Section 6
MIT and Industry

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MIT and Industry

Since its founding in 1861, MIT has fostered a problem-solving approach that encourages researchers to work together across departments, fields, and institutional boundaries. The resulting collaborations have included thousands of fruitful partnerships with industry.

- Industry sponsored R&D at MIT totaled $128 million in FY2014.
- Over 750 companies provided R&D/gift support to MIT; 36 companies funded $1 million+, 193 companies funded $100 thousand–$1 million. trillion in annual world sales.

Entrepreneurial Ecosystem

MIT also understands the fastest path from innovation to commercialization is often lead by young, entrepreneurial start-up companies, and the Institute has taken great care to design and build a unique, highly effective entrepreneurial ecosystem. It brings the world's best and brightest into a culture of "Mens et Manus," i.e. "mind and hand" focused on discoveries of real, practical impact and strong commercial value.

MIT's vibrant entrepreneurial ecosystem benefits from its historical entrepreneurial culture, supported by specialized entrepreneurship programs and classes, student clubs, and networking across all MIT departments and schools and between MIT and the surrounding entrepreneurship and venture capital community. Formal MIT institutions like the Technology Licensing Office, Venture Mentoring Service, and the Deshpande Center for Technological Innovation are committed to the continued health and growth of the MIT entrepreneurial ecosystem.

The impact of MIT's entreprenueiral ecosystem was quantified by a 2011 Kauffman Foundation Entrepreneurship Study:

- 25,000+ companies have been founded by MIT alums creating 3.3+ million jobs and $2 trillion in annual world sales.
- Five states gaining the most jobs from companies started by MIT alumni were Massachusetts, with just under 1 million jobs; California, with 526,000 jobs; New York, with 231,000 jobs; Texas, with 184,000 jobs; and Virginia, with 136,000 jobs.
- MIT acts as a magnet for foreign entrepreneurs. Half of those companies created by "imported" entrepreneurs, 2,340 firms, are headquartered in the United States, generating their principal revenue ($16 billion) and employment (101,500 people) benefits here.

Partnering at MIT

Industry partners at MIT are global industry leaders who understand that technological advantage and innovation are key drivers to their competitive advantage. These are leaders who have created and defined industries, who quickly grasp the implications of breakthrough technology. Industry managers engage fully in MIT's collaborative, interdisciplinary culture, and join big thinkers who are perpetually focused on wringing practical applications from excellent ideas.

Strategic Partnerships

In 1994, MIT began to build new kinds of research partnerships, creating longer-term alliances with major corporations that would allow these companies to work with MIT to develop programs and strategies that address areas of rapid change. In return for their research and teaching support, the corporations share ownership of patentable inventions and improvements developed from the partnership. In a number of these alliances, funds are earmarked for specific education projects.

A selection of these partnerships are described below.

ExxonMobil
In 2014, ExxonMobil became a founding member of the MIT Energy Initiative (MITEI), a unique collaboration aimed at working together to advance and explore the future of energy. ExxonMobil has had a long and productive relationship with faculty and students at MIT, and in its most recent agreement collaborates on a wide range of projects, including research to improve and expand renewable energy sources and find more efficient ways to produce and use conventional hydrocarbon resources. The agreement also establishes 10 graduate energy fellowship appointments each year at MIT (ExxonMobil Energy Fellows). These fellowships will support operating costs and expenses for talented graduate students while they pursue their selected areas of study and research.

Novartis
Novartis and MIT have launched a long-term research collaboration aimed at transforming the way pharmaceuticals are produced. The partnership, known as the Novartis-MIT Center for Continuous Manufacturing, will work to develop new technologies that could replace the conventional batch-based system in the pharmaceuticals industry—which often includes many interruptions and work at separate sites—with continuous manufacturing processes from start to finish. The Novartis-MIT Center for Continuous Manufacturing combines the industrial expertise of Novartis with MIT's leadership in scientific and technological innovation.

Philips
In May 2015, Philips announced an alliance with MIT that will ultimately support MIT research in the company's core areas of health care and lighting solutions technology. The agreement follows the company's recent decision to move its North American research headquarters to Kendall Square, citing the area's concentration of startups and research labs—especially in the biomedical area—and for its proximity to MIT. Research projects under the alliance are expected to focus on areas such as lighting for green buildings and cities; clinical decision support; clinical informatics; interventional guidance, planning, and assessment; and medical ultrasound, photonics, and bioinformatics.

RIKEN
RIKEN is a nonprofit corporation with financial support furnished by the Japanese government and industry. It has funded research at MIT in learning and memory, neuroscience of higher order cognition, and plasticity of the developing and mature brain. Since its 1998 "Agreement for Collaboration in Neuroscience Research, the fruitful RIKEN collaboration has created the RIKEN-MIT Neuroscience Research Center, the RIKEN Brain Science Institute (BSI), and the RIKEN-MIT Center for Neural Circuit Genetics, directed by Nobel Laureate Susumu Tonegawa.

Samsung
Samsung chose MIT for its energy research focus and the decision to embark on this collaboration was made in parallel with the establishment of its Advanced Materials Lab in Cambridge. Current project topics include energy storage, all-inorganic quantum dot photovoltaics, computational materials design (materials genome), and functional layer-by-layer synthesis.

Tata
The MIT Tata Center for Technology + Design was founded in 2012 with generous support from the Tata Trusts. The Center's research and education mission is to develop solutions to challenges facing resource-constrained communities globally, with an initial focus on India. Center-affiliated faculty and graduate student Tata Fellows engage in hands-on projects, with an approach that is rigorous and relevant to societal, economic, environmental, and political factors. The Tata Center brings together technical, pedagogical, and organizational expertise from across MIT to provide holistic support to more than 40 projects in the developing world, focused on agriculture, energy, environment, health, urbanization, and water. See page 107 for more information.

Selected Projects

The Future of Food

MITCityFARM, a Media Lab project led by Caleb Harper, employs a methodology that has the potential to reduce water consumption for agriculture by 98%, eliminate chemical fertilizers and pesticides, double nutrient densities and reduce embodied energy in produce by a factor of ten. Harper hopes to catalyze a paradigm shift from traditional practice to resource leveraged and environmentally optimized urban food growing solutions. MITCityFARM exploits innovative research and development of hydroponic, aquaponic and aeroponic production systems, novel environmental, diagnostic and networked sensing, control automation, autonomous delivery and harvest systems, data driven optimization and reductive energy design.

http://www.wired.co.uk/magazine/archive/2014/10/features/server-farm

Programming Materials for Better Design

MIT's Self-Assembly Lab, directed by Skylar Tibbits, is harnessing the power of computer sciences to program the physical world to assemble and transform itself, taking advantage of the transformational potential of precise material, geometric, and kinetic properties. On a recent project with Airbus, the lab developed a programmable carbon fiber flap to control airflow; the flap automatically opens and closes based on temperature, altitude or pressure as the plane leaves the ground and flies. Such an adaptable component could minimize weight, dispense with the need for a failure-prone electromechanical actuator, and avoid the need for pilots to control it.

http://ilp.mit.edu/newsstory.jsp?id=20909

Body on a Chip Helps Accelerate Drug Discovery

The BIO-MIMETICS program at MIT, led by Linda Griffith, is part of a cooperative agreement between MIT and DARPA, developed to create a versatile microfluidic platform that can incorporate up to 10 individual engineered human microphysiological organ system modules in an interacting circuit. The modules will be designed to mimic the functions of specific organ systems representing a broad spectrum of human tissues, including the circulatory, endocrine, gastrointestinal, immune, integumentary, musculoskeletal, nervous, reproductive, respiratory and urinary systems. The goal of the program is to create a versatile platform capable of accurately predicting drug and vaccine efficacy, toxicity, and pharmacokinetics in preclinical testing.

http://ilp.mit.edu/newsstory.jsp?id=19645

Fiber Made by Transforming Materials

Chong Hou and researchers from fibers@MIT Group are practicing a kind of "alchemy," turning inexpensive and abundant materials into high-value ones. Drawing thin fibers from bulk materials is nothing new, but the group discovered that when aluminum metal and silica glass are heated and drawn, they react chemically and produce a fiber with a core of pure, crystalline silicon—the raw material of computer chips and solar cells—and a coating of silica. It's the first time fibers created through this method can have a composition that's completely different that of the starting materials. Yoel Fink, who leads fibers@MIT, says the technology could open new possibilities for electronics—including solar cells and microchips—to be incorporated into fibers and woven into clothing or accessories.

http://news.mit.edu/2015/high-quality-fiber-electronic-devices-0220

Raising the IQ of UAVs

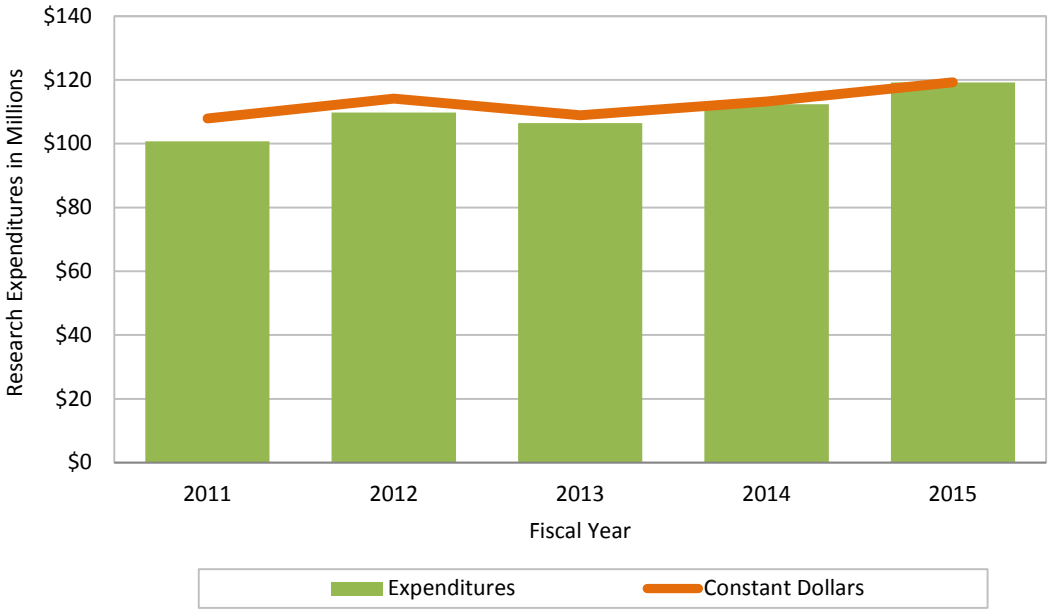
Before drone-delivered packages can become a reality, UAVs need to be taught to think for themselves. Nick Roy, former head of Google Inc.'s drone-delivery project, Project Wing, and now director of MIT's Robust Robotics Group, says that UAVs require more autonomy to avoid collisions and crashes, as well as to understand what's happening around them. Roy is studying the use of approximation algorithms to surmount computational challenges of fusing and integrating data from multiple sensors. Ultimately, the group hopes to develop sophisticated algorithms to enable UAVs to take instructions from people or collaborate with them.

http://ilp.mit.edu/newsstory.jsp?id=21067

Campus Research Sponsored by Industry

Industry Campus Research Expenditures (in U.S. Dollars)
Fiscal Years 2011–2015

	2011	2012	2013	2014	2015
Campus research	100,762,512	109,744,829	106,447,700	112,379,455	119,238,077
Constant dollars*	107,867,456	114,138,999	108,897,368	113,197,553	119,238,077



*Constant dollars are calculated using the Consumer Price Index for All Urban Consumers weighted with the fiscal year 2015 equaling 100.

Leading Departments, Laboratories, and Centers Receiving Support in Fiscal Year 2015
(shown in descending order of expenditures)

MIT Energy Initiative
Chemical Engineering
Mechanical Engineering
Computer Science and Artificial Intelligence Laboratory
Koch Institute for Integrative Cancer Research
Media Laboratory
School of Management
Center for Transportation and Logistics
Chemistry
Aeronautics and Astronautics

MIT is a leader in conducting research sponsored by industry. Over 200 industrial sponsors supported research projects on the MIT campus in FY2015, with over $119 million in expenditures. Companies often join together in these collaborations to support multi-disciplinary research programs in a wide range of fields.

Managing the Industry/ University Interface

Drawing on decades of successful industry collaboration, MIT has assembled a coordinated team of professionals who expertly manage the important industry/ university interface, leveraging and exploiting proven pathways for two-way knowledge transfer.

Industrial Liaison Program

Officers at MIT's Industrial Liaison Program (ILP) help company managers by scheduling and facilitating face-to-face meetings with MIT faculty, coordinating on-campus networking activities, and advising company managers on how to navigate, adapt and benefit from the dynamic, interdisciplinary MIT environment. Two hundred of the world's leading companies partner with the Industrial Liaison Program to advance their research agendas at MIT, and ILP member companies account for approximately 44% of all single-sponsored research expenditures and corporate gifts/grants at MIT (FY2014).

Office of Corporate Relations

MIT's Office of Corporate Relations (OCR), the organizational parent of the ILP, aids and directs companies interested in pursuing significant, multi-year, multi-disciplinary involvement with the Institute. OCR works with MIT senior administration, faculty, and company executives to structure and define individualized alliances that mutually benefit the company and MIT. The result is a holistic industry/ university relationship that addresses broad needs and interests, from specific research projects and initiatives, to executive education, technology licensing, and recruitment.

Office of Sponsored Programs

The Office of Sponsored Programs' mission is to conduct the centrally organized administrative, business, and financial functions related to award administration and to assist faculty, principal investigators, and their administrators in the identification of resources for and the management of individual sponsored projects consistent both with MIT's academic and research policies and with the stewardship requirements of and obligations to external sponsors.

Technology Licensing Office

The MIT Technology Licensing Office (TLO) is a world class model of excellence in university technology licensing. Its staff is especially attuned to the needs of pre-competitive research and promotes an Intellectual Property protocol that accelerates commercialization, and, at the same time, honors MIT's obligations to education and research. The TLO oversees a vibrant flow patenting/licensing activity

Technology Licensing Office Statistics for FY2015

Total number of invention disclosures:	795
Number of U.S. new utility patent applications filed:	293
Number of U.S. patents issued:	314
Number of licenses granted (not including trademarks and end-use software):	91
Number of options granted (not including options as part of research agreements):	33
Number of software end-use licenses granted:	33
Number of companies started (number of new license or option agreement to MIT technologies that serve as the foundation for a start-up company):	28

Entrepreneurship

MIT is recognized as one of the most entrepreneurial universities in the world. Its faculty ranks include hundreds of serial startup founders, and its hands-on approach to education encourages students to make a difference in the world by discovering and exploiting new technologies. The science-based ventures coming out of MIT helped transform Kendall Square into a major hub of biotech innovation, and the area thrives today with startups representing an array of industries from energy, to healthcare, to nanotech to advanced manufacturing.

$100K Entrepreneurship Competition

The MIT $100K Entrepreneurship Competition (student group) is the leading business plan competition in the world. The competition was founded in 1990 to encourage students and researchers in the MIT community to act on their talent, ideas, and energy to produce tomorrow's leading firms. Entirely student-managed, the competition has produced hundreds of successful ventures that have created value and employment.

Deshpande Center for Technological Innovation

The Deshpande Center for Technological Innovation was established at the MIT School of Engineering in 2002 to increase the impact of MIT technologies in the marketplace, and support a wide range of emerging technologies including biotechnology, biomedical devices, information technology, new materials, tiny tech, and energy innovations. Since 2002, the Deshpande Center has funded more than 80 projects with over $9 million in grants. Eighteen projects have spun out of the center into commercial ventures, having collectively raised over $140 million in outside financing. Thirteen venture capital firms have invested in these ventures.

Martin Trust Center for MIT Entrepreneurship

The Martin Trust Center for MIT Entrepreneurship is committed to fostering and developing MIT's entrepreneurial activities and interests in three primary areas: education and research, alliance, and community. The Center educates and nurtures students from across the Institute who are interested in learning the skills to design, launch, and grow innovation-based ventures. The Center facilitates business and technology partnerships by combining breakthrough academic research with practical, proven experience. The people of the Center cultivate and nourish a thriving network that unifies academic, government, and industry leaders around the vision of entrepreneurial success.

MIT Startup Exchange

MIT Startup Exchange (STEX) connects industry to startups from across the MIT innovation ecosystem, fostering interactions that lead to strong partnerships. ILP members can engage the STEX community including 1000 active MIT-connected startup companies at all stages of development and representing seven technology clusters: ICT, Biotech, Nanotech, Energy Tech, Advanced Manufacturing, Healthcare, and Hybrid Innovation. STEX runs monthly workshops on topics in technology and innovation including robotics, mobility, biotech, energy, food, and cybersecurity. MIT STEX is a service of MIT's Industrial Liaison Program (ILP).

Venture Mentoring Service

Venture Mentoring Service (VMS) supports innovation and entrepreneurial activity throughout the MIT community by matching both prospective and experienced entrepreneurs with skilled volunteer mentors. VMS uses a team mentoring approach with groups of 3 to 4 mentors sitting with the entrepreneur(s) in sessions that provide practical, day-to-day professional advice and coaching. VMS mentors are selected for their experience in areas relevant to the needs of new entrepreneurs and for their enthusiasm for the program. VMS assistance is given across a broad range of business activity, including product development, marketing, intellectual property law, finance, human resources, and founders issues. VMS services are offered without charge to MIT students, alumni, faculty and staff in the Boston area.

Learning

Sloan Executive Education

MIT Sloan Executive Education programs are designed for senior executives and high-potential managers from around the world. From intensive two-day courses focused on a particular area of interest, to executive certificates covering a range of management topics, to custom engagements addressing the specific business challenges of a particular organization, their portfolio of non-degree, executive education and management programs provides business professionals with a targeted and flexible means to advance their career development goals and position their organizations for future growth.

Professional Education

MIT Professional Education provides short courses, semester or longer learning programs and customized corporate programs for science and engineering professionals at all levels. Taught by renowned faculty from across the Institute, MIT Professional Education programs offer professionals the opportunity to gain crucial knowledge in specialized fields to advance their careers, help their companies, and have an impact on the world.

- Short Programs—Over 40 courses, in two-to-five day sessions, are taught on the MIT campus each summer by MIT faculty/researchers and experts from industry and academia. Participants earn Continuing Education Units (CEUs) and a certificate of completion.

- Advanced Study Program—Enroll at MIT for a 16-week, non-matriculating, non-degree program that enables professionals to take regular MIT courses to gain the knowledge and skills needed to advance their careers and take innovative ideas back to their employers. Participants earn grades, MIT credit, and an Advanced Study Program certificate.

- Custom Programs—Enhance your organization's capabilities and expertise through customized programs tailored to meet your specific needs and priorities. These programs can be a single week or several weeks over a year with interrelated projects. These specialized courses can be delivered at MIT, the company site, or off site.

Leaders for Global Operations

The Leaders for Global Operations (LGO) program is an educational and research partnership among global operations companies and MIT's School of Engineering and Sloan School of Management. Its objective is to discover, codify, teach, and otherwise disseminate guiding principles for world-class manufacturing and operations. The 24-month LGO program combines graduate education in engineering and management for those with two or more years of full-time work experience who aspire to leadership positions in manufacturing or operations companies. A required six-month internship comprising a research project at one of LGO's partner companies leads to a dual-degree thesis, culminating in two master's degrees—an MBA (or SM in management) and an SM in engineering.

MIT Sloan Fellows Program in Innovation and Global Leadership

This full-time, 12-month (June–June) immersive MBA program is designed for high-performing mid-career professionals. The program typically enrolls more than 100 outstanding individuals with 10–20 years of professional experience from at least two dozen nations, representing a wide variety of for-profit and nonprofit industries, organizations, and functional areas. Many participants are sponsored by or have the strong support of their employers, but the program also admits independent participants, many with unique entrepreneurial experiences and perspectives. The program is characterized by a rigorous academic curriculum, frequent interactions with international business and government leaders, and a valuable exchange of global perspectives.

System Design and Management

System Design & Management (SDM) is the MIT master's program in engineering and management. Jointly offered by MIT's School of Engineering and the Sloan School of Management, SDM educates mid-career professionals to lead effectively and creatively by using systems thinking to solve large-scale, complex challenges in product design, development, and innovation.

Recruiting

Global Education and Career Development

The MIT Global Education and Career Development center assists employers in coordinating successful on- and off-campus recruitment of MIT students and provides students with opportunities to interact and network with professionals and obtain quality internships and full-time positions. MIT is proud to serve the needs of undergraduates (including Sloan), graduates and MIT alumni. (Departments that conduct their own recruiting include Chemistry, Chemical Engineering, and Sloan School of Management).

Sloan's Career Development Office

Sloan's Career Development Office (CDO) serves a vital role in connecting MIT Sloan's innovative master's students and alumni with the world's leading firms. The CDO is dedicated to supporting employer recruiting goals and helping them identify the best candidates for their organization.