

MIT Portugal Program

The [MIT Portugal Program](#) (MPP) is a strategic international partnership between Portuguese universities and research centers, the Massachusetts Institute of Technology, and the Portuguese government. The program has built interactions and collaborations with a collection of industrial partners. Program funding is provided both by the Fundação para a Ciência e Tecnologia (FCT), the Portuguese Science and Technology Foundation, and by a number of industrial partners. Launched by the Portuguese government in 2006 and renewed in 2013, MPP's goal is to strengthen the country's knowledge base and international competitiveness through strategic investments in people, knowledge, and innovative ideas.

Since 2015, MPP has been hosted by the MIT Institute for Data, Systems, and Society. In 2015, the program leadership passed from Professor Dava Newman, who took over from MPP's founding director, Professor Daniel Roos, to Professor Bruce Tidor. By early 2016, the program had enrolled more than 950 students in Portugal, supported more than 200 MPP students and scholars at MIT, and involved 270 faculty in Portugal as well as 80 faculty and 30 staff researchers at MIT. MIT faculty and research and teaching staff have come from departments in all five Schools at MIT. Broad institutional support and expertise have played a significant role in the success the MIT Portugal Program.

During its first phase (2006–2013), MPP focused on the internationalization of Portuguese universities in four focus areas: bioengineering systems, engineering design and advanced manufacturing, sustainable energy systems, and transportation systems. The efforts and programs of the first phase enabled Portuguese universities to overcome long-standing patterns of isolation and competition by encouraging inter-university cooperation through joint partnerships with MIT. MPP has contributed to the strengthening of innovation and entrepreneurship at Portuguese universities through a variety of activities—from venture competitions to entrepreneurial education—and contributed to significant higher education reforms in Portugal. The first phase of MPP led to the construction of innovative curricula across Portuguese partner universities. Portuguese universities involved in MPP offered doctoral programs and advanced courses in its four focus areas to future leaders in technology and innovation. MPP contributed to the formation of a wider community of affiliated Portuguese universities and to collaborations with MIT, industrial partners, innovators, and entrepreneurs from within Portugal and around the world. These improvements helped generate hundreds of scientific papers and contributions to international conferences. MPP, with the support of FCT, successfully funded more than 20 research projects, enabled the creation of more than a dozen startups by students, graduates, researchers, and faculty; and achieved visible impact and cultural change within Portugal and beyond.

In its second phase (2013–2017), with a reduced budget, MPP has concentrated on a smaller set of key objectives. These include supporting a higher education ecosystem directly connected to technology development and innovation; promoting a thriving relationship among graduate students, faculty, and industry experts through collaborative projects; and further developing trans-disciplinary innovation and entrepreneurship activities. These objectives aim to maximize knowledge transfer and the translation of

technology-based ideas into economic value. A goal of this second phase is to focus the MIT input on research, innovation, and hosting and co-supervising students at MIT.

The second program phase focuses on improving the innovation ecosystem and developing and fostering integrated research activities in joint university-industry partnerships—projects intended to create value and contribute to sustainable economic growth through the development of new knowledge-based products and services. This is supported by new mechanisms for joint university-industry research at a national and international level through seed and test-bed research projects.

Test-bed research projects are designed as partnerships that include universities, public institutions, industry, and other private organizations. These collaborative and integrated research projects are strongly supported by funding from FCT and contributions from private sector test-bed collaborators for a duration of up to three years and with the objective of developing innovative technologies leading to new products and services with potential to advance Portugal's international competitiveness and innovative capacity, ultimately contributing to the growth of the Portuguese economy. These large-scale, test-bed projects are complemented by exploratory seed projects. MPP researchers have attracted industry and other private and public partners. Corporate research partners and companies involved in MPP's innovation and entrepreneurship activities have formed the core of a community that is being engaged in MPP's Industrial Advisory Committee.

The program's success in attracting support for test-bed research from private and public institutions outside of MPP, exceeding 30% of total project funding, and an average annual number of PhD candidate applications and PhD graduates surpassing the accomplishments of the first phase, led to the Program Governing Committee's decision to recommend to FCT the release of additional funding.

The MIT Portugal Program has advanced the internationalization of Portuguese universities through an increasing number of international students and graduates. By the summer of 2016, MPP had received more than 3,500 student applications. The program attracts many students from outside Portugal, with the number of international applicants (from more than 25 nations) averaging 52%. To date, MPP has enrolled more than 950 PhD and master's degree students at participating Portuguese universities, and 434 of these students have graduated since the start of the program, including 29 PhD students that transferred to MPP's program in transportation systems. As the number of successful MPP graduates has grown, the program has taken significant steps toward developing an alumni network.

Over the years, MPP has become a widely known success and a role model for multi-stakeholder alliances involving universities, industry, governmental agencies, and international partners with the goal of increasing international competitiveness.

Program Highlights

Education

MPP offers a trans-disciplinary curriculum in PhD and master's programs across four focus areas: bioengineering systems, sustainable energy systems, transportation systems, and engineering systems. During the last calls for graduate student applicants, more than 1,300 applications were received for the MPP doctoral and master degree programs. In addition, 92 PhD and 12 master's students graduated since 2014 from the different programs. A total of 434 students have graduated since 2006. MPP conducted a survey among PhD graduates that provided valuable information about their professional development and experiences. Further, MPP has initiated a similar survey directed at master's program graduates. Since 2014, 60 PhD students have been hosted at MIT. In the same period, MIT faculty hosted nine Portuguese scholars for academic exchange, research, and collaboration, further strengthening already strong ties among MPP faculty.

Research

In the second phase of the collaboration, MPP introduced large-scale research projects conceived as test beds that address research topics in a holistic fashion through integrated, multidisciplinary approaches. A first call for test-bed projects identified three projects for funding in three research areas: Sustainable Cities (SusCity), led by John Fernandez; Stem Cell Engineering and Regenerative Medicine (CardioStem), led by Robert Langer and Jeffrey Karp; and Introduction of Advanced Materials Technologies (IAMAT), led by Brian Wardle. All three projects advanced research and collaboration between industry and academic partners. Overall, these projects succeeded in attracting additional private funding exceeding 30% of the total project funding.

In addition to the test-bed projects, five seed projects were selected for funding at MIT. Seed projects were introduced to stimulate and foster novel, early-stage research that could be synergistic with research in test-beds or enhance MPP in other ways, e.g., by increasing the impact, sustainability, and visibility of the program. Current seed projects are:

- Recycling system architecture enabling economic value recovery in Portugal: Consumer electronics case study (led by Elsa Olivetti)
- Sustainable polyurethane-like materials for engineering plastics and biomedicine (led by Bradley Olsen)
- Sustainability urban mobility: The role of autonomous and connected vehicles (led by Carolina Osorio)
- The transport properties of targeted therapeutics via coarse-grained simulation (led by James Swan)
- Value of solar energy systems with storage in Portugal (led by Jessika Trancik)

The following MIT faculty members and researchers greatly supported MPP in all of its programmatic and functional areas: Richard De Neufville, Herbert Einstein, Stan

Finkelstein, Paula Hammond, John Heywood, Richard Larson, Kristala Prather, Leia Stirling, Joseph Sussman, and Christopher Zegras.

Innovation and Entrepreneurship

MPP has attracted two “innovation professors,” Nuno Arantes-Oliveira and João Bigotte, within the Technological Change and Innovation Initiative of MPP. Both are making critical contributions to MPP’s efforts toward the sustainability of program activities. MPP has also put in motion an additional approach for industry engagement through area-specific academia-industry roundtables, which aim to connect MPP faculty and students to industry players. In an effort to continue the stimulation and facilitation of entrepreneurial activities in Portugal, MPP continued to engage Portuguese startup companies through different channels, including the Building Global Innovators program, educational programs and workshops, and direct interactions with companies and innovation hubs. In 2016, the second International Workshop on Innovating took place at MIT. The workshop represents a week-long immersion into novel ways of understanding how to innovate. Innovations solve real-world problems, and their impact transcends the object and the organization innovators build.

MIT International Science and Technology Initiatives Portugal Program

The MIT International Science and Technology Initiatives (MISTI) program officially incorporated a program in Portugal in August 2014. The first eight MIT students went to Portuguese companies, research institutes, and universities during the summer of 2015. MPP kick-started the MISTI Portugal Program with initial funding. Expenses were fully or partially covered by Portuguese companies for their visiting intern students. MISTI and MPP covered the cost for students who visited universities and research institutes. In the future, MISTI is considering a collaboration with the International Research Opportunities Program, which might provide funds to undergraduate students that intern at research institutes or university labs in Portugal. The MISTI Spain and Portugal managing director, Alicia Goldstein Raun, coordinated the application and placement process and relationship with hosts. Applicants followed the application procedures in accordance with the MISTI timeline and requirements. Priority was given to MPP-associated companies and institutes. In 2016, seven MIT students were selected to work at Portuguese companies, research centers, and universities.

Events and Outreach

Each year, MPP hosts a number of events, both at MIT and in Portugal, to promote research, education, and innovation and to help foster MPP student and researcher interactions with industry and the public. Selected events are highlighted below.

Annual Conference

The 6th annual MIT Portugal conference, MIT Portugal: 10 Years Engineering a Better Future, featured a range of speakers from Portuguese universities, industry partners, and MIT. It also welcomed members from across Portugal’s scientific, industrial, and education communities. As in previous years, the conference included a poster session to highlight contributions from MPP PhD students and ongoing research projects, and ended with a best-poster award and a graduation ceremony for recent MPP PhD and master’s program

students. The keynote address was delivered by Douglas Hart, professor of mechanical engineering and the MIT Innovation and Entrepreneurship lead in MPP, on the topic “MPP: Building the Future—New Horizons: Engaging Industrial Innovation.”

Workshop

MPP was represented at the workshop Atlantic Interactions: Knowledge, Climate Change, Space, and Oceans, held at the Institute of International Education in New York. The event was organized by the Fundação para a Ciência e a Tecnologia in the framework of the celebrations of the Day of Portugal. The workshop launched discussions regarding the role of the Azores as an international hub for research in the areas of space, climate change, and oceanography. The discussion among researchers from several countries was a first step toward setting an agenda for transatlantic research in areas such as climate change, energy, and space, and on the interactions between Earth, atmosphere, and oceans—taking advantage of natural conditions that the Azores offer for conducting such studies. Workshop participants included Manuel Heitor, the Portuguese Minister of Science, Technology, and Higher Education; the General Consul of Portugal in New York; and experts from MIT, NASA, US-American and Portuguese universities, and representatives of MPP, including Bruce Tidor, Doug Hart, and Pedro Arezes from MPP in Portugal. The workshop was the first in a series of three workshops. On June 27, the second workshop took place in the Azores, with input and participation from MPP representatives. The third workshop will be held in late September 2016 in Brussels, Belgium.

MIT Portugal Program Showcased at MIT’s Open House

The MIT Portugal Program showcased its education, research, and innovation and entrepreneurship activities at MIT’s Open House event on April 23. MIT’s The open house attracted more than 40,000 visitors to labs and departments, and offered 380 different activities across the campus. The MIT Portugal Program and other global initiatives were represented at the event, underlining the Institute’s global engagement through strategic partnerships. The MPP booth attracted a broad range of visitors interested in learning more about the program and its impact on Portugal. Visitors had the opportunity to engage directly with program representatives, who provided information emphasizing the impact and vibrancy of the program.

Roundtables

Portugal has recently invested in accelerating the development and diffusion of electric mobility and could become a global leader in this field. This roundtable gathered together a group of researchers, industry leaders, and policy makers to present and discuss innovative ideas on how to facilitate the transition to electric mobility as quickly and smoothly as possible. The goals of the roundtable were to help assess Portugal’s positioning in this sector, to identify ideas, areas of research, and challenges of particular interest for the country and for the participating stakeholders, and, ultimately, to give rise to a new roadmap for fast-tracking the deployment of electric mobility and its impact on society and the world. The question of how research, technology development, and innovation can be geared toward cross-disciplinary and collaborative approaches was discussed. Cutting-edge research projects, innovative business models,

and public policies were presented and their significance discussed, both on a global level and in the context of Portugal's capacity to compete globally.

New concepts in the healthcare field often stem from cross-disciplinary research approaches bringing together engineers, computer scientists, software developers, designers, physicians, and entrepreneurs. Recent examples include m-health, e-health, precision medicine, ambient assisted living, wearables, cognitive therapeutics, and point-of-care diagnostics. This roundtable focused on gathering a group of researchers, industry leaders, practitioners, and policymakers to present and discuss new ideas for innovation in healthcare. The question of how educational methods and research policies may be geared towards favoring and nurturing cross-disciplinary approaches to innovation—in particular in crucial industries such as healthcare—was one of the central topics. At the roundtable, cutting-edge research projects and research-based business ventures were presented and their significance was discussed. The goal of the roundtable was to assist in the assessment of Portugal's positioning in these emerging sectors, to identify ideas, topics, and challenges of particular interest for the country and participating stakeholders, and to give rise to new research avenues for graduate students at the interface of new technologies and their impact on society.

Engineering Design Roundtables

The Engineering Design Roundtables series aims to exchange ideas on critical issues that will foster crosscutting and trans-disciplinary competences in engineering systems around new product development, and explore solutions to complex industrial problems through project-oriented and project-based activities. In order to achieve these objectives, the roundtables bring together doctoral students, researchers, and experts from industry and government to discuss new frontiers in product development, new technical developments, and project-based activities. The MIT Portugal Program, through the Engineering Design and Advanced Manufacturing Initiative, is an institutional sponsor.

Visits to MIT Portugal Program

On October 23, 2015, his Excellency Domingos Fezas Vital, the Portuguese ambassador to the United States, and his Excellency José Velez Caroco, the consul general of Portugal in Boston, visited the MIT Portugal Program. Bruce Tidor and key members of the MPP team welcomed the ambassador and the consul general and provided an overview of the program. The ambassador and the consul general were given the opportunity to engage in an exchange with MIT faculty and MPP students from Portugal who were visiting MIT as part of their PhD program. The ambassador and the consul general also met with senior MIT representatives, including Professor Ian Waitz, dean of the School of Engineering, and Professor Richard Lester, associate provost for International Activities.

In an effort to support entrepreneurial activities in Portugal and to strengthen relationships with other Portuguese institutions, MPP hosted five Portuguese startup companies on October 19, 2015. The startup companies are backed by the Startup Braga incubator and were accompanied by representatives of the Luso-American Development Foundation (Fundação Luso-Americana para o Desenvolvimento), which helped facilitate the visit. The purpose of the visit was to expose the startup companies

to innovation and entrepreneurship programs and activities at MIT and MPP, and to facilitate the exchange of ideas and innovative solutions.

On June 8, 2016, her Excellency Teresa Ribeiro, the Portuguese secretary of state of foreign affairs and cooperation, his Excellency João Queirós, the head of cabinet of the Portuguese secretary of state of foreign affairs and cooperation, along with José Velez Carço visited the MIT Portugal Program. Bruce Tidor and key members of the MPP staff welcomed the secretary and her delegation and provided an overview of the program. In addition, the secretary was engaged in an exchange with MIT faculty members who have been advancing the program through their test-bed and seed projects, as well as current and former MPP students.

Global Visibility and Recognition

In an independent assessment, the Finnish National Academy recognized the MIT Portugal Program and its Portuguese sister collaborations as an excellent and commendable initiative, interesting to the whole European research area. The assessment called the program a “model of good practice” and applauded the program’s many successes, including national collaborations, internationalization, and attention to quality. The Academy found the MIT Portugal Program to have a very solid success record with regard to the three goals of collaborative research projects: excellence in teaching, excellence in training, and effective commercialization and entrepreneurship.

From its inception, MPP has strived to become a model international program that combines innovative research and educational programs from around the globe to address some of today’s greatest technical, economic, and social challenges. The program has been both a driver and result of important ongoing reforms of the Portuguese higher education system.

Managing and measuring the success of complex multiparty alliances that aim at societal impact by employing unique experimental measures adapted from best practices at leading institutions has become an important area of research at MIT. A particular focus of this research is on the analysis of early indicators of impact, since validated performance indicators that can be linked to long-term program effects have not been established as a result of the heterogeneity of approaches pursued by different programs and the limited applicability of historical data from institutions that have grown over many decades. Research conducted within MPP has compared different partnership architectures and continues to analyze the impact of the program on academic research in Portugal, which will contribute to discussions regarding the design of future international programs at MIT.

Bruce Tidor
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