

Technology and Development Program and MIT-Masdar Institute Cooperative Program

The primary mission of the [Technology and Development Program](#) (TDP) is to provide a focus for research and education related to the role of technology in the socioeconomic development of newly industrialized nations. TDP works with other academic departments and research centers throughout MIT to:

- Promote awareness of the relationship between science, technology, and development among faculty and students at MIT
- Provide a focal point for the technology and development activities of faculty, students, and visiting scholars interested in the field of technology and development
- Assist the faculty, students, and staff of collaborating institutions in other countries to develop research and academic interests consistent with their national needs
- Serve as a contact for interested organizations outside MIT (in government, academic, and private sectors) to access the Institute's resources and its knowledge of developing countries, particularly of their socioeconomic and technological problems

TDP carries out these objectives through research, academic programs, and contacts with international and national organizations that have an interest in broad areas of technology and development. To fully utilize available resources, TDP is structured to interact with other academic departments and research centers throughout MIT.

Professor Fred Moavenzadeh will continue to serve as the president of the Masdar Institute of Science and Technology (Masdar Institute) until June 30, 2013, and will return to MIT as the director of TDP on July 1, 2013.

Academic Program

During the past year, MIT continued its work with Masdar Institute in expanding its graduate education programs, including a new master's degree program in chemical engineering, which was first offered in September 2011, and assisted with documentation for accreditation of a new interdisciplinary PhD program. The second graduating class received its Masdar Institute degrees on May 30, 2012, in Abu Dhabi.

Current Research Programs

From July 1, 2011, to November 30, 2012, TDP will be responsible for the MIT-Masdar Institute Cooperative Program in Abu Dhabi. Masdar Institute serves as the nucleus of the overall Masdar initiative, feeding it talent and innovative technologies to enhance

economic development and promote new industries, using renewable energy and resources in the emirate and surrounding regions. Masdar Institute is an intellectually elite, private, not-for-profit, and independent institute of science and technology devoted to graduate-level education as well as research.

In order for Masdar Institute to make important contributions to national human resource development in Abu Dhabi and the United Arab Emirates, it undertook a wide range of activities—comprehensive in terms of research, industrial and governmental linkages, and academics. Also, these activities encompass a diverse set of disciplines, including science, technology, management, and public policy.

Research Projects

Over the past year, the following eight new research projects were initiated, bringing the total number of joint research projects with Masdar Institute to 45.

- Sustainable Networks from Smart Grids to Robust Information Networks (professors Eytan Modiano of MIT and Sid Chi-Kin Chau of Masdar Institute)
- Development of New Sorbents Systems for CO₂ Post-combustion Capture (professors T. Alan Hatton of MIT and Mohammed Abu Zahra of Masdar Institute)
- High Concentration Solar Electric-thermal Cogeneration System Optimal Design Transient Analysis and Prototype (professors Evelyn Wang of MIT and TieJun Zhang of Masdar Institute)
- Engineering Open Anaerobic Microbial Fermentations for Conversion of Organic Waste into Biofuel (professors Gregory Stephanopoulos and Eric Alm of MIT and Jorge Rodriguez of Masdar Institute)
- Salinity Tolerance Mechanisms and Carbon Fixation Efficiency of a Prochlorococcus Originating from the Arabian Sea: A Model Organism for Developing Bioenergy Systems (professors Sallie Chisholm of MIT and Lina Yousef of Masdar Institute)
- Computational Methods to Analyze Microbial Community Resilience in Bioenergy Systems with Application to Algae-based Biofuels (professors Martin Polz of MIT and Andreas Henschel of Masdar Institute)
- Atmospheric Circulation Signatures of the Space-time Water Resources Distribution Across Arid and Semi-arid Middle Eastern Climates (professors Dara Entekhabi of MIT and Annalisa Molini of Masdar Institute)
- Electronic Photonic Integrated Circuits (professor Vladimir Stojanovic and Franz Kaertner of MIT and Anatoly Khilo of Masdar Institute)

MIT and Masdar Institute produced over 49 peer-review papers, over 50 joint conference papers, and filed for five patents in this past year.

To date, 137 faculty, postdoctoral associates, and research scientists have participated in the Cooperative Program, together with 171 graduate students from 22 different MIT departments, laboratories, and centers.

Many difficult steps are required to bridge individual projects to large centers; experience at MIT (and now at Masdar Institute) shows that this is too large a gap to immediately leap. Instead, a healthy and diverse research system is needed, as summarized in Figures 1 and 2 below. A key element of the continuing Cooperative Program includes the Flagship Research Projects, bringing together teams of MIT and Masdar Institute faculty on larger research efforts of high potential and relevance to Abu Dhabi, and fostering the development of future Masdar Institute research centers.

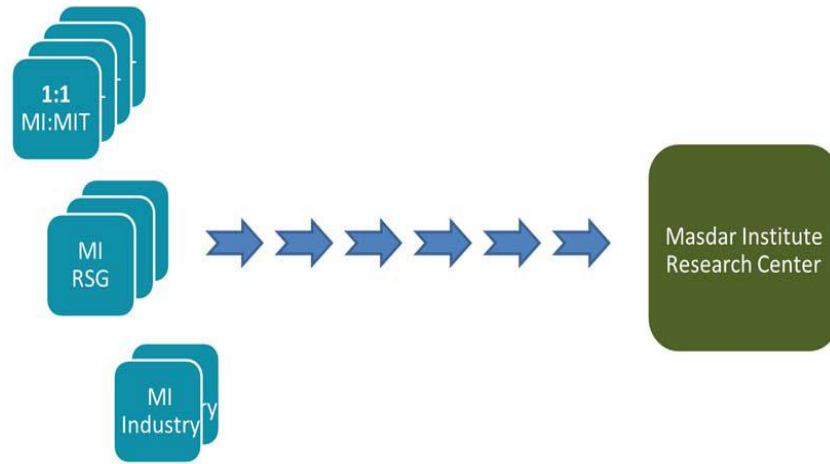


Figure 1. Existing Masdar Institute Research System.

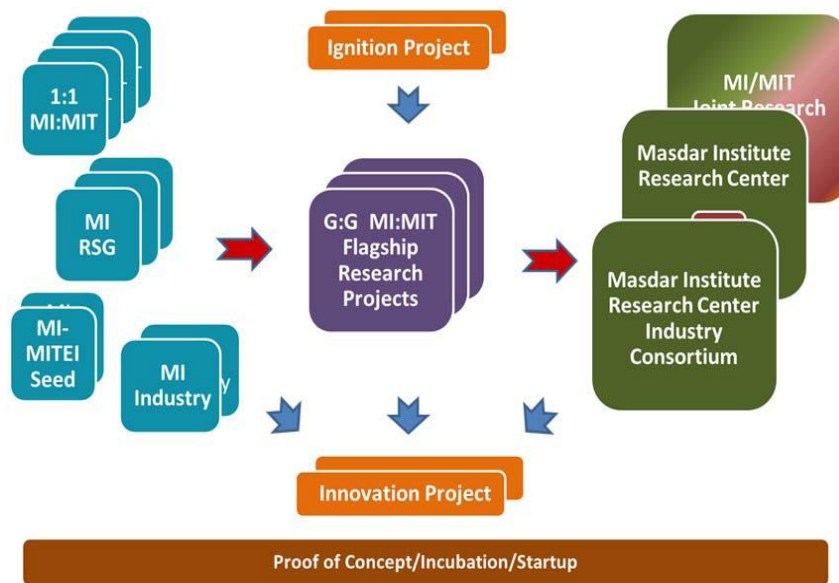


Figure 2. A Robust Research System Enabling Development of Large-Scale Research Efforts and Mechanisms to Foster Deeper Engagement of Research with Industry

A call for Flagship Research Projects proposals went out to the MIT and Masdar Institute communities in February 2012, and 26 proposals were received and subsequently shortlisted to 10, with three being selected for implementation in the coming year.

Outreach Program

Newly hired faculty from Masdar Institute continued to be stationed at MIT, working on their course material and joint research activities. MIT faculty travelled to Masdar Institute to give lectures, and faculty and students participated in workshops and conferences. In addition, senior-level administrative staff from Masdar Institute came to MIT to meet their respective counterparts and discuss their organizational units with appropriate MIT personnel. The Teaching and Learning Laboratory @ MIT continued its lecture series to the in-house Masdar Institute faculty members on a diverse set of topics, including cultural norms and teaching styles.

Governance of Cooperative Program

The Cooperative Program Steering Committee oversees the intellectual and strategic goals of the program, as well as any modifications or extensions to the agreement. The joint steering committee is responsible for reviewing and approving the activities to be developed under the cooperative agreement and, through its program directors, the implementation thereof.

From 2006 to November 30, 2011, the MIT-Masdar Institute Cooperative Program was managed at MIT through TDP. As of December 1, 2011, the Cooperative Program is being managed through the Office of the Provost, with professor Duane Boning serving as director. In Abu Dhabi, Professor Moavenzadeh, president of Masdar Institute, manages the Cooperative Program and collaboration with MIT.

Organization

Professor Moavenzadeh (Department of Civil and Environmental Engineering) is the director of TDP. Professor Nazli Choucri (Department of Political Science) is the associate director, and Patricia Vargas is the executive director.

Professor Duane Boning (Electrical Engineering and Computer Science) is the director of the MIT-Masdar Institute Cooperative Program (Office of the Provost). Ms. Vargas is the executive director, Charles Hsu is the assistant director of research and education, Paul Arsenault is the administrative/financial officer, Susan Cass is the director of communications, and Danielle Atwell is manager of outreach programs.

Fred Moavenzadeh

Director

Technology and Development Program

James Mason Crafts Professor of Engineering

Duane Boning

Director

MIT- Masdar Institute Cooperative Program (Office of the Provost)

Professor of Electrical Engineering and Computer Science