically attend to the numerous legal issues that seem to be plaguing the institution. Also, a team needs to be assigned to look into public relations issues that can preempt some of the problems of perception that seems to have dogged the institute, for example the bad press with respect to student suicides, etc. In this context, the psychiatric and psychological counselling that is made available to students, faculty and staff can be strengthened considerably.

14) Financial planning and resource mobilization apart from grant-in-aid

The financial planning and resource mobilization procedures are well thought out. The principles of the financial planning and resource mobilization are sound. The execution steps, to generate resources from multiple sources like R&D, teaching, contributions and grants, alumni and other sources are well thought out, and a lot of personal focus is seen at the leadership level.

However, as the Director and Deans recognize, much more can be done to garner funding from alumni, Philanthropists, and Corporations for buildings, laboratories, endowments for chairs and professorships, scholarships and awards for students, travel awards for both faculty and students, etc. The Dean in charge of alumni affairs is on top of things and is in contact with counterparts at US institutions to learn how they raise money for their institutions.
The only systemic suggestion which can be made, is to apply some lateral thinking – e.g. with the expertise in different departments and centers especially management studies, as well as active alumni and possibly student involvement, in refining and fine-tuning the process as well as its execution. A constant quest for setting the benchmarks in the India context will be a useful feature to instill.

15) State of incubation and strategy for growth

Adequate thought has been given to support faculty and students who may wish to incubate new ventures, with finances, facilities and some mentorship. The plan is to double the number of incubated companies from the current number of around 10 per year, in the next 3-5 years. External stakeholder outreach through collaboration with an Alumni venture (SmartKonexion) is being rolled out. Other peer institutions in India are in touch to absorb the best practices at IITM.

The visit to the IITM Research Park included a visit to some of the IITM Incubator, and an overview of some of the Incubated companies. This is good evidence on the ground that the culture of entrepreneurship is being fostered. The IIT Incubator now works as a nodal body for entrepreneurship at IITM, and collaborates with existing incubators like RTBI, c-Tides, Bio incubator, as well as with student bodies like CFI, and IC&SR. There are 30 companies in the incubator, 24 of these are in IITMRP. Faculty startups including Gyan data, Dhvani Research, Unilumen photonics, as well as Student startups - Grad labs, Hyperverge, Pibeam labs, Alumni startups and externals with faculty collaboration are trying to make a mark. The goal is to create a blockbuster incubated company in the future, which is laudable.

As a systemic learning, the Incubation function should benchmark itself with similar set-ups in countries like Canada, Finland and the US and UK. The critical success factor is to find the right mix of technology, business and market guidance, finance, infrastructure and reach to the target market – not many institutions succeed! The help of the extensive entrepreneurial and corporate expertise in the alumni community could be a positive catalyst.

16) Status of Research Park and strategy for leveraging it

The Research Park is the first of its kind institution which other IITs are trying to emulate. There is a very clear strategy in place to leverage it. There was an extensive visit to the facility and to different types of occupants including startups as well as corporate labs.

From a systemic perspective, IITM RP will provide a great platform for Incubation, Entrepreneurship and interaction with the Industry Research ecosystem for students and faculty. The model is being pioneered in India, and should be fine-tuned with care to Indian conditions. The collective experience of similar parks in other institutions as they come up, should be used as a valuable source of learning.

A second building that is coming up is already completely spoken for with multi-national corporations like M/s Saint Gobain taking a major stake. The Research Park is a facilitator and catalyst for incubating small businesses as well as start up by students and faculty not only from IIT Madras but other institution as well.

17) Intensity of international linkages with universities and bilateral exchange of students and faculty

The Dean for International and Alumni Relations made a detailed presentation on the plans and status of the international linkages with Universities. A good platform has been established with a large number of bilateral MoUs (45 signed in 2013, nearly 100 are now active). The number of inbound students has shown healthy growth, from around 90 a year in

2011 and 2012, to over 120 in 2013. The number of outbound students is still comparatively low, at around 20 in 2013. Funding is clearly a constraint.

However, true linkage is achieved not by signing MOUs between institutions but by fostering research collaboration and student and faculty exchange programs between the participating institutions. It is heartening to note that IIT Madras encourages its faculty and students to go abroad to participate in research collaborations and attend international meetings and workshops, by making funds easily available. More students and faculty should be encouraged to participate in such programs. The recent initiative to grant joint Ph.Ds with international universities is a good start that needs to be built upon.

From a systemic perspective, the top-down support for international linkages with international institutions is an important enabler, but a lot of bottom-up culture building, alignment of interest, and finally financial support is required to achieve quality and scale. Multi-lateral collaboration support and funding exists in many countries like Canada, and also the European Union, to help foster this. IITM could actively engage with such mechanisms.

18) Breadth and depth of alumni relations, and linkages with alumni and their organizations

The Dean for International and Alumni Relations made a detailed presentation on the plans and status of the linkages with alumni. As it happens, all the members of the Peer Review Committee are IIT Distinguished Alumni (3 from IITM and 1 from IITD) and have first hand external knowledge of the functioning of the Alumni Relations office.

The processes for relationship building with Alumni are well designed and are demonstrably doing a good job. Outreach using social media (a mobile app is coming), a student managed blog is active. An Annual giving report has been published. Several alumni interactions, alumni day, DA day, department wise PG reunions, and the Alumni leadership lecture series are being organized regularly.

There is clearly a sense of belonging and linkage to the alma mater. Having said that, only around 60% of the alumni are formally registered with the Institute, which has to be remedied. The involvement of Alumni in different new activities of the institute, like Professors of Practice, Entrepreneurship and Incubation, mentoring initiatives for students, Research collaborations through IC&SR as well as IITM RP can be made explicit part of the agenda of interaction, in addition to fund-raising.

While there is good linkage in place it could be strengthened further by having a professional staff employed to keep in contact with alumni as in institutions in the United States. Usually the alumni relations office is staffed by professionals who are experts at fund raising. While a Dean could be ex-officio head of such efforts it should be left to professionals to handle such affairs.

19) Fund Raising and Growth Plan for Institute's Endowment

Fund raising efforts are new to Indian academic institutions. The goal of having a corpus of 500 crores, in comparison to what exists presently is a good start, but it is nowhere near the type of corpus necessary to fund infrastructural needs and faculty research initiation grants if IIT Madras is to be a global competitor.

While it is impossible even in the long term to compete with the likes of Harvard (endowment of 180000 crores; 33 billion dollars) or Stanford (endowment of Rs.110000 crores; 18 billion dollars), it is necessary to think along the lines of eventually raising a corpus of Rs.1500 crores. Such a corpus would be a fifth to a tenth of world class engineering schools such as Carnegie-Mellon and Lehigh (private universities) and University of California, Berkeley and Georgia Tech (State Universities).

20) Outreach, both terms of educational offerings to industry and the community, and in terms of publicizing the research and achievements of the Institute

The discussions with the Directors and the Deans indicate that they recognize the need to publicize the research and educational achievements of the institute. They also recognize that while a good start has been made with regard to this a great deal more needs to be done. A good start has been made in the conventional media, and also the social media. The I&AR team is targeting the academic community in India and overseas, and specific communities like Alumni as the first ones on the outreach agenda. IC&SR, IITM RP are helping to reach out to Industry. Nationally visible centers and projects also help substantially in the outreach as well as brand building, as do individual awards. Mechanisms and examples for all of these are visible.

Ecosystem connect is a important aspect of the overall brand of the institution. Many leading global peers now have formal functions at the leadership level to work on the strategy and implementation, and invest substantially in all aspects of this initiative. All means of communication – physical or face-to-face, conventional media, social media are systematically used for the outreach. Effectiveness is measured directly by metrics like quality and quantity of research collaboration, funding, 'soft power' to attract faculty and students, and so on. IITM may like to consider this as part of the strategy.

A full- fledged team has to be in place to constantly publicize the achievements of the faculty and students. Newspapers, Television Networks, alumni both in India and overseas, possible donors and philanthropic foundations, Companies, Parents of Students, and Peer Institutions nationally and internationally, should be recipients of such information.

IITM should have plan a strong PR department like that in the US and Canadian institutions. Public perception is very important in gathering public and political support. Arranging tours for politicians, journalists, industry leaders are very important in publicizing excellent research accomplishments. One such example is Unit of Excellence on Clean Water. This is a national need. Press release from this center is well recognized in the west. It is also important to note that this center is also producing large number of high quality publications in prestigious journals. IITM PR department should publicize seminal publications by IITM faculty and point out the importance of such scientific discoveries through local media. This is a common practice in the west.

Mr.Bhaskar Bhat

Mr.K.Ananth Krishnan

Dr.P.R.Vasudeva Rao

Prof.K.R.Rajagopal

Prof.Thomas Thundat

Appendix-1

Terms of Reference to the Peer Review Committee defined by the Board of Governors of IIT Madras

1. Performance of the Institute with reference to the charter specified in the Sarkar Committee Report and other IIT system review committee reports of 1972, 1986, and 2004, and most recently, the Kakodkar Committee Report of 2012.
2. Performance of the Institute with respect to its own Strategic Plan for the past decade.
3. Review of the goals outlined in the Strategic Plan for the next decade, and adequacy of the strategies proposed to meet them.
4. The performance of the academic departments in light of the review reports, the Action Planned, and the Strategic Plan's objectives. Academic course programmes, quantity and quality of research, doctoral programme, industrial consulting, and engagement with entrepreneurship are to be assessed.
5. The strategy of the Institute with respect to quantitative and qualitative growth in funded research, industrial consulting, IP generation and commercialization.
6. Technology development of relevance to national priorities, both strategic and societal, and thought leadership at national level.
7. State and adequacy of infrastructure, and plans for expansion/ upgradation
8. Academic culture, Learning environment, ambience and opportunities for multi-dimensional growth for UG, PG and research scholars
9. Quality of library infrastructure and services.
10. Quality and diversity of Job placement of students
11. Quality and rate of faculty recruitment, coverage of emerging areas, career growth and performance assessment
12. Career paths and growth opportunities for non-teaching staff, efficiency of staff deployment in technical and ministerial cadres, performance evaluation
13. Governance structures, administrative efficiency, automation, quality assessment, transparency in decision making, procurement, infrastructure development and public disclosure.
14. Financial planning and resource mobilization apart from grant-in-aid.
15. State of incubation and strategy for growth.
16. Status of Research Park and strategy for leveraging it.
17. Intensity of international linkages with universities and bilateral exchange of students and faculty.
18. Breadth and depth of alumni relations, and linkages with alumni and their organizations.
19. Fund Raising and Growth Plan for Institute's Endowment.
20. Outreach, both terms of educational offerings to industry and the community, and in terms of publicizing the research and achievements of the Institute.

Appendix-2

Agenda for Institute Peer Review: 12-5-2014 to 14-5-2014

Day-1: 12.5.2014

12.00 noon	Meeting of the peer review committee members		BEGH Ground Floor Lounge
1.00 pm	Lunch: Review committee members with Director, Deans and Registrar		BEGH
2.30 pm	Presentation of Strategic Plan for 2014-2020 (Board Room) Director Dean (Planning) Dean (ICSR) Dean (IAR)	2.30 pm to 3.30 pm 3.30 pm to 3.45 pm 3.45 pm to 4.10 pm 4.10 pm to 4.30 pm Discussion	Board Room
5.00 pm	Meeting with Heads of the Department to discuss departmental reviews and action plan (all the Deans and HoDs and Fellows of academies to be present) AE/AM/BT/CH CY/CE/CS/ED EE/HSS/MA/MS/ ME/MME/OE/PH General discussions	5.00 pm to 5.30 pm 5.30 pm to 6.00 pm 6.00 pm to 6.30 pm 6.30 pm to 7.00 pm 7.00 pm to 7.30 pm	ICSR Hall-II
7.30 pm	Dinner: Review committee members with Director, Deans, Registrar, HoDs, Fellows of National academies		ICSR Dining Hall

Appendix-2

Day-2: 13.5.2014

9.00 am	Visit to i) National Centre for Combustion R& D ii) Centre for Non-Destructive Evaluation iii) RS center for excellence for Tyre and vehicle mechanics iv) PGS Centre for Computing Resources v) Centre for NEMS & Nano-Photonics	09.00 am to 09.15 am 09.25 am to 09.40 am 09.50 am to 10.05 am 10.15 am to 10.25 am 10.35 am to 10.50 am	
11.00 am	Tea	ICSR Dining Hall	
11.15 am	Meeting with YFRA and research awardees: V. Kamakoti, C. Balaji, Sanjay Kumar, S.R Chakravarthy, Nagendra Krishnapura, A. Thillai Rajan, HSN Murthy, Anuradha Banerjee, Nitin Chandra Choodan, C.S.Shankar Ram, M.Pattabiraman, N.V.Ravikumar, Ashwin Mahalingam, Deepa Venkatesh, Edamanaa Prasad, A. Arockiarajan, Boby George, Madhulika Dixit, K. Kalpana, A.N. Rajagopalan, R.I. Sujith, Sundargopal Ghosh, Devdas Menon	Dean (AR)- very brief outline about awards 1 minute introduction by each faculty highlighting their teaching and research activities discussion	ICSR Hall-II
12.15 pm	Presentations on unique research centres/programmes: i. China study centre: Sonika Gupta ii. Centre for Technology and Policy V.R.Muraleedharan ii. Visionary leadership in Manufacturing:Venkatesh B /TT.Narendran v. User-oriented MTech programmes: K.Ramamurthy v. National Centre for Heritage Structures: Arun Menon	12.15 pm to 12.25 pm 12.35 pm to 12.45 pm 12.45 pm to 12.55 pm 12.55 pm to 01.05 pm 01.05 pm to 01.15 pm	ICSR Hall-II
1.30 pm	Lunch		BEGH
2.30 pm	Meeting with Registrar, Deputy registrars, CSO and CMO, workflow Presentation on Administrative initiatives: Ms.Bhooma Workflow: Anil Prabhakar/Koshy	2.30 pm to 2.50 pm 2.50 pm to 3.10 pm	ICSR Hall-II
3.30 pm	Online education programmes i) NPTEL/NKN : Mangala Sundar Krishnan/Pratap Haridoss ii) QEEE: Uma Jalapathi/ G.Venkatesh iii) MOOC: Shankar Balachandran iv) TLC: Ajit Kumar Kolar/Edamana Prasad	3.30 pm to 3.40 pm 3.40 pm to 3.50 pm 3.50 pm to 4.00 pm 4.00 pm to 4.10 pm	ICSR Hall-II
4.30 pm	Visit to Sabarmathi hostel: EU/General Secretary Himalaya mess: HAS/CCW/Dean(S) – (**Tea)** Swimming pool: Sports Sec Indoor stadium: Sports Sec/captains/ Dean (S) Centre for innovation: Co-curricular Sec/Advisor	4.35 pm to 5.40 pm 4.45 pm to 5.10 pm 5.15 pm to 5.20 pm 5.25 pm to 5.30 pm 5.35 pm to 6.00 pm	
6.00 pm	Discussion among peer review committee members	6.00 pm to 6.30 pm	
6.30 pm	Meeting with students' representatives, students/scholars with high academic record: Presentations by Secretaries: Co-curricular; Cultural; sports; AAS; RAS; IAR; To be present: Dean (S), Advisors- Sports, co-curricular, Cultural; MiTr		ICSR Hall-II
8.00 pm	Dinner with students' representatives		ICSR dining hall

Appendix-2

Day-3: 14.5.2014

8.00 am	Breakfast meeting with Bhatnagar Awardees: Ashok Jhunjunwala, Y.Shanti Pavan, Chandrakumar, B.S.Murty		BEGH
9.00 am	Visit to i) Centre for Decentalised Power Systems ii) Nano-Functional Materials Technology Centre (NFMTC) iii) TUE on Water technology: T.Pradep iv) National centre for Catalysis Research v) GFRG building:	09.00 am to 09.20 am 09.30 am to 09.50 am 09.55 am to 10.15 am 10.20 am to 10.35 am 10.40 am to 10.55 am	
11.00 am	Visit to IITM Research Park 11:00 – 11:20 Presentation on Research Park by Ashok Jhunjhunwala 11:20 – 11:30 Invention Labs (incubate) 11:30 – 11:40 Uniphore (incubate) 11:40 – 11:50 Vortex (incubate) 11:50 – 12:00 Renault Nissan 12:00 – 12:20 Healthcare Technology Innovation Centre 12:20 – 12:30 Titan 12:35 – 12:45 Rural Technology and Business Incubator presentation by Suma Prashant 12:45 - 12:55 IITM Incubation Cell presentation by Tamaswati 12:55 - 13:20 Phasor, Ether, Skillveri (incubates) 12:20 - Discussion and lunch		IITM RP
1.30 pm	Lunch at IITM RP		IITM RP
2.15 pm	Presentation of MITr initiatives Any specific visit/meeting requested by the peer review committee Meeting with Deans and Director	02.15 pm to 02.30 pm	Board Room
3.00 pm	Discussion among peer review committee members		Board Room
5.00 pm	Closure meeting with Director		

Appendix-3

List of Documents provided to the Peer Review committee

i) Terms of Reference for the Peer Review committee
ii) Report of the Kakodkar Committee: https://www.iitsystem.ac.in/admin/Review-Reports.jsp
iii) Terms of reference to the Departmental peer review committees
iv) Reports of the 16 Departmental peer review committees (DPC)
v) Proposed action plan on the reports of DPC submitted by the academic departments
vi) Brochures of Departments, Research centres and IITM Research park
vii)
viii) Background Documents: Reports of earlier IIT review committee reports (Rama Rao Committee; Nayudamma committee; Sarkar committee)

Important statistics /Data

1. Curriculum and Courses offered
i. Range of degrees and disciplines
ii. Yearly-sanctioned intake for Various programs
iii. Programme-wise students/scholars on roll
iv) Periodicity of curriculum review at both UG and PG level
v) Mechanism for program review at the UG and PG level
vi) Course work mandated for MS (by Research) and Ph.D Scholars & average courses done
vii) Student Placements (Through office of Placement)
2. Teaching environment
a) Department-wise distribution of faculty, students and research scholars
b) Results of Teacher-Course Feedback for theory and Laboratory courses
c) Number of students who were motivated to opt for careers in engineering / science / technology sectors. Based on available data, for at least last five years.
d) Iinfrastructure, teaching labs and equipment, for example, by assessing the average number of students per experiment I core courses.
e) Modernization of libraries: extent of electronic accessibility to library resources
f) Students' workshops/tinkering labs to students so that they may pursue their own ideas
g) Feedback from employers in science/engineering sectors.
h) Internal assessment reports of departments and centres. These reports should have been discussed at length in institute's senate
3. Research and Development
a. Range of research activities: (i) Volume, (ii) Breadth
b. Publications per faculty / masters / Ph.D student
c. Average number of citation per department/centre/school
d. Number of papers with citations that are more than the average number of citations of the journal in which they are published.
e. Other major research contributions: Technology developed/technology transferred/patents filed/patents obtained/etc.0
f. Recognitions & Awards (national/international) to faculty/research scholars/students

4. R&D Environment
a. Average time that it takes a new faculty to set up lab:
b. Retention of faculty
c. Consultancy and project money from non-internal sources.
d. Research grants / seed money from internal savings of the institute to young faculty / post-doctoral fellows/Post graduate students
e.Rresearch infrastructure, labs and equipment
f. Number and competence of research and technical assistants/officers/engineers
g.Number of large interdisciplinary research projects
h. Workspace for PhD scholars
i.Number of international conferences/workshops attended by a Ph.D
j. Number of papers with Ph.D students as first author
k. Number of M.Tech and MS scholars who were motivated to motivated for pursuing Ph.Ds
l. Number of post-doctoral scholars hired in the institute
m. Number of international students as PhDs / Post-doctoral scholars
n. Visiting researcher programs: Strength/extent of engagement measured e.g., by
(i) Number of international visiting reseachers who stay for at least a week = 20
(ii) Number of courses / workshops / conferences with international participation
5. External Stakeholder Engagement
A. Industry Collaboration
a. Number of PhD/Masters thesis directly linked to/funded by industrial projects
b. Total income from industry sponsored projects
c. Technology transfer / adopted by labs, industry
c. IPR and Patents
e. Curriculum development initiatives for industry
B) Contribution to National Development Goals/Priorities
a. Number of nationally research projects, e.g., in sectors of defence, medicine, environment, energy, health, infrastructures, etc.
b. Policy Inputs/Consultancies
C. Social Responsibility
a. Community Relevant Projects, Social Outreach
b. Sensitiveness to on-campus labour / environment / energy / water / land issues
c. Environment / Energy / Water / Land / Employment impact on local communities
D. Alumni Engagement(academic/publicity/policy/growth)
6. Vision for the future
7. Systems for recognition / awards
8. Infrastructure development, right from requirements to planning to execution
Sensitivity and eco-friendlyness of the infrastructure to the campus and surrounding environment (land / water / energy / greenery)
9. Diversity
Gender Diversity in Administrative and technical staff
Gender Diversity in faculty
Gender-diversity in students and research scholars
Current state of international diversity: