System Design and Management

MIT's System Design and Management (SDM) program is a master's of science degree program that combines an intensive, unified core subject sequence with related subjects from the School of Engineering and the Sloan School of Management. The program brings together innovative distance learning, flexible matriculation options, and an interdisciplinary perspective. SDM completed its 23rd year of operation in academic year 2019.

There are two program tracks: the SDM track, which completed its 23rd year of operation in AY2019, and the Integrated Design and Management (IDM) track, which admitted its fourth cohort in fall 2018. The SDM track focuses on teaching mid-career professionals to lead effectively and creatively by using systems thinking to solve large-scale, complex challenges in a variety of industries and professions. In the IDM track, students use a human-centered design process as a foundation as they work to solve complex problems and to create innovative products and companies.

Academics and Research

The SDM track continues to exhibit its commitment to education and to research in systems thinking. In the spring semester, students complete projects in partnership with sponsors from a variety of industries. In AY2019, these projects were presented in a poster session in MIT's Lobby 7 for the first time, allowing students to display and explain their work to the MIT and Cambridge, MA, communities.

The SDM program continues to improve the synchronous distance education capabilities for the integrated core class. The yearlong SDM core course is now delivered via Zoom meeting software, allowing distant certificate and master's degree students to attend two lectures and two recitations each week together with on-campus students.

SDM also held a comprehensive review of the engineering subject choices for the SDM degree during the academic year. The purpose of the study was to identify connections between the key concepts taught in the SDM core and those explored through other graduate engineering courses at MIT.

Communications and Outreach

The MIT SDM Systems Thinking Webinar Series continued into its 10th year, offering live and on-demand streaming of lectures to students, alumni, and the general public. SDM also sponsored a booth at the Grace Hopper Celebration of Women in Computing in Houston, TX, as a form of outreach to prospective students and recruiters from industry.

SDM held several events aimed at highlighting the continued relevance of the program to industry. A "Systems Night" networking event for current students and alumni was held in October 2018. Selected alumni gave brief "lightning talks" on how they integrate systems thinking into their work. SDM also hosted an event in partnership with the Boston Product Management Association (BPMA). BPMA members and SDM alumni spoke about their daily routines and challenges as product managers in a range of different industries.

The event was attended by more than 100 SDM and MIT students and members of BPMA. SDM plans to hold more events in conjunction with BPMA in the future.

SDM also had the opportunity to visit multiple companies on two separate trips to observe operations, talk with high-level executives, and introduce the SDM perspective in discussions. Innovation Discovery Japan (IDJ) was organized by SDM students Hiroyuki Ikukawa '17, Ayano Kagami '17, Takuya Kashimura '17, Koji Nakashima '18, Yuki Soeda '18, Ryuichi Takagi '18, and Yasutsugu Tamura '18. A group of 27 MIT undergraduate and graduate students and staff from across the Institute traveled to three cities in Japan during the January Independent Activities Period. The group visited 20 companies that ranged in size from small start-ups to global manufacturers, including Honda, Japan Rail Central, Toyota, and teamLab. A second trip took place during spring break in March 2019. This annual SDM trek to San Francisco included visits to eight companies, including Facebook, Google, Blue River Technologies, and Potrero Medical. Thirty-six students and staff were able to speak with C-level executives, tour manufacturing facilities, and network with program alumni who shared their experiences in industry after graduation. This trip was also spearheaded by students; the co-chairs were Lisa Crofoot '18 and Monisha Pushpanathan '18, working in conjunction with SDM staff. SDM also held smaller local visits to companies in Boston, including the Cambridge offices of Google and Facebook.

Industry Partners and the Graduate Certificate in Systems and Product Development

The MIT Graduate Certificate Program in Systems and Product Development is now in its 18th year; 568 students have completed the program to date. Students enrolled in the certificate program attend the SDM core course, synchronously but at a distance, with the SDM master's degree students; they also participate in teams, study groups, and projects. The certificate program culminates in a capstone project that integrates in-class learning with real-world projects from the students' sponsoring companies. Company sponsors have included Deere & Company, Lawrence Livermore National Laboratory, Cummins, Boeing, United Technologies Corporation, the Charles Stark Draper Laboratory, Inc., Analog Devices, Inc., and BioMérieux, among others. Deere & Company has sponsored more than 170 students in either the master's or the certificate program. Enrollment for the certificate program in AY2019 included 34 students sponsored by six companies.

SDM also invites industry participation in spring projects for the SDM core subject. The program received 40 responses to its call for projects from industry for spring 2019. These proposals spanned multiple domains and industries—aerospace, automotive, defense, energy, government, health, life sciences, infrastructure, maritime, petrochemical, operations, and transportation. Of these, SDM students selected 22 proposals and worked in teams to identify, analyze, and present possible solutions to these complex real-world problems.

Student Awards and Achievements

Alejandro Diaz '18 received the Society of Hispanic Professional Engineers Technical Achievement and Recognition (STAR) Award. The award honors outstanding professionals for their dedication and commitment to advancing Hispanics in STEM careers.

Roland de Filippi '18 led the MIT team that participated in NASA's 2019 Moon to Mars Ice and Prospecting Challenge in the Revolutionary Aerospace Systems Concepts Academic Linkage. The MIT team was first to extract water during the competition and received an honorable mention for its overall performance as well as an award for best technical paper.

Javier Gotschlich Praus '17 received the MIT SDM Student Award for Leadership, Innovation, and Systems Thinking. The other finalists were Ayano Kagami '17 and Eric Xu '17.

Tareq Saqr '18 received an Endowed Fellowship of the Arab Republic of Egypt, recognizing outstanding scholarship by students from Egypt.

Pankhuri Sen '17 received a Cadence Women in Technology Scholarship, awarded to female students who exemplify leadership and demonstrate passion for technology.

Andrew Tsang '17 received a Legatum Fellowship. He founded the startup InSanirator, which is participating in MIT's 2019 Delta V Summer Accelerator program.

Nick Dowmon and Ajie Nayaka Nikicio, both SDM '18, were software and electronic systems leads, respectively, for the MIT Hyperloop II team. That team received an Innovation Award and placed first of the US teams and fifth internationally at the SpaceX Hyperloop Competition IV.

Admissions

SDM's marketing and admissions teams continued to focus on reaching out and educating potential students and companies about SDM. The team uses a combination of in-person information evenings—which target local technical professionals, including MIT alumni and others interested in the program—and virtual information sessions. SDM held three virtual sessions in AY2019, enabling prospective students from around the world to attend live webcasts or view the recorded sessions on demand.

SDM used Slate, an admissions software platform also used by the Sloan School, for the AY2019 admissions cycle. Two staffers attended in-person training and conferences to continue their education on the new platform, which will allow for better tracking and retention of applicants at all stages.

Sixty-six master's degree students entered the SDM program in August 2018. The majority of these students (66%) attended the program full-time on campus; the rest were split evenly between distance students and local commuters. Distance and commuter students remained employed while pursuing the SDM degree. In addition to students from corporate backgrounds, there were seven students from four US military branches (Air Force, Army, Coast Guard, and Navy). The overall yield of admitted students remained above 90%.

System Design and Management Admissions and Student Statistics, AY2010–AY2019

Year	2009	2010	2011	2012	2013	January 2014	August 2014	2015	2016	2017	2018
Applications	141	117	190	256	222	111	248	296	175	170	172
Self-funded admitted students	57	50	51	39	41	52	33	60	59	35	38
Company-sponsored admitted students	27	22	24	23	21	17	16	11	13	29	29
Total admitted students	**84**	**72**	**75**	**62**	**62**	**69**	**49**	**71**	**72**	**64**	**67**
Enrolled current round	63	52	63	56	57	41	43	59	57	58	64
Deferred acceptance to future year	3	8	6	5	1	19	4	4	4	3	3
Prior year deferral enrolled	1	2	8	6	5	1	19	4	2	2	2
Total enrolled	**64**	**54**	**71**	**62**	**62**	**42**	**62**	**63**	**59**	**60**	**66**
Research assistants	0	14	12	12	6	7	10	6	15	19	24
Distance students	19	10	11	11	15	4	16	8	4	4	5

Note: The start of the program was changed in 2014 from January to September. Two cohorts were admitted in 2014 (one in January, another in September). Students admitted for January 2014 were given the option to start in either January or September.

Nineteen admitted students deferred their start date to September 2014. "Deferred acceptance" and "prior year deferral" are not always equal; there have been students that do not enroll after deferral.

"Research assistants" indicates the number of students who held assistantships during the academic year

Faculty and Staff

SDM continues to be led by faculty co-directors Warren Seering and Steven Eppinger, Executive Director Joan Rubin, and Academic Director and Senior Lecturer Bryan Moser.

Ben Linville-Engler, an SDM alumnus, was hired as the industry and certificate director to facilitate the program's relationships with companies and oversee the certificate program. Amanda Peters joined as the SDM and IDM manager of career development, with responsibilities covering all aspects of career planning and development of employment skills, internship and full-time recruiting of students, and promoting the program to recruiters. Jazy Ma was hired as the new SDM and IDM financial officer. Naomi Gutierrez was promoted to the role of communications and alumni administrator.

Master of Engineering Management Program Consortium

The Master of Engineering Management Programs Consortium (MEMPC) continues to provide benefits to SDM through the sharing of best practices in admissions, program content and administration, and alumni support. In addition to MIT, consortium members now include Cornell University, Dartmouth College, Duke University, Johns Hopkins University, Northwestern University, Purdue University, Tufts University, and the University of Southern California. Regional alumni groups are active in Boston, New York City, Washington, DC, and Chicago. SDM hosted the consortium's spring meeting

on April 11–12, 2019. In addition, SDM hosted the first-ever MEMPC Design and Pitch Competition on April 12, 2019. Teams of students from the nine programs were challenged to design innovative concepts and solutions and deliver business pitches to a panel of judges.

Integrated Design and Management

Students in the IDM track use a human-centered design process as a foundation for thoughtful leadership as they strive to create innovative products and companies and to solve complex problems. IDM combines a studio environment with in-depth instruction in engineering, management, and design. Lectures by engineering and management faculty, practitioners, thought leaders, and entrepreneurs round out the curriculum.

IDM draws students with backgrounds in engineering, business, and design—the elemental components for achieving financially sustainable, feasible, and desirable solutions and products. The admissions team deliberately selects participants for their desire to have a meaningful impact on the world. The mission of the IDM track is to develop extraordinary leaders who will bring creativity, vision, and integrity to business and society.

In AY2019, the cohort increased to 26 students—11 male and 15 female, with nine in business, nine in engineering, and eight in design. IDM is in its fifth year and has graduated three classes to date. SDM most recently admitted 27 students for the cohort starting in the fall of 2019, nine into each discipline; 13 students are male and 14 female. Among these, the program will be welcoming international students from Australia, China, Colombia, Dominican Republic, India, Indonesia, Mexico, Pakistan, Singapore, South Korea, Taiwan, and Turkey.

IDM's core curriculum is known as the Integrated Design Lab. This studio-style course, located in MIT's D-Lab, consists of lectures, workshops, seminars, and teamwork. The class meets twice weekly for five hours each day. Its blended learning approach emphasizes the importance of mind and hand, plus heart. Degree requirements for graduation also include engineering and management foundation subjects and elective subjects along with a final project and complementary thesis. This is consistent with the SDM track.

Integrated Design Management Events

IDM hosted its annual sales gala on December 13, 2018. During this event, student teams sold products that they had designed and built, and of which they had manufactured at least 50. All teams successfully sold out their inventory and turned a profit. More than 100 people from MIT and industry attended.

In the spring term, IDM students and industry partners presented more than 20 potential product opportunities, from which eight working projects were selected. The final products were presented at a May 15, 2019, event.

In June 2019, IDM graduated 19 students.

Integrated Design Management Outreach

IDM has been active in establishing community partnerships, building industry relationships, and engaging companies through annual events. In AY2019, program outreach specifically included:

- Nurturing community partnerships with Innovators for Purpose and the Atlantis Charter School;

- Building industry relationships with Continuum, Brio Systems, Techstars, Foundation Capital, IDM, Stylus Publishing, EmberTribe, Microsoft Corporation, Avatech, Youth Cities, Rhoost, the Ministry of Supply, OnShape, the Solo Project, and more; and

- Engaging companies through local design and manufacturing treks to Bose Corporation, Altitude (product design; owned by Accenture), NN Inc., and Bruce Diamond Corporation.

Integrated Design Innovation Consortium

IDM was instrumental in creating the Integrated Design Innovation (IDI) Consortium. Co-founding consortium members are from Northwestern University, the University of Pennsylvania, and Carnegie Mellon University. Harvard University, Hong Kong Polytechnic University, Northumbria University, and many others have shown strong interest.

The IDI Consortium is a collaboration of graduate programs that integrate design, engineering, and business. Its programs provide students with tools to make the world a better place. Its graduates understand their responsibility to approach complex problems with empathy, integrity, and optimism. IDI programs do this by:

- Teaching students a human-centered design process for framing problems and generating creative, innovative solutions to social and business problems;

- Helping define what is desirable as advances in technology make more things possible while employing new technologies to create compelling user experiences; and

- Exploring and defining what is healthy and fulfilling for the Earth and society.

As leaders of academic programs on integrated design innovation, the IDI Consortium members are uniting to share best practices and raise awareness of integrated design among prospective students, peer programs, project partners, and potential employers.

IDM hosted the IDI Design Challenge on February 8–9, 2019, when teams from Northwestern University, Carnegie Mellon University, and the University of Pennsylvania visited MIT to collaborate on reducing food insecurity on campuses and enhancing Feeding America initiatives.

Integrated Design Management Admissions and Student Statistics

Year	2015	2016	2017	2018
Applications	41	102	161	185
Company admissions	0	0	0	0
Self-sponsored admissions	19	25	33	31
Total admissions	**19**	**25**	**33**	**31**
Enrolled (current round)	18	21	22	26
Total enrolled	**18**	**21**	**22**	**26**
Research assistants	0	0	4	11
Distance education	0	0	0	0

Awards for Integrated Design Management Students

Juliet Wanyiri '17 and Chinh Bui '18 received Legatum Fellowships.

Nidhi Sharma '17 received a Tata Fellowship.

Melody Mui '17 received an Angela Leong Fellowship Fund Award.

Ameneh Fadaie '18 received a Neekeyfar Award.

Helena Briones '18 received the La Caixa Scholarship.

Andrea Diaz Baquero '19 received the Fulbright–MinTIC Scholarship.

Dipo Doherty '18 received an Honorable Mention for the 2019 Harold and Arlene Schnitzer Prize in the Visual Arts.

Jill Qua, Nidhi Sharma, Saranya Rukmangadhan, and Jiani Zeng (IDM '17 and Team Luna) received the Gold Prize in the Home Interior Products, Kitchen Accessories, and Tabletop category and the Bronze A Design Award in the Bakeware, Tableware, Drinkware, and Cookware Design category from International Design Awards.

Kamin Phakdurong, Yang Yang (IDM '16), Ming-hui "Jenson" Wu, and Xiaoyu "Sharon" Yan (IDM '18) received a $2,500 cash prize at City Robotics: Design-a-Hack-a-thon for People-Centric Mobility.

Samip Jain, Ming-hui "Jenson" Wu (IDM '18), Jill Qua, Karen Chen (IDM '17), and Pushpaleela Prabakar (IDM '16) participated in the MIT Hyperloop II team.

Alumni Employment Report

IDM has graduated three cohorts—a total of 58 alumni. Of this number, 51% are women. Companies founded by IDM students include Waypoint Resource Group (Sara Remsen '15), Kalani (Attia Qureshi '16), BloomerTech (Alicia Rodriguez Chong '15 and Aceil Halaby '15), Skillist (Matthew Tucker '15), Atolla Skin Lab (Meghan Maupin '16), Avir Technologies (Honey Bajaj '15), Human Element (Alex Klein '16, Prateek Kukreja '16, and Saluka Amarasinghe '17), and LookAlive Studio (Kamin Phakdurong and Yangyang Yang '17).

About a third of SDM's alumni have started their own companies after graduation. A small percentage pursued continuing education and the majority found employment with companies.

Staff Changes

Grace Agosto, events and administrative assistant, joined the team in June 2019.

Steven Eppinger
SDM Co-Director

Warren Seering
SDM Co-Director

Joan Rubin
SDM Executive Director

Matthew Kressy
IDM Director