Strategic Plan
2014–2020

IIT Madras

INDIAN INSTITUTE OF TECHNOLOGY MADRAS

Graduands' Pledge

We the graduates and post-graduates of the Indian Institute of Technology Madras, hereby pledge that we shall, in thought, word and deed ever endeavour to be scrupulously honest in the discharge of our duties, that in all circumstances, we shall uphold the dignity and integrity of our profession and the honour of our Institute and the nation and that we shall devote all our energies to promote the unity and secular ideal of our country and utilise our knowledge in the service of our nation and society

Saha naavavatu, saha nau bhunaktu saha veeryam karavavahai tejasvi, nauadheetamastu, maa vidvishaavahai

Om shanthi, shanthi, shanthihi

Contents

Executive Summary

The first five IITs were established in the 1950s and 1960s on the basis of the recommendations of a committee headed by Sir Nalini Ranjan Sarkar. The committee recommended that a programme of higher technical education and research in India be pushed forward. The committee suggested that higher technical institutions along the model of the Massachusetts Institute of Technology be established in the country. Over the years, the IITs have gained widespread recognition as institutions of excellence. The achievements of IIT alumni in science and technology, academics, enterprise and other fields are notable. The IITs have a special status as Institutes of National Importance under the Indian Institute of Technology Act.

IIT Madras was established in 1959 with assistance from West Germany. In the beginning 10 departments were set up. It was initially planned that 300 students would be admitted annually to five-year undergraduate courses. Facilities were planned for admitting 500 students each year to M.Sc., M.Tech. and Ph.D. programmes, and a student population of 2000 was envisaged. The campus was to be fully residential for students and the academic staff. The campus came up in a forested site of about 633 acres which was offered by Madras State. Today the Institute has well over 8000 students enrolled in 16 departments offering B.Tech., M.Tech., M.Sc., M.S., M.B.A., M.A. and Ph.D. degrees.

Since the establishment of IIT Madras, India's population has grown considerably. The country's economic environment has changed, and industry has developed. There have been global changes as well, particularly in the new millennium, such as redefinition of political boundaries in Europe and Asia, an explosive growth in the use of the personal computer, outsourcing of service and manufacturing activities and the development of the Internet. All these changes have led to a redefinition of the role of technology in India. Under the circumstances of change, the IITs have been reviewed periodically—most recently, the IITs were reviewed in 2010 by a committee headed by Dr. Anil Kakodkar.

In 1996, IIT Madras set up a Strategic Planning Committee, and the Board instituted the Strategic Management Project to build up internal capability for change. The project consisted of a series of coordinated interventions to bring about changes in the Institute's direction, structure, interfaces and performance. A strategic plan, outlining recommendations and action plans for implementing the strategy, was drawn up. Subsequently, as part of the planning cycle, the strategic plan has been reviewed and revised at intervals.

The broad goals of Strategic Plan 2014–2020 are an affirmation of IIT Madras' commitment to excellence in research and education, and the Strategic Plan consequently focuses on these core themes. The Strategic Plan enunciates IIT Madras' aim of being recognised as a global leader in research and education.

IIT Madras seeks to attract the best students from diverse backgrounds and offer them an excellent educational experience. It offers more flexibility and choice to the students in the academic programmes, an inviting and stimulating ambience for education and research, and a rich suite of extra- and co-curricular activities. Personality development, life-skills and career planning will be a part of the holistic development.

The Strategic Plan seeks to leverage the strengths that IIT Madras has developed over the past five decades and to build upon them and acquire or develop new strengths. In particular, the Strategic Plan proposes to nurture the large groups of faculty working on transformational technologies that have the potential to address the societal challenges faced in India today—specifically in areas such as water, energy, healthcare, housing and education. It outlines steps to increase the quality and quantity of research output through an increase in research intensity, faculty strength, Ph.D. student enrolment, infrastructure, engagement with industry

and international collaborations. The Strategic Plan envisages a doubling (with reference to 2014 levels) in sponsored research levels and a focus on life-cycle management of intellectual property. It seeks to make the IIT Madras Research Park, which is the first of its kind in the country, a force multiplier in this effort. It envisions the creation of a rich incubation ecosystem at the Research Park that will enable entrepreneurship and value creation from the research and innovations at IIT Madras.

In appreciation of the unique natural heritage of the IIT Madras campus, the Strategic Plan ensures the sustainability of the sylvan beauty and biodiversity.

Strategic Plan 2014–2020 identifies the following broad targets:

- Become a leading technological university, ranked in the global top 50 in all disciplines

- Become as renowned for postgraduate education and research as for the flagship undergraduate programme

- Earn the recognition among students and research scholars that IIT Madras is a 'happening' campus

- Establish a track record as a creator of new and innovative technologies for industrial and national needs

- Become known globally for transformational technologies that impact lives of people

- Incubate successful start-ups creating innovative products and business models using the knowledge and technologies developed by the Institute

- Build the IIT Madras Research Park up to its full capacity and create a world-class ecosystem for collaborative research with industry and for incubation

- Provide an invigorating work environment for faculty and staff, where merit and hard work are recognised and rewarded

- Be a model university campus in terms of sustainability, usage of energy and water and recycling of materials

- Be an institute that is sought for international collaborations leading to exchange of students and faculty and joint degree programmes

- Intensify the involvement of alumni in all aspects of the Institute's development—interacting with students, mentoring incubatees, contributing resources towards enhancing the facilities and quality of education, collaborating with faculty members in research and development.
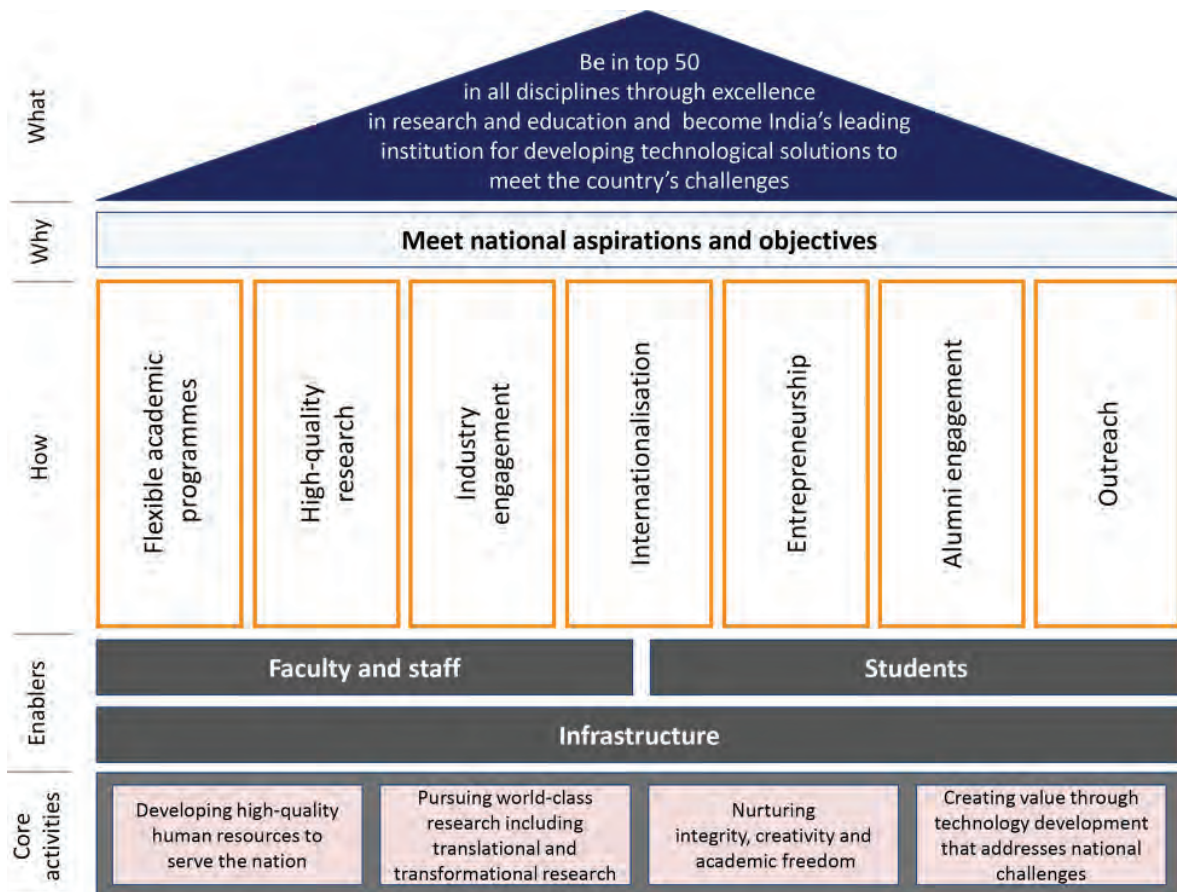
Outgoing Chairman's Foreword

There is only one educational brand from India, namely IIT, which is known globally. IIT Madras occupies a pivotal position on many counts. We all know that Technology is a key factor in promoting rapid economic, all-inclusive growth. IIT Madras is contributing in several ways to the intellectual and financial wealth of India. IITs, through an act of Parliament, created a new trajectory for higher technical education in India, based on a rigorous all-India entrance examination for admissions. This ensured the brightest students from all over India and significantly contributed to national integration. This, coupled with an accomplished faculty, created a formidable combination to usher in high-quality technical education.

IIT Madras has done well on practically all parameters based on its rigorous undergraduate and postgraduate education. In recent years, thanks to an all-India initiative of the MHRD, the strength of postgraduate students at IITs has exceeded the number of undergraduate students. Further, the number of doctorates has taken a quantum leap, and before the end of this decade, IIT Madras will graduate over 400 doctorates each year.

The initiative of the MHRD to increase the intake of undergraduate students has led to a very substantial rise in the number of residents on the campus, and IIT Madras has adapted itself creditably to cope with this massive upsurge. Further, the recruitment to enhance the number of faculty members has been handled well. IIT Madras has made its mark in the social sciences too.

A number of awards, memberships of professional societies, memberships of editorial boards, etc. have been achieved by the faculty, which speaks well of the Institute. The record of publication in leading technical journals is impressive, and scholarly writing of monographs and books is also commendable. A striking feature of IIT Madras has been the translation of quality academic research into products for the marketplace. The pioneering effort of creating a research park is now bearing fruit and is considered as a role model for Indian institutions.

We now live in the age of the Internet, Facebook, etc., and IIT Madras has moved with the times. IIT Madras boasts of a verdant atmosphere and is probably the only institution in India to have such a rich biodiversity on its campus.

In our fast-changing world, IIT Madras will have to cope with meticulous mentoring of undergraduate students and attract foreign students for undergraduate and postgraduate courses and, more importantly, for doctoral studies. It has become necessary to create a corpus of at least ₹500 crores to start with and to scale it to ₹2000 crores in due course. The interaction with alumni is commendable and needs to be pursued more effectively and vigorously to realise a substantial corpus. It will be most desirable to attract more women faculty members.

IIT Madras has launched its Strategic Plan for 2014–2020, which is laudable, and I wish the Institute a great future with a fervent appeal to accomplish the objectives of this Plan.

Prof. M.M. Sharma

Chairman's Foreword

IIT Madras boasts of a long legacy, but what has remained and will remain constant is its focus on excellence and innovation in research and education. The Strategic Plan aims at providing IIT Madras a vision and direction for the next few years and strategizes collective efforts to realize the plan. The vision for IIT Madras laid out by Strategic Plan 2014–2020 is to be in the top 50 in all disciplines, by being a global leader in research and education, which will benefit society around us and the environment. The key pillars that will help IIT Madras achieve this vision are course programmes, research, engagement with industry, internationalisation and entrepreneurial activity.

Through this plan, IIT Madras aims to offer a wider spectrum of courses with improved flexibility in order to meet the various education and R&D interests. In terms of its research capabilities, IIT Madras will incubate globally recognized Centres of Excellence and nurture best-in-class research capabilities that cater to the technology needs of the nation. Industry and academia engagement is also a key pillar where IIT Madras plans to increase engagement with various industries through sponsored research, consultancy and collaboration to encourage 'idea-to-product' transformation. IIT Madras also plans to annually increase its exchange faculty and scholar strength to encourage learning and collaboration on a global platform. Another key focus for IIT Madras is to incubate 'blockbuster' companies that will create high-value intellectual property. True to its heritage, IIT Madras aims to consistently provide and sustain an invigorating work environment that fosters a culture of excellence, innovation and entrepreneurship.

Through the strategic road map, the Institute is committed to nurturing its dedicated faculty and aspiring students as well as investing in best-in-class infrastructure and facilities. These tenets of the Strategic Plan 2014–2020 are driven by IIT Madras' core principles of developing human resources to serve the nation, recognizing teaching as a unifying activity, nurturing integrity, creativity and academic freedom and retaining a willingness to experiment with new paradigms.

Modern India has a strong need for robust and innovative technology solutions, be it to improve the quality of life or to be on a par with global standards. Given the growing expectations and complexities, IIT Madras will face the challenges in meeting this plan. However, Strategic Plan 2014–2020 has been thought through well, and keeping in mind the Institute's robust ecosystem and dedicated team, I am confident that IIT Madras will make rapid progress towards achieving its vision.

Dr. Pawan Goenka

Director's Perspective

IIT Madras undertook a comprehensive planning exercise starting in the late 1990s that led to Strategic Plan 2003–2010. Several working groups from within the Institute developed the Plan with the assistance of experts from outside. This exercise, which involved a large cross section of the faculty, had the benefit of focusing our minds on the years ahead and helped us develop clarity regarding our objectives. Most of Vision 2010 as outlined in the Plan was successfully accomplished, well before the end of the decade.

Taking a cue from this experience, IIT Madras launched in 2011 the exercise for developing the Strategic Plan for the next decade. This Plan was developed in the context of the capacity expansion of the Institute by 54 percent, mandated by the Government of India in 2008 and the Kakodkar Committee Report, accepted by the IIT Council in 2011.

Given this setting, the broad objectives for the next decade were clear before us. These included the creation of the requisite infrastructure for the expansion, increasing the faculty strength and increasing the number of Ph.D. scholars and the research output. These goals needed to be formulated in a manner that builds on the strengths of IIT Madras and the aspirations of the faculty, staff and students. In particular, aspects unique to IIT Madras, such as the IIT Madras Research Park, the strong linkages with industry, the incubation ecosystem and the large groups working on transformational technologies that impact people's lives, needed to be leveraged.

This Strategic Plan was developed by creating a broad template, wich was discussed in town hall-style meetings and then evolved to its final form on the basis of the inputs from all the stakeholders. The Plan was then presented to the Board of Governors and our Distinguished Alumni to obtain their feedback. The culmination of these efforts is presented in this document.

I wish to thank the Deans—Profs. K. Ramamurthy, S.K. Das, L.S. Ganesh, R. Nagarajan, R.D. Koilpillai, Krishnan Balasubramanian and P. Sriram—and the Registrar, Ms V.G. Bhooma, for their untiring efforts in compiling the Strategic Plan. I also wish to thank our Board of Governors, Distinguished Alumni, faculty and staff for their valuable inputs. I am very grateful to our former Director Prof. M.S. Ananth for his painstaking perusal of the draft and valuable suggestions. Finally, I wish to thank our alumnus Mr. Kumaran Sathasivam for creating the text version of the Plan and the final document.

The Strategic Plan 2014–2020 document will serve the purpose of aligning all the stakeholders of the Institute towards a set of common goals so that the sum total of our efforts and achievements is much more than our individual contributions. I trust that IIT Madras will become the pride of our nation and that each one of us will enjoy the satisfaction that comes from doing our part to enable our Institute to achieve its rightful place among the best in India and the world.

Prof. Bhaskar Ramamurthi

Section 1:   Preamble

1.1   Historical Background

The origin of the Indian Institutes of Technology (IITs) has been traced back to 1943, when World War II had still not ended. That year saw the arrest of the advance of the Axis forces after they suffered defeats to the Allied troops in various battles. With an Allied victory being sensed, Britain looked ahead and made post-war reconstruction plans for India.

India was primarily an agricultural country then, with her industrial activity (in the widely understood sense of the term) restricted mostly to the production of textiles.

The Secretary of State for India wrote to the President of the British Royal Society, enquiring whether Professor A.V. Hill (a Secretary of the Royal Society and a Nobel laureate) could be spared to advise on the 'organisation of scientific research'. Professor Hill came to India and visited various cities between November 1943 and April 1944, the arrangements being made by the Department of Education, Health and Lands. In August 1944, he submitted a report titled *Scientific Research in India* to the Government of India. He declared that the development of Indian agriculture and industry would depend on a 'supply of first-class technical brains, trained in an atmosphere both of original research and of practical experience'. He recommended that one or two technical institutes 'of the highest possible standing' be developed or founded to provide this supply. He identified the Massachusetts Institute of Technology as an institution that excelled in teaching and research and possessed the best equipment, with nothing comparable in the United Kingdom.

Members of the Viceroy's Executive Council were aware of Professor Hill's report and appreciated the author's perception of the future prosperity of India depending on technology.

One of these members, Sir Ardeshir Dalal, proposed the setting up of the Council of Scientific and Industrial Research. He conceived of Indian institutions that would train the technologists who would man the council's laboratories. Sir Ardeshir died young, having been on the Viceroy's Executive Council for less than two years, and did not see his vision fulfilled. But in 1946, Dr. Humayun Kabir, an educationist of the Government of India, appointed a committee for creating an institution of higher technical learning. He made Sir Nalini Ranjan Sarkar, who had himself been on the Viceroy's Executive Council previously, the chairman of the committee.

The interim report of the Sarkar Committee formed the basis on which the first five IITs were set up.

1.2   The Sarkar Committee's Recommendations

The Sarkar Committee outlined the need for establishing one or more IITs (although the committee did not use the term 'IIT'): "In view of the certainty of an appreciable increase in the demand for higher specialists in Industry, a rapid expansion in the facilities of higher Technical Education is a pressing necessity. It is evident that apart from any other considerations, the calls of reconstruction in Europe and elsewhere, and the enormous industrial and Government undertakings contemplated in Europe and America to provide full employment, will make it difficult, if not impossible, to secure from abroad, the services of the right type of engineers, architects, technologists and planners, etc. to carry out India's post-war projects. The initiation of a programme of higher technical education and research in India should therefore be pushed forward with the utmost speed and determination."

The Sarkar Committee was of the opinion that the existing facilities for higher technical education in India were inadequate. The committee considered the situation to be extremely urgent. The key recommendation of the committee was the establishment of "higher technical institutions in the Eastern, Western, Northern, and Southern regions of the country along the model of the Massachusetts Institute of Technology."

In accordance with the recommendations of the Sarkar Committee, the first IIT was established at Kharagpur in 1951. The next four IITs were established at Bombay (1958), Madras (1959), Kanpur (1959) and Delhi (1961).

1.3 Institutions of Excellence

Over the years, the IITs have gained widespread recognition as institutions of excellence. This is particularly reflected in the extent to which IIT graduates are valued by academia and industry, and the recognition has come in various forms. For instance, IITs take the top positions in the nationwide rankings of engineering colleges. They are also listed in international rankings, finding their place easily among the top 100 engineering and technology institutions. The achievements of IIT alumni in science and technology, academics, government and entrepreneurial ventures are notable.

The success of the IITs has been attributed to factors such as the procedure for the admission of students, the stringent process for the recruitment of faculty members and the autonomy of the IITs in academic matters.

Officially, IITs have a special status as Institutes of National Importance under the Institutes of Technology Act.

The commitment of IITs to excellence is enshrined in IIT Madras' vision statement:

To be an academic institution in dynamic equilibrium with its social, ecological and economic environment, striving continuously for excellence in education, research and technological service to the nation.

1.4 IIT Madras

IIT Madras was established in 1959 with assistance from the Federal Republic of Germany. This assistance was received in three forms: (1) services of German professors and foremen, (2) training of Indian teachers in Germany and (3) technical equipment.

At its inception, the facilities and equipment of IIT Madras were the best available in the country at the time, and they were comparable with those in Germany.

In the beginning, it was decided to set up 10 departments: (1) Civil Engineering, (2) Mechanical Engineering, (3) Electrical Engineering, (4) Chemical Engineering, (5) Metallurgy, (6) Physics, (7) Chemistry, (8) Mathematics, (9) Applied Mechanics and (10) Humanities and Social Sciences. Three hundred students would be admitted each year to the five-year degree courses leading to the degree of Bachelor of Technology. Facilities were to be provided for admitting 500 students each year to M.Sc., M.Tech. and Ph.D. programmes. A student population of 2000 was envisaged. The campus would be a fully residential set-up for all the students and the academic staff. It was planned that the instructional buildings would have a total area of 8,00,000 square feet and that there would be 10 hostels for students. Staff quarters that could accommodate 1100 persons were to be provided.

Madras State offered a site measuring about 633 acres, falling partly within the reserve forest at Guindy and partly within a few villages nearby. There were no buildings on the campus when the first batch of students was admitted. So the new IIT functioned out of institutions around the campus, such as the Central Leather Research Institute and A.C. College of Technology. The initial phase of construction started, and in July 1961, IIT Madras shifted to its own campus. Facilities such as a shopping centre, post office, bank, primary school, dispensary and open air theatre came up. In 1963 the staff of the Institute moved into the campus.

In 1959, IIT Madras had started with the first batch of 120 students. In a few years' time, the post-graduate courses and research work started. The number of students admitted each year increased gradually.

As a result of capacity expansion by 54 percent beginning 2008, IIT Madras today has well over 8000 students enrolled in 16 departments offering B.Tech., M.Tech., M.Sc., M.S., M.B.A., M.A. and Ph.D. degrees.

The four other IITs that were established in the 1950s and 1960s have also grown correspondingly. Subsequently, IITs were created in 1994 (Guwahati) and 2001 (Roorkee). Nine more IITs were created in 2008, 2009 and 2013.

1.5 Changing Environment

The growth of IIT Madras has been in response to the national and global changes taking place over the five decades since the Institute was established.

India's population has grown rapidly. It was 389 million in 1941, and it grew by 50 per cent over the next three decades, becoming 550 million in 1971. In another 30 years, it almost doubled, becoming

1 billion in May 2000. The implications for technological education are obvious.

India's economy, which was very tightly regulated for many years after Independence, has also changed. In 1985, the Union budget sought to remove some controls. Measures were taken to increase production and improve competitiveness. Industry grew at a healthy rate in the latter half of the 1980s. In 1991, following the foreign exchange reserves crisis, various changes were introduced that represented a significant departure from past policies. As a result, economic growth over the next decade was significantly greater compared with 20 years earlier.

The most significant growth was in the services sector, with most of the contributions coming from the software industry. This industry grew even faster in the first decade of the new millennium. To provide an indicative figure, it was absorbing 50,000 fresh engineering graduates each year during that period. Notably, much of the expansion took place as a result of exports. In 2004, for example, exports were worth $13 billion, up from $6.3 billion in 2000 and a mere $100 million in 1990. The ascent of the software sector in India cannot be explained without referring to changes that took place across the globe towards the end of the 20th century and in the early 21st century.

These changes led to a new phase of globalisation in terms of commerce, wherein all competitors enjoyed equal opportunity. Among these changes are a redefinition of political boundaries in Europe and Asia, an explosive growth in the use of the personal computer, outsourcing of service and manufacturing activities and the development of the Internet.

All these have led to a redefinition of the role of technology in India. Given these circumstances, the IITs have been reviewed periodically.

1.6 Reviews

The first review was in the 1970s, with each IIT being reviewed separately. IIT Madras was reviewed in 1971 under the chairmanship of Professor P.L. Bhatnagar.

In 1986, all the IITs were jointly reviewed by a committee chaired by Dr. Y. Nayudamma. Among the key findings and recommendations of the Nayudamma Committee were that (1) the IITs were producing B.Tech. graduates of excellent quality, comparable with the best in the world; (2) the impact of the IITs on national development needed to be improved; (3) the IITs needed to make a conscious attempt to excel in research and improve their interaction with industry; and (4) the optimum campus size of an IIT was 2500 students.

In 2004, the IITs were reviewed, jointly again, by a committee chaired by Dr. Rama Rao. The committee recommended that (1) provisions be made to induct foreign nationals as faculty members; (2) research be enhanced by identifying challenges and problems, recruiting bright B.Tech. students into the Ph.D. programme and providing incentives for achievements in research; (3) the science and humanities content in the B.Tech. programme be enhanced and business-centric projects be encouraged; (4) innovation be promoted and dedicated intellectual property (IP) management centres be established; (5) linkages be forged with industry through initiatives such as joint research projects supported by industry funds; and (6) the B.Tech. intake be increased.

In 2010 a committee was constituted to suggest a road map for the IITs to become world-class institutions of higher education and research and to give them continued and greater autonomy. The committee was chaired by Dr. Anil Kakodkar.

The report of the Kakodkar Committee summarises the achievements of the IITs thus:

As pointed out by 2 review committees, the IITs have met the challenge of creating a world-class undergraduate programme and attracted the intellectual cream of India into its campuses and produced graduates who have gone out to occupy positions of importance in all spheres of activities. Over 50 years, IIT has become a brand.

Having established [their] educational programme, the IITs turned their attention to research and over a short period of 2 decades have risen in global stature consistent with the infusion of funds they have received.

Academic programmes at the IITs underwent change continuously to keep pace with changing times. New programmes in upcoming areas have continuously been added. PG programmes have gained strength and PhD programmes have seen increased output.

Funded research has gained momentum with [a] tremendous increase in R&D funding. The total R&D funding of all the IITs put together in 2010 was about ₹573 crore.

The IITs have turned their focus on patenting and technology transfer and have pioneered business incubation and are slowly growing in these fronts.

The committee's report goes on to describe the aspirations of the IITs:

Having reached levels of achievement that have been noticed globally, the IITs now aspire for higher things.

Sustain the high quality education. *The IITs have put in place a world renowned education system on their campuses. These academic programmes have a distinct character of rigour, flexibility, being futuristic, integrally linked to research, strong in design component and being connected to local challenges.*

Research that makes a difference. *Impact-making research that addresses major challenges faced by the nation and the world and important fundamental issues of the area are dreams that IITs wish to turn into reality.*

World-class infrastructure. *Basic campus infrastructure, infrastructure for education, modern classrooms and laboratories, infrastructure for research, infrastructure that nurtures innovation and entrepreneurship, linkages with industry and society, and major investment in facilities to enable cutting edge research.*

Outstanding faculty. *The need to attract top-class students of the nation into the teaching profession in large numbers is a challenging proposition. Attractive salaries, start-up grants, excellent research facilities and good campus life are factors that can influence this.*

Performance evaluation and tenure systems. *These are possible ways of nurturing world-class faculty. Becoming a faculty at an IIT should become the most coveted position and must attract top UG students to PhD programmes, and the best among them to faculty positions.*

Support systems. *Strong administrative and technical support will enable faculty to be productive, and achieve their potential.*

The entire report of the Kakodkar Committee outlines a 15-year plan to take 'IITs to [the] next logical phase', including expanding the number of IITs, increasing the number of graduating students—both undergraduate and postgraduate—and fostering research in frontier areas and in locally relevant subjects.

The Kakodkar Committee has suggested that the faculty of each IIT should progressively (in about 10 years) grow to have around 1200 members (from the present strength of around 500). The suggested number of students at each IIT is 12,000, with the maximum growth being in the number of Ph.D. scholars.

Among the Kakodkar Committee's suggestions are that the faculty–student ratio be retained at 1:10 and that the postgraduate–undergraduate student ratio be 1:1 or higher.

The committee has made a number of recommendations aimed at increasing the number of Ph.D. students graduating annually from each IIT. One of these recommendations is an annual target of one Ph.D. per faculty member. Another recommendation is that the IITs engage with other engineering and science education institutions such as NITs and IISERs to enlarge the pool for the selection of quality students for the Ph.D. programme. An augmented intake of Ph.D. scholars from industry has also been suggested.

The Kakodkar Committee has also made a number of recommendations for augmenting research facilities and infrastructure to support the increased number of Ph.D. scholars.

1.7 Strategic Development Initiatives

Considering the major changes that had taken place globally and in India, in 1996, the Board of IIT Madras set up a Strategic Planning Committee. The Board instituted the Strategic Management Project the same year to build up the internal capability for change. The project consisted of a series of coordinated steps to bring about changes in the Institute's direction, structure, interfaces and performance.

Several workshops and discussions were held with the different stakeholders to develop a knowledge base and a consensus around key issues. Seven areas of strategic importance to the Institute were identified for intensive study through internal task forces and external consultants. Reports on these areas were widely discussed and debated to build a consensus. A strategic plan, outlining recommendations and action plans for implementing the strategy, was drawn up.

Subsequently, as part of the planning cycle, the strategic plan has been reviewed and revised at regular intervals.

1.8 Strategic Plan 2003–2010

The last strategic plan to be drawn up covered the period 2003–2010 (*The Strategic Plan: Vision 2010.* IIT Madras, June 2003). A summary of the recommendations of this plan, as well as the key achievements, is provided in this section.

Educational Processes

Recommendation	Selected outcomes
• To review and change, wherever necessary, the academic programmes of the Institute	• The Senate reviewed the undergraduate and postgraduate course programmes and initiated several reforms.
• To create new departments in response to emerging demands in frontier areas such as biotechnology	• The Department of Management Studies was established in 2004. • The Bhupat and Jyoti Mehta School of Biosciences and Ashok Leyland and Bosch Centre of Excellence in Engineering Design were set up.
• To consider offering programmes with flexible learning options, such as self-learning modules using modern educational technology, dual-degree programmes, lateral entry opportunities and cross-registration of students across institutions located close to each other	• Several dual-degree (DD) programmes were initiated, leading to a DD–B.Tech. intake ratio of 40:60. • IIT Madras is the lead co-ordinator for the NPTEL programme of the IITs and IISc. • A unique 5-year M.A. programme (Humanities) was initiated. • An M.Tech. programme (Clinical Engineering) programme involving a three-way partnership with CMC, Vellore and SCTIMST, Thiruvananthapuram was launched.
• To create specialised schools in selected areas such as management, information technology, energy, environmental studies and manufacturing	• The Visionary Leadership for Manufacturing Programme, M.Tech. programmes in Petroleum and Nuclear Engineering and the Indo-German Centre for Sustainability are examples.
• To focus the research and postgraduate education efforts on select, frontier areas	• Several Centres of Excellence were created.
• To build strategic alliances between the Institute and leading academic/research institutions and enterprises for globalising institutional activities	• The Office of International Relations was created to focus on building alliances with peer universities globally.

Educational Processes *(Continued)*

Recommendation	Selected outcomes
• The faculty of the Institute should be placed in a matrix structure with dual coordinates: one in a Department dimension and another in a Research dimension.	• Adjunct positions have been created to enable faculty to be a part of more than one department. • The departmental structure is primarily for administrative purposes. • The faculty belonging to a department are expected to teach core/elective courses pertaining to the programmes offered by the department. • With respect to the Research dimension, there are no departmental boundaries/restrictions, i.e., the faculty enjoy complete freedom to pursue collaborative research, undertake joint guidance and send joint research proposals. The Institute funded 15 inter-disciplinary projects involving faculty across multiple departments in order to seed new focus areas.

Human Resources

Recommendation	Selected outcomes
• To develop a heterogeneous academic community, which is necessary for technological innovation and excellence in learning	• Research Park, exchange students from abroad, etc. contribute to a heterogeneous academic community.
• To recruit top-quality faculty and staff	• Sustained recruitment of top-quality faculty in the period 2004–2010 led to a net increase in strength by around 300 in this period.
• To train and improve quality by imparting new skills to employees and by redesigning staff jobs/functions	• A slew of HRD programmes were run regularly for the benefit of the staff, and the ISO certification programme was continued with vigour.
• To strengthen the incentive structure associated with performance appraisal	• Being taken up in the Plan for 2014–2020
• To evolve policies to identify tasks that require outsourcing of human resources, without compromising on quality	• Considerable outsourcing of non-academic services was achieved.
• To deploy technology for enhancing productivity and efficiency	• The Workflow Automation Programme was initiated.

Physical Resources

Recommendation	Selected outcomes
• To develop state-of-the art facilities	• Several new infrastructure facilities were created: the P.G. Senapathy Centre for Computing Resources, Deshpande Centre for Communication Networks, Bhupat and Jyoti Mehta School of Biosciences, Ashok Leyland and Bosch Centre of Excellence in Engineering Design, Nano Functional Materials Technology Centre, Reliance–IITM Telecom Centre of Excellence, JK Centre for Tyre Research and National Centre for Catalysis Research are some examples.

• To prioritise infrastructural investment options	• Significant investments were made in the hostel sector in the form of four men's hostels, a new ladies' hostel, centralised dining facilities and an indoor sports complex.
• To adopt project management practices	• Adopted for large infrastructure projects
• To ensure effective utilisation and maintenance of infrastructure	• The Board of Infrastructure was set up, and annual maintenance contracts were outsourced.
• To benchmark institutional infrastructure and performance periodically	• Academic departments were reviewed by visiting committees.

Governance

Recommendation	Selected outcomes
• To make IIT Madras' activities a more productive mix of education, research, consultancy and services, maintaining an optimal faculty workload mix of 40–25–25–10	• A large section of the faculty operates with this near-optimal mix.
• To make the organisation leaner, more professional and more focused	• The non-academic staff strength dropped to the sanctioned level of 11 percent of the student strength.
• To redesign organisational processes	• The processes were reviewed when the Workflow Automation Programme was initiated, and where warranted, the processes were simplified and optimised.
• To include a business role, nationally and internationally, while performing a predominantly academic role. The Strategic Plan, therefore, recommends that a company be formed under Section 25 of the Indian Companies Act that may be managed by professionals to (i) market the Institute's products and services and (ii) outsource services needed by the Institute. This company will thus act as an outreach arm of the Centre for Industrial Consultancy and Sponsored Research (IC&SR).	• IIT Madras has a tradition of incubation through bodies such as the Rural Technology and Business Incubator and the Cell for Technology Innovation, Development and Entrepreneurship Support. The Institute has also pioneered innovation with centres such as the Centre for Innovation and Centre for Social Innovation and Entrepreneurship. The Section 25 company was formed in 2013.
• To form selective strategic alliances with academic, research and industrial organisations	• A number of relationships have been built or strengthened: with ISRO, IGCAR, DRDO, foreign universities, etc.
• To strengthen the existing systems and procedures for conflict resolution and redressal of grievances	• The Institute has created the requisite processes and mechanisms for handling grievances covering all sections—students, staff and women.

Building Relationships

Recommendation	Selected outcomes
• To develop a knowledge base for promoting value added products and services	• Industrial consultancy grew significantly.
• To create an IP arm of the Institute as a limited company	• Implemented in 2014
• To commercialise software developed in the Institute	• Some design and simulation software packages have been commercialised.
• To set up a technology park in collaboration with alumni and industry	• The IIT Madras Research Park, the first of its kind in India, is successfully operating to full capacity in Phase I. Phase II is now under implementation. It has become a model for the country.

Financial Resources

Recommendation	Selected outcomes
• To develop rational pricing practices	• Implemented for services provided by the Institute
• To levy user charges	• Implemented for software packages procured by Computer Centre, for gases, etc.
• Initiatives for resource-mobilisation need to be undertaken. There are various external sources of funds, within and outside the country. Their potential for support and their terms and conditions should be explored. A systematic effort should be made towards identifying opportunities for creating synergy through strategic alliances. This should be strongly linked with the marketing efforts of the Institute.	• An Office of Alumni Affairs was set up to enable networking with alumni as a first step, and this networking was used to generate resources which paved the way for batch-based contributions. The office organises annual alumni meetings within and outside the country to disseminate happenings in the campus and solicit the support of alumni.
• The finance function should provide the key inputs for resource mobilisation from external sources. It should use expert advice to perform a variety of functions including fund-raising, treasury, financial accounting, budgetary control and costing. This reform is necessary in order to develop the requisite skills/culture for dynamic financial management.	• A new Dean position was created during this Strategic Plan period, namely Dean (Planning), with an objective of systematic budgetary control and costing. Management of corpus funds, rationalization of resources allocated to the departments and relative allocation of funds (apart from those received from the Government of India), such as revenue generated through IC&SR earnings, to infrastructure creation/upgradation are carried out by the Dean (Planning).

1.9   Strategic Plan 2014–2020

India's economic growth, the need to scale up technological education, the roles of innovation and IP in the nation's economic trajectory and sustainability issues such as global warming have set the national context for the development of Strategic Plan 2014–2020. India is emerging as an innovator, and the present situation offers opportunities for the country to take the lead in demonstrating how growth can be achieved in a sustainable manner. The IITs are expected to play a key role in research and education towards achieving this goal.

This Strategic Plan has been drawn up, as with previous plans, through a process of consensus building. Even while this process was on, implementation of several elements of the plan has been taken up. As a result, it would be quite appropriate to say that the plan covers the period 2012–2020, with the years 2014–2018 being the core period during which fruition of this plan will take place.

The targets of the Strategic Plan and the vision underlying the plan are presented in the following sections.

Section 2:   Vision

The broad goals of Strategic Plan 2014–2020 are aligned with IIT Madras' commitment to excellence in research and education, and the Plan is consequently focused on these core themes.

The Strategic Plan enunciates IIT Madras' objective of being recognised as a global leader in research and education. There are a number of international rankings of educational institutions. These draw up lists on the basis of different indicators such as research excellence, student preference and academic and employer surveys. IIT Madras seeks to rise in those rankings whose parameters are in alignment with the institution's objectives.

IIT Madras aims to attract the brightest students from diverse backgrounds and offer them an excellent education.

The Strategic Plan seeks to leverage the traditional strengths of IIT Madras and to acquire or

High-performance computing cluster

develop new strengths. In particular, it seeks to nurture large groups of faculty working on transformational technologies that have the potential to address the societal challenges faced in India today with regard to water, energy, healthcare, housing, education and the like. Industry- and government-funded research and development is a major component of this effort.

Titan transmission electron microscope

3nethra—pre-screening ophthalmology device

Vortex ATM

Fitness centre

Squash court

Rooftop solar panels

The strategic plan envisions the development of infrastructure commensurate with the anticipated increases in research needs and in the numbers of the faculty and students. It seeks to leverage the IIT Madras Research Park, the first Indian university-based research park. This will make a big difference in industry–academia collaboration and create a rich ecosystem for incubation and innovation. IIT Madras continues to have strong links with Germany and hopes to nurture this heritage especially in this context.

Appreciating the unique natural heritage of the Institute, the strategic plan has the objective of developing the IIT Madras campus into a model university campus in terms of sustainability, usage of energy and water and recycling of materials.

Section 3: The Targets

3.1 Mission

- Become a leading technological university, with international recognition (including global rankings) in all disciplines.

- Become as renowned for postgraduate education as for the undergraduate courses.

- Earn a reputation among students that IIT Madras is a dynamic and student-friendly campus.

- Establish a track record as a creator of new and innovative technologies for industrial and national needs.

- Become known globally for transformational technologies that impact lives of people.

- Incubate successful start-ups for products using technology developed by the Institute.

- Improve the sustainability of the campus in terms of energy and water usage, waste management and recycling of materials.

3.2 Research

To achieve goals related to raising the quantum of research output and improving its quality, IIT Madras will adopt a multi-pronged strategy addressing the issues of enhancing the number of research scholars and the faculty strength and of augmenting resources. Some measures are already being implemented.

A major initiative is a plan to develop focussed Centres of Excellence in the Institute—on areas with potentially large societal impact. Centres have already been created in IIT Madras in areas such as catalysis, combustion, water, decentralised power systems, nanotechnology, nanoelectronics, telecommunications, heritage structures, technology and policy, sustainable development and China studies. Eventually, there will be approximately 25 such active centres at IIT Madras at any given time. It is envisaged that each Centre of Excellence will involve 10–15 faculty members drawn from multiple disciplines. The Centres of Excellence could also be multi-institutional, involving partnerships with other IITs and IISc. Research at the centres will be carried out through an industrial membership programme and an Advisory Board consisting of representatives from the various stakeholders including key industry partners. Deployment of professional management and contract staff will be a feature of the centres. A formal mechanism will be instituted for life cycle management of the Centres of Excellence.

A number of measures are planned that are aimed at improving research:

Improving the research input in terms of both human and physical resources.

Creating a better ambience for research by providing greater flexibility to encourage performance of faculty members and scholars while continually improving research infrastructure.
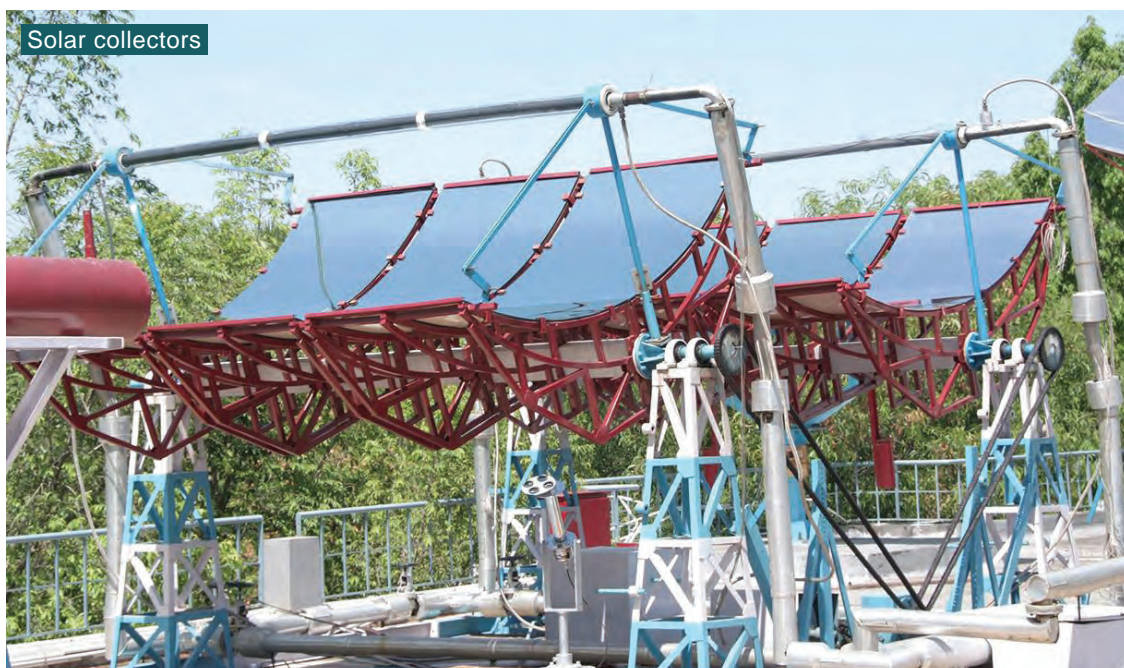
A process for continuous performance improvement at the Institute, department, group and personal levels to achieve excellence. Publication in top journals and presentation at venues where the world's leading researchers are present will be encouraged. A significant quantum of research will originate from problems identified as a result of the faculty's engagement with industry. Research output will be assessed periodically, and early-career faculty members will be assisted in every way possible to enhance their productivity.

Improving research scholar intake. IIT Madras is already implementing a number of measures towards this goal. The Institute is reaching out to the best feeder institutions. Direct Ph.D. admission is an option for top B.Tech. and B.E. students. Interdisciplinary M.S. and Ph.D. research is being encouraged, and the top M.S., M.Tech. and M.Sc. students have the option to upgrade to the Ph.D. programme. IIT Madras seeks to evolve towards a highly competitive selection process for Ph.D. candidates.

New gateways are being opened to attract the top M.Tech. and M.Sc. students from GATE/JAM to a career in research. Prospective research scholars will have more flexible options in accounting for their prior academic preparation, such as ease of credit transfer and waiver of courses. Prestigious fellowships and joint Ph.D. degree programmes with foreign universities will be offered.

Enhanced financial support. Sponsorship of Ph.D. scholars by industry will be developed. Support can be in the form of total sponsorship or top-up scholarships. Stipends are to be enhanced with top-ups from projects and alumni contributions. The Institute will ensure adequate access to

Solar collectors

instruments frequently used in research work. The Central Workshop is already available for fabrication with quick turnaround.

Enhanced post-doctoral fellowships policy. Measures proposed to foster the post-doctoral research programme include enhanced stipends, greater independence and periodic advertisement for positions.

Improvement of the research ambience. Induction of foreign research scholars is one of the long-term measures to be adopted. The Institute will work with the other IITs to urge the government to create a favourable policy regarding student fees.

High-impact initiatives such as the creation of special research zones, or discovery parks, with visual impact are also planned. The thrust of these parks is on broad inter-departmental areas.

Further, a host of *complementary measures* are envisaged: (1) A large number of Ph.D. scholars will be able to obtain international experience for one semester or more. (2) A conference facilitation cell is to be developed. This cell will assist in hosting important conferences that will improve the visibility of IIT Madras. The cell will also develop support for travel grants. (3) Lectures by leading scientists from all over the world will be held regularly. (4) Industry and academia will be proactively approached for good placement of graduating

M.S. and Ph.D. scholars. (5) Graduating research scholars will be groomed in all aspects to become professionals and academics who are keenly sought by employers.

Improving the amenities of research scholars is one of the measures identified by the Strategic Plan. Researchers need to have sufficient individual workspace and well-appointed reading rooms in their departments. In addition to workshop facilities, they will have access to other engineering services. They will enjoy enhanced hours of library access. Twenty-four hour cafeterias will be provided in the academic zone in addition to the hostel zone.

These steps require funds broadly under the heads of institutional facilities, enhanced stipends, student exchange programmes and participation in conferences. They will be supported by industrial consultancy and by contributions from alumni and industry, apart from the Institute's own resources.

The Deans will coordinate the various initiatives aimed at augmenting research output. In addition to topping up stipends, the Centre for Industrial Consultancy and Sponsored Research (IC&SR) will provide conference support, including organisational support, and network with and reach out to industry for student sponsorship and for placement of M.S. and Ph.D. scholars. The role of the Dean (I&AR) will be in promoting networking among alumni, raising funds from the alumni community, reaching out to industry through alumni, and leveraging the international network of universities for student exchanges. The Dean (Planning) will focus on space, resources and engineering services for the Institute. The Dean (Academic Courses) will ensure sufficient flexibility for meeting course requirements, and enable the transfer of credits in international exchanges. The Dean (Students) will oversee matters such as provision of suitable accommodation for exchange students, while the Dean (I&AR) will assist them with acclimatisation, meeting statutory requirements, etc.

The Institute will periodically analyse its research output using third-party services. Departmental reviews will be conducted by visiting committees of experts from academia and industry once every five years in the context of departmental action plans. Interdisciplinary research, infrastructure, recruitment and admission will be institutionally promoted. A sub-committee of Deans will have annual meetings with individual faculty members during the early stages of their careers to assist their professional progress.

Encouragement will be provided for high-performing faculty through Institute research awards, Young Faculty Recognition Awards and greater visibility through the Institute's website, special reports and media projection.

3.3 Course Programmes

The course programmes at IIT Madras are developed with well-defined objective and outcomes. Students are constrained to exercise their choice of stream according to the all-India single-window admission process of the IITs. However, their interest may change after they begin their studies at IIT Madras. An undergraduate may develop a liking for a different or allied discipline, while a post-graduate may change his/her goal from a job to further studies and a career in research. In order to enable students to meet their changing objectives, the Strategic Plan aims to introduce flexibility in the IIT Madras curriculum through a wide choice of electives.

The curriculum will be structured such that the core course component makes up around 50 percent and opportunities for multi-disciplinary diversification through electives are maximised. Thus, a student will have the freedom to choose, as electives, nearly half the courses that he or she must complete to obtain a degree. A strategy of introducing curricular flexibility is adopted to sustain the interest of all students, both high performers and those with difficulties. The traditional emphasis at IIT Madras on hands-on laboratory training has been maintained despite the increase in number of students. Undergraduate labs have been modernized and expanded in the last few years. This is an ongoing process and will continue in the years ahead.

By 2020, the Institute will have a faculty that is 700 strong. At that time, IIT Madras will be offering 2000 courses. Hence, while the core courses will define the stream opted for by the student at the time of admission, students can choose from a wide variety of courses for completing their degrees. Core courses will address the widest possible audience and will not be specific to niche streams with small enrolment levels. A heterogeneous mix of students from various streams is considered desirable in the classroom. The electives, if properly chosen, will define the specific domain knowledge and skills of the graduating student.

Further, the means by which undergraduate students could obtain research-based credits are being explored. These may take the form of hands-on learning and research projects. Undergraduate students may also obtain credits through research-oriented self-learning.

With an increased student strength, the number of students in each class is increasing, calling for exploring non-traditional forms of pedagogy. Conventional chalk-and-talk teaching will continue to have its place of pride in the teaching–learning environment. However, self-learning and learning in groups will be encouraged. Larger classes will have high-quality tutorials and discussion groups of smaller size.

The quality and quantity of teaching assistant (TA) support will be enhanced. Scalable TA-training programmes have been introduced.

Online teaching will be used as an aid to class-room teaching. Contact hours in the classroom will not be compromised. The Teaching–Learning Centre will be used to encourage exploration of new teaching systems.

There will be a continued focus on seamless integration of first-year (both undergraduate and postgraduate) students entering from diverse back-grounds. Students will be assisted proactively in the first year so that they perform well. Postgraduate programmes will be tailored to enable customisa-tion for both seekers of jobs in industry and future researchers.

Live online access to courses will be provided to teachers in colleges aspiring to take up Ph.D. programmes. Outreach programmes will be extended to engineering college students through NPTEL courses and massive open online courses (MOOCs)—since such initiatives are part of the charter of what IIT Madras wishes to achieve using technology. The Institute also plans to introduce interactive online evening courses for professionals in industry, with certification. A bouquet of carefully selected courses could lead to an M.Tech degree as well.

The Strategic Plan includes faculty-centric initia-tives aimed at enhancing the quality of teaching. Top-quality Ph.Ds, preferably with some industry experience, will be recruited. At induction, all faculty members will be encouraged to undergo a programme in teaching–learning. Their teaching responsibilities and accountability will be clearly enunciated. In addition, the Institute plans to induct "Professors of Practice" from industry veterans with vast experience and practical knowledge. They will teach specialized electives in their area, drive collaboration with industry, take up new projects and co-supervise students, giving them a hands-on perspective.

Assessments of teaching performance will be a factor in awarding promotions. Special programmes will be prescribed for those in need of improvement. There will be a system of awards and recognition for excellence in teaching and mentoring.

A smooth entry-to-exit online process is being put in place to handle a student's academic progress. This will minimise the administrative overhead for faculty members. Information relating to the perfor-mance of students will be made available online through a secure system.

Another technological initiative is the provision of a course management platform for managing multiple pedagogical approaches such as conven-tional teaching, online courses and group learning.
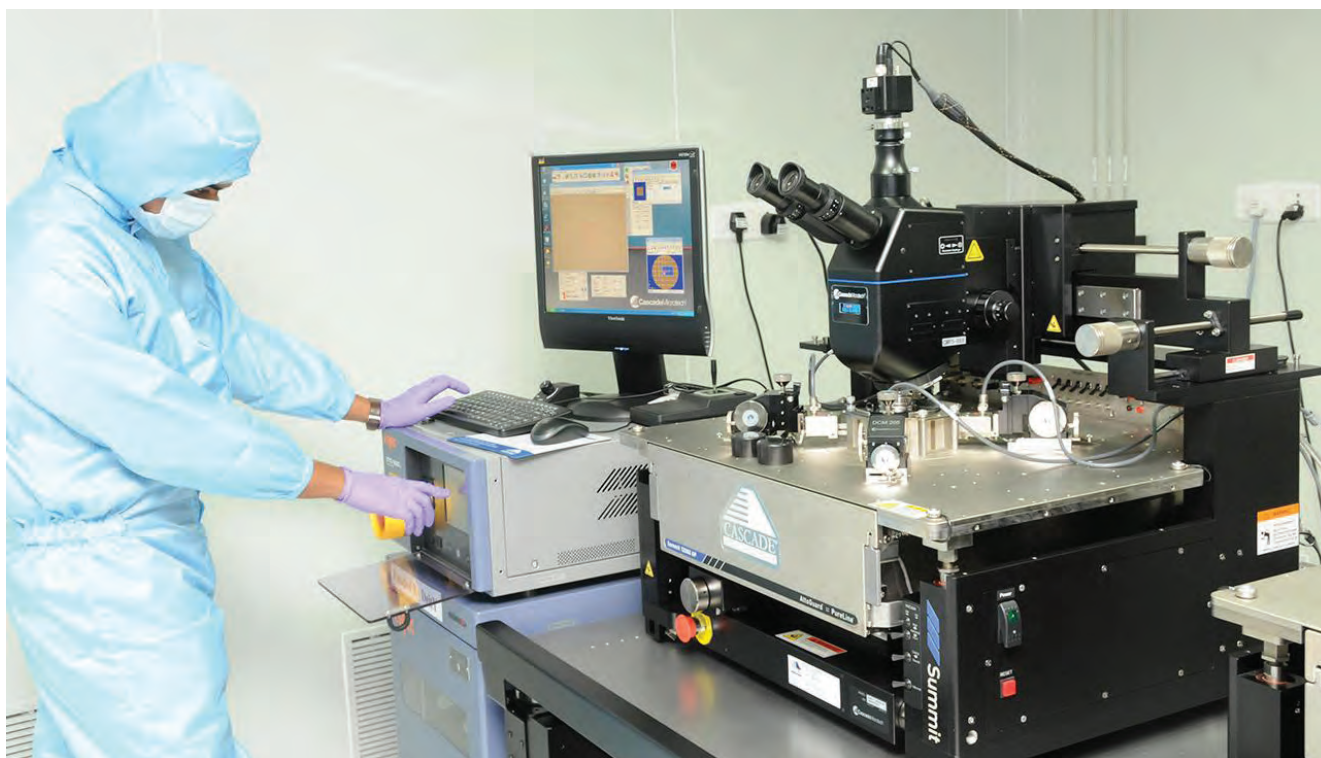
3.4 Sponsored Research and Industrial Consultancy

IIT Madras is known among the IITs for its strong industry linkages. The Industrial Consultancy and Sponsored Research (IC&SR) Centre was created in 1972 and has spearheaded the growth of spon-sored research at IIT Madras ever since.

The overall strategy for developing sponsored research and industrial consulting activities at IIT Madras during 2014–2020 is to vigorously identify new research projects of relevance to the nation and of interest to industry and to build relation-ships. A Sponsored Research Development Office is to be additionally created that will identify and

assist with the definition of research projects and creation of centres of excellence by the faculty in a manner that meets the objectives of sponsors of research. An Industry Relations Office, which will foster relations with industry in India and abroad and help discover research objectives of mutual interest, will be set up.

An Industry Connect Programme has recently been launched wherein faculty spend a few weeks embedded in industry with a view to discovering research challenges of mutual interest. It is proposed to expand this programme with at least 25 percent of the faculty participating in it.

IIT Madras will continue to grow its patent portfolio by pursuing a policy of active patenting and commercialisation, with a goal of doubling the number of patents filed per year by 2020.

Other measures are related to purchase, maintenance and use of instrumentation and facilities. The Centre for IC&SR will assist with these. There will be sufficient provision for acquiring and maintaining commonly used instrumentation and machinery for use by anyone in the Institute. A policy and a formal mechanism for research facility utilisation and maintenance will be created.

Software will be used to manage inventory maintenance, usage of facilities and tracking of maintenance contracts. The Centre for IC&SR will assist with the creation of the centres of excellence mentioned in the foregoing.

3.5 Research Park and Entrepreneurship Activity

IIT Madras has already set in motion the creation of a powerful innovation and incubation ecosystem jointly with industry as a trend-setter for the country. The idea is to work with industry to support the development of new products and their commercialisation and to create *ab initio* new companies

IIT Madras Research Park

for sunrise technologies and products through incubation. Towards this end, the IIT Madras Research Park (IITMRP) was established in 2010. IIT Madras Research Park is an independent company promoted by IIT Madras and its alumni. It is incorporated under Section 25 of the Companies Act 1956. The Research Park promotes research and development by the Institute in partnership with industry. The first venture of its kind in India, the Research Park has emerged as a game changer.

The first tower of IIT Madras Research Park is fully occupied, by around 50 companies and 15 incubatees. The second phase of construction is proceeding, and when this is completed, the available space will be tripled.

The Research Park is serving as a catalyst for industry–IIT Madras interaction, just as envisioned. It is a magnet for high-quality incubatees from amongst the Institute's faculty and students, as well as external incubatees with potential for collaboration with IIT faculty members.

IIT Madras will work towards a comprehensive engagement with the Research Park companies. This engagement will be in the form of research projects, consultancy, guest teaching, co-supervision of research scholars and student projects, internships and sponsorship of employees for postgraduate studies by the companies. Efforts will be made to facilitate maximal interaction of the faculty and students with Research Park.

The interaction will be two-way: IIT Madras will enrol adjunct faculty members and research scholars from Research Park companies and support technologically creative companies as clients.

It is IIT Madras' vision to help Indian companies through the Research Park to become globally competitive technologically and to enable a significant fraction of the incubatees each year to become successful.

3.6 Human Resources

IIT Madras recognises human resources as the most important among the assets needed to realise its aspirations. This importance is particularly accentuated in the present context of steep growth. Thus human resource management is a vital institutional

Activity at the Teaching and Learning Centre

function. Falling within the domain of this function are the activities of need-identification, recruitment, training and development, personnel administration and evaluation of performance.

The human capital of IIT Madras consists of its students, research scholars, faculty and staff. Whereas the Institute continues to attract the best undergraduate and postgraduate students in the country every year, faculty recruitment needs to be tackled purposefully. This has been done systematically over the last ten years, and the Institute has added more than half of its current faculty in this period. The Institute needs to continue to recruit faculty members at the same rate for the next seven years to compensate for retirements as well as to grow towards the sanctioned strength of around 800.

IIT Madras is endowed with a talented technical and administrative staff that is equipped to deal with the complexities of administering an institution of its kind. Consequent to the increase in student strength, the sanctioned strength of the staff has also gone up. IIT Madras has maintained a lean staff structure over the years, with the number on rolls being less than the sanctioned strength. This gives the Institute the opportunity to recruit young blood and enable the fresh staff members to grow professionally along with the Institute.

The human resource strategy of this plan is aimed at increasing the strength of the human resources while giving it focus and improving its quality. In order to improve the productivity of the faculty, staff and students, IIT Madras will continue to focus on quality and process improvements through ISO 9001:2008-certified administrative functions, NABL-accredited testing and calibration facilities and a move towards a green, paperless office via the enterprise resource planning (ERP) software system Workflow, which provides Institute-wide e-services.

3.6.1   Faculty

IIT Madras seeks to become the most favoured destination for potential faculty members. The Institute will appropriately recognise different types of experience, be it in academics, industry or research. Post-doctoral fellows and faculty members will be recruited from all over the world. While most of them are likely to be of Indian origin, foreigners with suitable qualifications will also be actively sought for the diversity they bring to the academic environment. The proportion of women in the faculty is about 12 percent at present and growing, and the gender gap will be actively sought to be bridged. The trend is encouraging in this regard, as more than 75 percent of the women faculty have been recruited in the last decade. Generous assistance will be provided to

Specific objectives and targets
- To recruit around 30 top-class faculty members each year during 2014–2020
- To provide a five-step path for promotion and rewards
- To reward high-achieving faculty members once every 5–6 years

all faculty members for an early, solid start to their research activities.

A career path will be provided for all employees, including faculty and staff members. Faculty members will be successively promoted from assistant professorships to become associate professors and professors and be elevated to prestigious Chairs based on merit and performance.

The responsibilities and expectations of a faculty member will be enunciated clearly. Performance evaluation will be against the expectations. Promotions are based on assessments of performance in several dimensions: teaching, research, student supervision, sponsored research, collaboration with industry, involvement with the student sector, Institute service and national-level activities. Both quantitative and qualitative norms are being laid down for appraisal of performance in each dimension. A method of assessment is being evolved that is transparent, credible and fair. Underlying this system is a basic belief that each faculty member must excel in a combination of dimensions according to her or his preferences.

3.6.2   Staff

As with the faculty, so too with the staff is a vigorous system of recruitment, training and development necessary. The thrust of the Strategic Plan is to target recruitment primarily at the entry level and to bring in a system wherein staff members may and are encouraged to aspire for advancement—a Junior Assistant could aim to become a Deputy Registrar, or a Junior Technician could aim to become a Senior Technical Officer, for example.

Specific objectives and targets
- To provide a framework wherein five or six advancement steps are possible during a career
- To outsource those positions that do not belong to the core functions of IIT Madras and in which career growth is not possible within the Institute

IIT Madras seeks to provide staff members opportunities to obtain higher educational qualifications to pursue their aspirations.

It is an aim of the Institute to develop a system in which motivated persons are recognised and their progress is facilitated. Staff members will be provided with appropriate challenges throughout their careers. The key determinant of a member's reward will be meritorious performance.

Those positions that have few opportunities for career growth within the Institute will be outsourced. Outsourced services will be effectively managed and monitored.

3.6.3 Students

IIT Madras adopts various measures to ensure expeditious acclimatisation of first-year students. The Institute subscribes to the view that IIT Madras has a responsibility of integrating students into all spheres of campus life. As the diversity of incoming students increases, the Institute will take several proactive measures to make it easier for first-year undergraduate and postgraduate students to adjust to the academic and social life on campus.

Personality development is considered very important for all students, from undergraduates

to Ph.D. scholars, throughout their time at IIT. The Institute has traditionally provided a plethora of options for students to take up co-curricular and extra-curricular activities for all-round development. These will be augmented considering the increase in and diversity of the student population. While many students do take to one or more activities, there are some who simply drift along, and this will be addressed proactively. Students' achievements in fields other than academics will be certified and publicised through addendums to transcripts and supporting documents.

Today, overall development is viewed as a prerequisite for employment. Students will be provided career counseling, beginning midway through the degree programmes. M.S. and Ph.D. scholars will be groomed to demonstrate independent thinking and confidence. The programmes already in place to improve the communication skills of our students will be enhanced, enabling them to handle the rigours of professional life better when they graduate.

Student-centric initiatives at IIT Madras include training students on positioning their research or project work and matching the specialised knowledge of the Institute's graduates with job opportunities.

3.7   Infrastructure

The decision of the government in 2008 to increase the number of students on campus has already been implemented. The number of faculty members is also increasing steadily, and research activities are to be developed intensely, as described in the foregoing. These changes call for a corresponding development of the research, residential and other infrastructure of IIT Madras.

In 2011-2012, a comprehensive plan, the Second Master Plan, was drawn up to bring about this development. The following are the chief features of this plan:

The intent is to sustain a total student population of 8500.

The developmental activities are to be carried out starting in 2011, over a period of 15–20 years.

It takes into account the current state of the physical infrastructure.

The plan covers the buildings, roads, open spaces, electrical and networking (LAN) infrastructure, water distribution system and other facilities.

All aspects of growth in infrastructure are constrained to the existing campus.

Preserving the unique ecosystem of the campus has been a consideration in drawing up the plan.

The Second Master Plan added space zone-wise in the campus: in the academic zone, the hostel zone and the residential zone. An important consideration is the emphasis laid on cleanliness and safety (mechanical, chemical, biological). The Second Master Plan also attempted to retain the unique character of the campus. It proposed the construction of multi-storey buildings (in place of bungalows and two-storey apartments) so that the increase in the footprint of built-up space will be minimal.

As some older buildings that were not identified for reconstruction by the plan show distress and require to be demolished, some modifications may be introduced in the master plan. However,

Bhupat and Jyoti Mehta School of Biosciences

Sabarmati—ladies' hostel

the operating principles behind the Second Master Plan will be adhered to.

New facilities planned in the hostel zone are nearly complete; the residential zone needs around 150–200 more housing units to be built. The first phase of expansion in the academic zone is ongoing, with old structures being demolished. There is scope for addition of another 20,000 square metres by rebuilding old laboratories and workshops.

Creating a satellite campus is an option that is also being pursued by IIT Madras. If it were to become a reality, IIT Madras will join the ranks of universities that have non-monolithic campuses. Some old universities in India have had such campuses for many years. The Institute has requested the Tamil Nadu Government for permission and support, and the request is being considered. The proposed second campus should ideally be within 30 kilometres from the existing campus. If the proposal for the second campus fructifies, a new master plan exercise will be necessary for both the present campus and the new one. This will also enable the Institute to grow to 12000 students and 1200 faculty as envisaged in recommendations of the Kakodkar Committee.

The development of a satellite campus opens up various possibilities. The new campus may provide space for creating large inter-disciplinary centres as physically and architecturally distinct units, creating the ambience of a Discovery Park. Additional accommodation for scholars, faculty and staff members could also be created there. The second campus could accommodate facilities such as a convention centre as well. It may be possible to create an extension of the Research Park too at the new campus. Funds could be raised from donors to create world-class infrastructure.

Meanwhile, sustainability of the present campus informs all the actions of the Institute:

There is a plan to augment the waste water treatment towards zero discharge.

Energy conservation measures being implemented include increasing the efficiency of appliances and the use of renewable energy sources.

Progressively, measures will be introduced to minimise energy consumption for air-conditioning.

Specific objectives and targets

- To upgrade all buildings and their surroundings to global standards in cleanliness and safety

- To create the necessary capacity in the hostel sector to provide comfortable accommodation to all students and scholars

- To expand the laboratories and classrooms to accommodate the increase in number of students and research scholars, as well as carry out the research agenda

- To provide sufficient well-maintained quarters for the faculty and staff

Systems are being strengthened to improve waste disposal and handling processes and to ensure recycling of all materials.

Measures are being taken to dispose of hazardous waste in a safe manner.

Land use is being optimised through full lifecycle planning of built infrastructure.

3.8   Hostels and Other Facilities

A move towards progressively bringing in professionals is a highlight of the Strategic Plan's approach to the management of the hostels.

The services in the dining halls and hostels will be outsourced, but all activities and amenities will be run with active student governance. Professional supervisory staff will monitor the quality of services. These steps will ensure that hostels are tidy, clean and efficiently run. The transition has already been largely effected in the dining halls. They are supervised by professionals, and the service contracts are designed to ensure that good food is prepared and served hygienically and efficiently. The thrust of the Strategic Plan is to allow wardens to focus on students and their hostel life and to spend considerably less time on administration and maintenance.

Facilities will be augmented for students' participation in all major sports, including informal sports. Students will have increased access to coaches as well as to teachers of music, dance and art. Hobby clubs and nature appreciation activities will also be fostered. Each student will be encouraged and provided opportunities to cultivate at least one interest in addition to academics. First-year students in particular will be encouraged to take up new activities and nurture their innate talents.

One of the key support services provided to students is counselling. All steps will be taken to ensure that timely, effective counselling is available to students in times of crisis. The scope of counselling will also extend to longer-term aspects such as career planning and building life-skills. Counselling services will reinforce the point that extra-curricular activities need to be pursued as a part of all-round development. Students will also be exposed continuously

Indoor Sports Complex

to role models from all walks of life through organised lectures and other interactive sessions. Alumni will play a key role in this area. Students will have affordable and clean places for social interaction. The library will be promoted actively as an excellent place to frequent. Good, effective medical care will continue to be available to all students at all times.

A clear understanding will be developed amongst all students about discipline, rules and ethics in hostels. There is a trend of formally laying down rules and checklists and administering justice through committees. The Strategic Plan recognises that some of these are required but endorses a self-governed system based on trust and a student-centric honour code.

3.9 Outreach

Over the past five decades, IIT Madras has been providing technical expertise to both Tamil Nadu State Government and Central Government agencies. These outreach activities have taken the form of structural certification of vital infrastructure, environmental assessment, treatment of water and soil contamination, studying healthcare and education programmes, providing expertise in new renewable energy technologies, recommending measures to ensure the safety of heritage structures, port and coastal engineering and road and transportation engineering, to give some examples. The Institute will enhance its role in this regard in the coming years and actively contribute its expertise to help improve governance and speed up development.

Strategic Plan 2014–2020 identifies proactive outreach as an important aspect of achieving the Institute's goals of excellence in teaching and research.

One important objective of our outreach effort is to diversify the student population and promote aspirations to study at IIT Madras. Thus the Institute will

Assessing structural safety

- Reach out to students for a career in research

- Target top-tier colleges and student groups and

- Publicise research opportunities and facilities at IIT Madras, including developing international linkages.

The Institute will publicise through the press, Web and social media (1) major initiatives and research findings, (2) new courses and (3) technology breakthroughs and innovations, both in order to inform the general public, who have a stake in the success of IIT Madras, and to attract the best and brightest students to take up the challenges of the future.

Other outreach activities of the Institute will be aimed at filling gaps in mainstream services in the larger society:

- Provision of informed technical opinion

- Offering short courses and workshops for professionals, particularly in industry, to enable them to stay up-to-date and get qualified further

- Providing technical solutions to pressing issues of public importance
- Providing technical expertise to individuals and organizations involved in socially relevant projects and
- Playing vital roles during emergencies and after disasters.

The objectives of these outreach activities are to strike and strengthen relations with industry, to contribute directly to society at large and to spread awareness in the community about the important contributions of IIT Madras.

3.10 Placement

The placement initiatives under this Strategic Plan have been described in Section 3.6.3 Students. In sum, they are the following:

Placement of undergraduate students, which has traditionally been good, will be fine-tuned to meet the aspirations of the students and expectations of employers.

Postgraduate programmes will be flexible to enable customisation for seekers of jobs.

Students will be trained to position their research or project work and to match their specialised knowledge with job opportunities.

The Institute will proactively reach out to industry and academia for good placement of graduating research scholars. M.S. and Ph.D. scholars will be groomed in all aspects to become professionals who are keenly sought by employers.

IIT Madras will encourage and support overall development of students in numerous ways. Among the benefits of such development is the advantage it bestows for employment.

Students will be provided career counseling from midway through their study programmes.

3.11 Internationalisation

IIT Madras' efforts to be recognised as a global leader in education and research are resulting in increased international interest in the Institute. The Institute already has a growing exchange programme. IIT Madras is also working with the Ministry of Human Resources Development towards enabling enrolment of Ph.D. scholars from foreign countries in considerable numbers.

The Institute seeks to increase the quantum of exchange of both undergraduate students and

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Specific objectives and targets

- To increase the total number of exchange scholars (in and out) to at least 200 per year—from 30 (in) + 60 (out) in 2014 to 75 (in) and 130 (out) by 2020
- To increase the number of joint supervision and joint Ph.D. programmes to 45 and 20, respectively, by 2020

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research scholars. The emphasis will be on joint innovative student projects for the former, and collaborative research for the latter. IIT Madras also has the goal of increasing the level of faculty exchange. Faculty members participating in international collaborations will be involved in exchange programmes.

In September 2012, the Office of International Relations and the Office of Alumni Affairs were integrated to form the Office of International & Alumni Relations (I&AR) under the stewardship of a Dean. This has provided sharper focus and greater visibility to the Institute's programmes in these verticals.

The Office of I&AR will take a series of well-planned steps to meet these objectives:

Research interest mapping. Faculty across leading academic institutions will be paired with IIT Madras faculty based on overlapping research interests in order to collaborate and co-supervise the research work of exchange scholars. Joint Ph.D. programmes will be set up with universities that have a thriving exchange programme with the Institute. Such programmes will serve as magnets for research scholars.

Engagement with industry. This will be in the form of three-way interactions (IIT Madras, academic partner and industry) and joint projects.

Formation of 'account teams'. The teams will comprise the faculty members involved with specific universities and I&AR staff members. These teams will manage relations with strategic partner institutions.

Facilitation of faculty and research scholar mobility. Funding mechanisms to facilitate exchanges of scholars and faculty will be identified. Support will be enlisted from industry and alumni sources.

Improvements will be made continuously on campus to make IIT Madras more welcoming to long-term foreign visitors.

3.12 Alumni Relations

IIT Madras will continue to build mutually beneficial relations with its alumni during 2014–2020 so that a range of modes of engagement can be explored.

Steps that will be taken to achieve this objective include the following:

Increasing the presence of the Institute in social media to promote engagement between alumni, students and faculty members

Tele-calling and other personalised efforts to actively engage with alumni

Increasing the number of face-to-face meetings

Creating more opportunities for alumni to spend time on campus and engage with students and faculty.

Alumni will be encouraged to support activities of IIT Madras in multiple dimensions: nurturing IIT–industry relations, facilitating interactions between aspiring students, faculty entrepreneurs and alumni entrepreneurs, transforming fund-raising to a professionally managed development effort and, in the case of alumni faculty members of foreign universities, catalysing collaborations.

Fund-raising will have multiple strands, foci and strategies for India and other countries. Professional management is to be brought in to increase endowments and donations. Development offices are being opened in India and in the United States of America, with appropriate staffing and incentive structures. The entire approach to fund-raising will be highly systematic:

A 'Development Plan' will be linked to the Strategic Plan, and well-delineated projects will be defined for funding.

Specific objectives and targets

- To build up a corpus, including endowments, of ₹500 crores—opportunistically, this could be built up to ₹1000 crores

- To raise annual contributions from ₹20 crores in 2014 to ₹100 crores in 2020

A single consolidated database will be compiled.

Industry linkages will be cultivated to attract corporate social responsibility (CSR) funding.

Foundations will be profiled to match their giving interests and the Institute's aspirations.

3.13   Finance

An overview of IIT Madras' budget in recent years (specifically, 2008–2014) is provided in this section. The Institute receives funding from multiple sources, and growth is reflected in all the avenues of funding. Plan grants in any 5-year plan period are based on the needs of the Institute for capital expenditure, which are impacted by launching of new academic programmes, increased Ph.D. enrolment, increased student strength (such as due to introduction of OBC reservations during 2008–2015) and so on. Non-Plan funds for meeting the recurring expenses are currently being given as an annual block grant at the rate of ₹2.5 lakhs per student enrolled, with an inflation adjustment of 10 percent per annum.

Meeting of Distinguished Alumni

Targets related to sponsored research/consultancy and fund-raising during 2014–2020 have been listed in Section 3.4 Sponsored Research and Industrial Consulting and Section 3.12 Alumni Relations of this plan.

The comparative figures for 2008–2009 and 2013–2014 for various categories of funds are shown in the accompanying table (all values in crores of rupees).

Item	2008–2009	2013–2014
Total Plan grant	104	196
Non-Plan grants	127	194
Contribution of fee and interest income	28.3	49.1

The Plan grant of the Institute, which grew by nearly 100 percent in 5 years, goes primarily toward the creation of physical, electronic and other research infrastructure. The non-Plan grants, which provide for the operating expenses, also grew by about 50 percent in the same period. The contribution of the fee and interest income to the total budget for recurring expenses is around 20 percent, as envisaged by the Ministry of HRD. It is pertinent to note here that fees are waived for nearly 50 percent of the undergraduate students, while they are low for the postgraduate students (except for those in the M.B.A. and industry-funded programmes).

The sanctions received by the Institute for government-sponsored projects nearly tripled in the last 5 years, while funding from industry doubled in the same period. The gross income from projects also doubled.

Donations received by the Institute from alumni and others witnessed a very healthy 500 percent increase between 2009 and 2014. While some of these donations went toward specific projects or endowments according to the donors' wishes, others that were uncommitted went into the Institute's corpus.

The income from the endowments is used for supporting Chair positions and scholarships for students as envisaged by the donors. The income from the Institute corpus, which grew by 60 percent, is used to augment the operating budget whenever there is a deficit.

Section 4:   The Path Ahead

Strategic Plan 2014–2020 sets out specific targets in every sphere of activity of the Institute—academic programmes, research, collaboration with industry, human resource development, entrepreneurship, development of infrastructure and facilities, student life, placement, community outreach, international and alumni relations.

These targets have been set after extensive consultation to ensure that they are both ambitious and achievable.

The targets will likely be exceeded if the contributions of stakeholders—faculty, staff, students, alumni, international partners and collaborators from industry—are aligned and reinforce each other. The vision outlined in the Plan will then be realised, and IIT Madras can be justifiably proud that the trust reposed in it by the nation will stand redeemed.

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IIT Madras' Vision, Mission, Quality Policy and Core Values

Our Vision

To be an academic institution in dynamic equilibrium with its social ecological and economic environment striving continuously for excellence in education, research and technological service to the nation.

Our Mission

To create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with due consideration for ethical, ecological and economic issues

To pursue research and disseminate research findings

To provide knowledge-based technological services to satisfy the needs of society and the industry

To help in building national capabilities in science, technology, humanities, management, education and research

Quality Policy

To pursue global standards of excellence in all our endeavours, namely teaching, research, and consultancy and continuing education, and to remain accountable in our core and support functions, through processes of self-evaluation and continuous improvement

Core Values

Developing human resources to serve the nation

Recognising teaching as a unifying activity

Nurturing integrity, creativity and academic freedom

Retaining a willingness to experiment with new paradigms

Siddhirbhavati karmaja
Success through action