

MIT Center for Transportation and Logistics

For nearly 50 years, the [MIT Center for Transportation and Logistics \(CTL\)](#) has been a world leader in supply chain management, logistics, transportation education, and research. The center's world-renowned research programs directly involve more than 80 faculty and research staff from a wide range of academic disciplines, as well as researchers in various affiliate organizations around the world. MIT's program is consistently ranked first among graduate business programs in logistics and supply chain management.

There were 90 active projects in fiscal year 2017. Major projects and initiatives are described below.

Accomplishments and Awards

Accomplishments

- MIT's [Supply Chain Management \(SCM\) master's degree program](#) was ranked as the world's number one graduate business program in supply chain and logistics by Eduniversal.
- Massachusetts [Governor Charlie Baker](#) visited the [MIT AgeLab](#) at CTL, where he signed an executive order establishing the commonwealth's first Governor's Council to Address Aging in Massachusetts.
- CTL researchers published more than 40 articles in various mainstream and industry publications. In addition, faculty members were interviewed and quoted extensively on supply chain issues.
- CTL published weekly blog posts that were republished by other blogs and publications, a quarterly electronic newsletter published in English and Spanish for the Global Supply Chain and Logistics Excellence (SCALE) Network community, and a monthly article based on an SCM master's thesis in the leading trade journal, *Supply Chain Management Review*.
- The number of corporate partners in the CTL Supply Chain Exchange membership program has grown to more than 50 organizations.
- The Korean and Spanish versions of Professor Yossi Sheffi's fourth book, *The Power of Resilience: How the Best Companies Manage the Unexpected*, were published.

Awards

- Director Yossi Sheffi received *Strategy + Business Magazine's* Best Business Books Award for his book, *The Power of Resilience: How the Best Companies Manage the Unexpected*.
- Executive Director Chris Caplice received the Council of Supply Chain Management Professionals' 2016 Distinguished Service Award, the industry's most prestigious honor.

- Deputy Director Jim Rice received the Resiliency Educator of the Year Award from the Global Supply Chain Resiliency Council.
- André C. J. Snoeck and Matthias Winkenbach won the Outstanding Paper Award for their paper, “Establishing a Robust Urban Logistics Network at FEMSA through Stochastic Multi-Echelon Location Routing,” at the 10th International Conference on City Logistics.
- AgeLab Research Scientist Jonathan Dobres’ research on highway sign font legibility earned the Traffic Control Devices Committee 2016 Best Paper Award and was accepted for early publication in *Transportation Research Record: Journal of the Transportation Research Board*.

Education

MIT Supply Chain Management Residential Program

The MIT [Supply Chain Management Residential \(SCMr\) Program](#) attracts a diverse group of talented and motivated students from across the globe. Students work directly with researchers and industry experts on complex and challenging problems in all aspects of supply chain management. MIT SCMr students propel their classroom and laboratory learning straight into industry. They graduate from the program as thought leaders who are ready to engage in an international, highly competitive marketplace.

The SCMr Program receives four to five times as many applications as there are available slots in the program. The SCMr Program’s collaboration with other SCALE programs (in Malaysia, Latin America, Spain, Luxembourg, and China) continues to expand, with cross-center teams and international travel. All SCALE students congregate at MIT in January for an intense month of team projects, lectures, workshops, and presentations.

The SCMr Program has established the MIT Supply Chain Excellence Award at 11 undergraduate programs at eight leading US universities. The award is given annually to the most outstanding graduating supply chain or industrial engineering major in each school (US citizens only). To date, 36 students have won the award and 40 have earned honorable mention. Winners and those given honorable mention receive a partial scholarship to attend the MIT SCM Program.

Class of 2017

In spring 2016, 40 students (20 women and 20 men) were selected from more than 200 applicants to join the SCM Program as its Class of 2017. Students came from 14 countries, and had an average age of 28 (ranging from 25 to 35) and six years of professional experience. Twelve students achieved a 5.0 GPA this fall.

More than 50 companies recruited SCM students in academic year 2017. Of students who sought employment, 100% had received job offers by one month after graduation. SCM students received an average 82% boost in salary (64% for US students, 100% for international students) with the average outgoing annual base salary being \$120,000 (ranging from \$85,000 to \$150,000).

SCM Thesis Partners

Seventeen companies participated as Supply Chain Exchange thesis partners. This year's projects included:

- "Innovative Transportation Solutions: Uber for Freight" (chemicals)
- "Capacity Planning Under Demand and Manufacturing Uncertainty for Biologics" (pharmaceuticals)
- "Impact of Drug Serialization on US Pharmaceutical Industry Under Decentralized Information Flow" (pharmaceuticals)
- "Manufacturing Risk Assessment for Early Stage Pharmaceuticals" (pharmaceuticals)
- "Pharmaceutical Serialization—Track and Trace in the USA" (pharmaceuticals)
- "Unlocking Value in Healthcare Delivery Channels" (pharmaceuticals)
- "Smarter SKU Stratification" (consumer goods)
- "Enhancing the Customer Service Experience at Call Centers Using Queuing Theory" (third-party logistics)
- "Reducing Shipment Variability through Lean Leveling" (consumer goods)
- "Forecasting International Movements of Returnable Transport Items" (logistics services)
- "How to Integrate Production and Logistics Strategy for a CPG Company: A New Formulation" (consumer packaged goods)
- "Optimal Mode Selection: Intermodal vs. Truckload" (retailer)
- "Balancing Product Flow and Synchronizing Transportation" (consumer goods)
- "Predicting On-Time Delivery in the Trucking Industry" (logistics services)
- "Multi-Echelon Network Evaluation and Inventory Strategy" (oil field services)
- "Analysis of Inefficiencies in Shipment Data Handling" (logistics services)
- "Capacity Management and Make vs. Buy Strategy" (oil field services)
- "A Study of Freight Performance and Carrier Strategy" (logistics services)
- "Identifying Inventory Excess and Service Risk in Medical Devices: A Simulation Approach" (medical devices)
- "Understanding the Value of Real-Time Monitoring in Supply Chains" (transportation carrier)
- "A Generalized Framework for Optimization with Risk" (high-technology electronics)

MIT Supply Chain Management Blended Program

The MIT Supply Chain Management Blended (SCMb) Program is a new option being developed by MIT that will allow learners to combine the [MITx MicroMasters Credential](#) with one or more semesters at MIT. The MicroMasters credential requires a learner to successfully pass five rigorous online courses in supply chain management and also to pass a proctored comprehensive final exam. Learners with the MITx MicroMasters credential in SCM can then apply to MIT to the blended SCM master's program. This new program will require the successful applicant to come to MIT from January through May to take courses on campus for graduation at the beginning of June. Holders of the MicroMasters credential will receive credit for 42 academic units (90 units are required for graduation with a master's degree, leaving 48 to 57 units for on-campus work).

New Degrees Offered

All SCM students (including students in the SCMr and SCMb programs) will be able to choose from two degrees:

- The master's of applied science in supply chain management (MASc-SCM) is designed for students who want to take a job in industry or consulting on graduation.
- The master's of engineering in supply chain management (MEng-SCM) is more research-focused and is designed for students who wish to continue in research or to pursue a PhD.

In addition to the SCM Program, CTL offers a [master's of engineering in logistics](#) degree.

MicroMasters Credential in Supply Chain Management

On October 7, 2015, President Rafael Reif announced the launch of the MITx [MicroMasters Credential](#) in Supply Chain Management. This is an educational certification program that offers learners around the world a way to gain and demonstrate expertise in the growing field of supply chain management. Students who earn the MITx MicroMasters credential have the opportunity to apply those credits toward a master's degree at MIT through the SCMb Program.

CTL took the lead in the development and launch of this initiative by incorporating its existing online courses (SCx1 Supply Chain Fundamentals and SC2x Supply Chain Design) into the more comprehensive MicroMasters credential curriculum. The MITx MicroMasters Credential in Supply Chain Management is a stand-alone certification program designed and administered by CTL and supported by the Office of Digital Learning. It is run separately from the SCMr master's program.

The MicroMasters credential consists of five intensive online courses covering all aspects of logistics and supply chain management (equivalent to one semester's worth of courses in the SCMr program). Students submit graded homework every week and take midterm and final examinations. To earn the MicroMasters credential, they also have to pass a proctored examination. The total cost of this new MicroMasters credential in 2017 was \$1,350, including the cost of the five courses and the capstone examination. In 2017, the courses were:

- CTL.SC0x Supply Chain Analytics
- CTL.SC1x Supply Chain Fundamentals
- CTL.SC2x Supply Chain Design
- CTL.SC3x Supply Chain Dynamics
- CTL.SC4x Supply Chain Technology and Systems
- CFx Comprehensive Proctored Final Examination

The MicroMasters program is not a degree-granting program, nor is it a guarantee of admission to MIT or to the Supply Chain Management graduate program. It is a separate, stand-alone professional certificate.

During 2016, CTL created two new SCx courses: SC3x Supply Chain Dynamics, launched in fall 2016, and SC0x Supply Chain Analytics, launched in winter 2016. CTL also redesigned and relaunched SC1x Supply Chain Fundamentals in spring 2016 and ran SC2x Supply Chain Design for the second time in summer 2016. During 2017, CTL launched SC4x Supply Chain Technology and Systems. Last, in May 2017 CTL developed and administered the first comprehensive final examination for those learners who qualified by having passed all five courses. The examination was proctored both online and in person.

In addition to creating the materials for the courses, CTL worked on ensuring that the MicroMasters SCM credential has value in the market by creating a culture of honesty within the course. To this end, CTL did the following things:

- Developed a set of randomized problems in SC0x Supply Chain Analytics and SC4x Supply Chain Technology and Systems. All graded assignments and examinations included randomized problems. CTL is working on having a unique set of values for each student.
- Created a process for identifying, catching, and removing students who violated the honesty policy.
- Tested and implemented online proctoring software during a midterm examination in SC4x and the CFx.

As of June 2017, more than 190,000 learners from more than 196 countries across the globe had participated in at least one MicroMasters course. A total of 18,914 individual verified course certificates have been issued to 9,144 learners. Of the 1,077 learners in May 2017 who were eligible for the CFx, 787 attempted and 622 passed the examination. The team is currently reviewing admissions for the first cohort of MicroMasters graduates who applied to MIT in the SCMb program track and preparing for the next intake of SC0x learners.

CTL also participated in several conferences and academic events to disseminate the results of the MicroMasters program, including the Council of Supply Chain Management Professionals, MIT MicroMasters Roundtable, Supply Chain Management Directors Conference, and other academic and industry events.

MIT Global Supply Chain and Logistics Excellence Network

Collectively, the [MIT Global SCALE Network](#) now includes six centers on four continents, with more than 12 educational programs (both online and in residence), more than 50 academic partners, 80 researchers and faculty members, 150 corporate partners, and more than 1,000 alumni working worldwide. One such center is the Samuel Tak Lee MIT Real Estate Entrepreneurship Lab; the other five centers are described below.

Zaragoza Logistics Center

Zaragoza Logistics Center (ZLC) is a research institute established by the government of Aragon in Spain in partnership with MIT and the University of Zaragoza. Founded in 2003, the ZLC campus is located in the heart of PLAZA, the largest logistics park in southwest Europe. PLAZA serves as a working laboratory to transfer new knowledge and working practices.

Academic year 2017 was marked by the launch of two new iterations of the MIT Zaragoza master's of engineering in logistics and supply chain management (ZLOG)—blended and multicontinent programs. Personnel consisted of 44 people, including 11 faculty members, six researchers and doctoral students, and 27 professionals in the areas of finance, marketing, information technology, human resources, and education and research management.

On June 2, 2017, 51 students from 17 countries attended their graduation ceremony at Paraninfo Building in the University of Zaragoza. The students came from the 16th class of the master en dirección de supply chain (MDSC), the 13th class of ZLOG, and the MIT Zaragoza PhD in logistics and supply chain management. Thesis projects were sponsored by AB Inbev, Accenture, BSH, Carreras, Clariant, Elanco, Halliburton Co., J. F. Hillebrand, Johnson & Johnson, Proctor & Gamble, Panalpina, Pfizer Inc., and Roche, among others. The average rating for professors was 5.9/7.

Academic year 2017 brought a ZLOG class with 25 students from 14 countries, an MDSC class with 28 students from four countries, and two PhD students from two different countries. New ZLOG academic partners for this academic year are Accenture Strategy, Elanco, J. F. Hillebrand, and Panalpina. So far, 48 companies have participated in this program; among them were some of the Gartner Supply Chain Top 25.

In terms of worldwide recognition, the MIT SCALE master's in supply chain management was ranked No. 1 worldwide in the field of logistics and supply chain management by Eduniversal for the second year in a row. SCM World voted ZLC the best-specialized university for supply chain studies in Spain and fourth in Europe. Additionally, ZLOG was ranked No. 1 in the field of logistics in the "250 Best Masters in Spain" rankings by the newspaper El Mundo in 2017 for the seventh consecutive year. The graduates of MDSC won the Foro Pilot Award for the best MDSC master's thesis and the Asociación Empresarial PLAZA (AEPLA) Award for the most innovative master's thesis.

The MIT Zaragoza doctoral program had five students during this academic year. One student successfully defended his dissertation and is currently working at IESE Business School in Spain. Nineteen PhD students from universities all over the globe participated in the 10th edition of ZLC's annual PhD Summer Academy, conducted over

two weeks in summer. Instructors came from IE Business School, Ivey Business School, Pennsylvania State University, and the University of Texas.

More than 530 professionals participated in different executive education programs and workshops in supply chain management designed and taught by ZLC and MIT SCALE faculty. These included the executive course for the Spanish military and the third Global Supply Chain Research Forum, and the executive courses for the Singapore Business Federation, the Bimbo Group, the European Committee for Standardization, the South African Institute for Chartered Accountants, IDA, Roche Indico, Instituto Tecnológico de Aragón, Universidad Piloto Colombia, LOGYCA, and Terranum.

Within this period, there were 22 research and development projects at ZLC. Funding sources included the European Commission (which funds 14 of these projects), private companies (which fund seven projects), and the Centre for Industrial Technological Development (which funds one project). With these results, ZLC became the entity in Spain with the highest number of European research and development projects in the area of logistics and supply chain management. ZLC has continued with its participation in the European Technology Platform in Logistics: Alliance for Logistics Innovation through Collaboration in Europe (ALICE), an initiative that was promoted by ZLC. ALICE provides input to the European Commission to shape the European logistics research agenda. ZLC's director is a member of ALICE's steering board and ZLC participates in four of its five working groups (supply chain security, synchronicity, collaboration, and urban logistics), being vice-chair of the supply chain security group.

Research at ZLC has resulted in 10 articles in peer-reviewed journals, such as the *International Journal of Production Economics*, *European Journal of Operational Research*, *International Journal of Production Research*, *International Journal of Logistics Research and Applications*, *International Journal of Operations & Production Management*, *OR Spectrum*, *International Journal of Logistics Management*, *International Journal of Environmental Research and Public Health*, and *Integrated Environmental Assessment and Management*. Another three articles will be published in the coming months. Several research reports have been submitted during this period. ZLC faculty and research staff presented their research findings in key national and international conferences.

ZLC received visits from international representatives, such as Marcos C. Madojana, US consul, and Marcus Lee, co-chairman of the International China Investment Forum. Additionally, ZLC hosted visits from international universities, such as Tecnológico de Monterrey, Bryant University, Norwegian University for Science and Technology, and Universidad Talca-Chile, and from multinational companies such as Sonae, Danone, Futbol Club Barcelona, the Red Cross, UST, and Valeo.

ZLC had a direct financial impact on the local community of more than €6 million (estimated) during the past five years.

Malaysia Institute for Supply Chain Innovation

Located in Shah Alam, Malaysia, near Kuala Lumpur, the Malaysia Institute for Supply Chain Innovation (MISI) is the fourth center in the SCALE network. MISI is now in its sixth operational year as an institute of higher learning since being launched in March 2011 by the Malaysian prime minister as a joint initiative with MIT.

In August 2016, the fifth cohort of 19 students from seven different countries started the MSCM program; they graduated in May 2017. In the part-time master's program there are currently 62 students, almost all of whom are Malaysian. In January 2017, 19 students from MISI attended the annual Independent Activities Period program at CTL.

MISI now comprises seven permanent faculty members, two researchers, and an administration support staff of 18. In this period, MISI faculty had several articles accepted and published, in supply chain strategy, supply chain risk management, port logistics, and maritime and intermodal logistics.

Luxembourg Centre for Logistics

On December 7, 2015, the government of the Grand Duchy of Luxembourg and the University of Luxembourg, through a long-term partnership with CTL, founded the Luxembourg Centre for Logistics and Supply Chain Management (LCL) as a part of the faculty of law, economics, and finance. The center for research, teaching, and knowledge transfer will support Luxembourg's development as a transport and logistics hub in Europe. It will offer a master's degree program in logistics and supply chain management as well as carry out research in close cooperation with industry partners.

A first successful logistics and supply chain management networking reception was organized in June 2016 by invitation of the president of the university, welcoming industry partners from Luxembourg and Europe. In March 2017, LCL hosted its first annual eXplore conference. Around 100 experts in supply chain management and related fields joined the conference throughout the day, confirming the interest of the Luxembourg community in the LCL project.

Recruitment for the position of LCL director came to a conclusion in July 2016 when the University of Luxembourg's board of governors approved the appointment of Professor Benny Mantin, who is to start in January 2017. A first cohort of master's degree students will be welcomed in the fall of 2017. A full program of executive education sessions, roundtables, and seminar series, including contributions by CTL professors, is scheduled for the coming academic year.

Ningbo Supply Chain Innovation Institute China

On September 12, 2016, the Ningbo Supply Chain Innovation Institute China (NSCIIC) held its opening ceremony. Shaoxuan Liu, director of NSCIIC, accepted the opening ceremony plaque from Kirk Kolenbrander, vice president of MIT, Yossi Sheffi, director of CTL, and Zhongchao Chen, vice mayor of Ningbo. More than 400 distinguished guests witnessed this historic event.

NSCIIC is a nonprofit educational and research institution. It operates independently and will offer master's and doctoral degree programs as well as executive education programs. The first class of master's degree students will matriculate in the fall of 2017. "The faculty and staff of the NSCIIC will work closely with MIT and the Ningbo government, and do our best to establish NSCIIC as an international center of excellence for research and education in logistics and supply chain management," said Shaoxuan Liu. NSCIIC is the sixth center in the MIT Global SCALE network.

MIT SCALE Latin America and Center for Latin-American Logistics Innovation

The Center for Latin-American Innovation and Logistics (CLI) is the result of a partnership between CTL and LOGYCA/Research in Bogotá, Colombia. CLI has cultivated deep relationships with 27 top Latin American universities and institutions in the region. It has 14 full-time research staff and, as an official national center of excellence, has access to government grants and to various thought leadership opportunities. Because of the quality and quantity of its publications, this year Colciencias (the National Science Foundation of Colombia) has raised CLI's standing as a research center.

The flagship academic program is the MIT Graduate Certificate in Logistics and Supply Chain Management (GCLOG). This program is geared toward outstanding graduate students from Latin America. The GCLOG is open to students who are enrolled in a master's program in areas relevant to supply chain management and logistics.

The GCLOG Class of 2017 (eighth cohort) gathered 28 outstanding students selected from among 50 candidates, most of them proposed directly by members of CTL's network of partner universities throughout Latin America. This class hosted students from 16 universities in Argentina, Brazil, Colombia, Ecuador, Mexico, Peru, and, for the first time, Bolivia. In the program's first seven classes, 183 students graduated from the program. MIT hosts the students twice a year, for three weeks at a time, first in July and then again in January. They study alongside students from the CTL SCM program, the Zaragoza Logistics Center, and the Malaysia Institute for Supply Chain Innovation at SCALE Connect. This year, the GCLOG program combined online courses with the on-campus experience through the online course entitled GCx Excellence in Supply Chain. This was designed in the edXedge platform using content from the MITx MicroMasters in Supply Chain Management.

CTL, in collaboration with CLI, organizes academic workshops that take place annually at various venues in Latin America region and at the MIT campus. The latest workshop took place in March 2016 at the MIT campus, where the 27 Latin American SCALE partners discussed and aligned the research and educational agenda of the region. As a result of the workshop agreement, CLI will host the Undergraduate Certificate in Logistics and SCM program, which is expected to be launched in the summer of 2017. Another academic workshop was hosted by CLI (Colombia) in March 2017.

Corporate education is another CLI educational initiative. The center currently has 13 corporate partners with whom it develops a wide range of executive and collaborative research projects in seven research areas. To date, more than 100 collaborative projects with industry have been successfully completed.

Research

MIT Responsible Supply Chain Lab

Founded in 2015 as a natural evolution from prior work in sustainable supply chains, the [MIT Responsible Supply Chain Lab](#) was formed to examine the many issues connected with reducing the social and environmental impacts of supply chains. The Responsible Supply Chain Lab examines the past, current, and potential future practices

of sustainability in supply chain management across various industries. It develops applied models for businesses to effectively implement strategies to improve supply chain management and control practices.

Although the lab focuses broadly on sustainable supply chains, it has a particular focus on supply chain traceability and transparency. Given the likelihood of finding “skeletons” of environmental or social misdeeds deep in global supply chains, companies are struggling with how to grapple with deeply opaque supply chains. Recent research in the lab focused on exploring digital solutions to facilitate supply chain traceability, supplier relationship evaluation and innovation, and stakeholder analysis for supply chain sustainability communication. Students and faculty from around the world have been hosted at the MIT Responsible Supply Chain for collaborative research. The lab makes information about [research staff and ongoing research projects](#) available.

The lab has initiated research collaboration with other entities across MIT, including the Sloan School of Management, the Abdul Latif Jameel World Water and Food Security Laboratory, and MIT Minerals and Mining for the Environment. Recently concluded projects include palm oil traceability, apparel industry transparency, the true cost of water, and a systems review of ethanol.

The work and writings of the lab have been featured in the *Wall Street Journal*, *Sloan Management Review*, *Industry Week*, *Supply Chain Management Review*, and various other publications.

MIT Megacity Logistics Lab

Starting in 2012 as an outgrowth of research activities in logistics and supply chains in emerging markets, CTL created the MIT Megacity Logistics Lab (MLL). MLL focuses on understanding and transforming the supply chains that interface with megacities, with a particular focus on last-mile delivery operations in large, densely populated, and congested urban environments.

In AY2017, MLL has secured additional funding from various industry partners such as AB InBev (US), Coca-Cola Fomento Económico Mexicano, Fomento Económico Mexicano Sociedad Anónima Bursátil de Capital Variable (FEMSA S.A.B. de C.V., Mexico and Colombia), Flipkart (India), as well as the World Bank Group, to support its research efforts, partnerships, workshops, and data collection efforts in numerous countries around the world.

Since MLL’s foundation, more than 350 people from business, academia, and government have participated in MLL activities. Many graduate and undergraduate students have experienced first-hand the challenges of freight movement. In AY2017, MLL has once again hosted masters and doctoral students, as well as postdoctoral researchers and visiting scholars, from Germany, the Netherlands, Belgium, and Spain as it builds its research agenda.

MLL has also developed partnerships within MIT, with related initiatives such as the Changing Places and City Science groups at the MIT Media Lab, the Center for Advanced Urbanism, and the Singapore-MIT Alliance for Research and Technology, as well as Professor Karaman from the Department of Aeronautics and Astronautics and his group of researchers.

MIT Hi-Viz Project

The [Hi-Viz \[high-visibility\] Supply Chain](#) project seeks to create an automated system to create near-real-time board-ready displays of a company's end-to-end supply chain and to highlight areas of risk or concern on those displays.

CTL partnered with Sourcemap.com, a recent MIT PhD student's startup company. The initial three-year research project concluded in March 2014. Each subsequent year, students have undertaken master's thesis projects with sponsoring companies. The project succeeded in creating two valuable high-level displays of the supply chain: an interactive map and an interactive material flow diagram. Metrics highlighted atop these displays include inventory levels, recovery times, risk exposure, value at risk, and customer blackout days resulting from the loss of any supplier in the network. Geo-emergency alerts were added to the Hi-Viz displays. Initial progress was also achieved in adding geo-based baseline natural disaster probabilities to each node in the supply chain. As a result of this project, one large multinational sponsor has launched a large internal information technology project to build a global working version of the Hi-Viz software for its private internal use.

The most recent thesis project created a risk visualization and model of the supply chain for a large apparel manufacturing and uniform rental company. CTL worked with two analytical arms of Verisk Corporation: AIR Worldwide, which does natural disaster probability modeling, and Maplecroft, which calculates a catalog of risk indexes for terrorism, corruption, political instability, and so on, for 198 countries. These new associations made it possible to include in visualizations and modeling programs the risk factors for natural disasters; political disruptions, corruption, and terrorism; and financial collapse. The risks of losing suppliers because of these factors are now included in CTL's calculations of value at risk for all supply chain locations. The resulting risk profile is now much more complete and usable by senior management, presenting a balanced view of many causes of disruption.

MIT Humanitarian Response Lab

The mission of the [Humanitarian Response Lab \(HRL\)](#) is to help meet human needs by understanding and improving the supply chain systems behind public services and private markets. The lab has a diverse portfolio of projects to improve response operations during humanitarian crises and to develop resilient supply chains for global health and food security.

HRL is in the final year of its five-year major research project with the MIT Comprehensive Initiative on Technology Evaluation (CITE), supported by the U.S. Agency for International Development (USAID). Field research with CITE led to study reports and academic papers on the supply chains for [post-harvest storage technologies](#) and for [malaria rapid diagnostics](#). HRL also launched a new CITE evaluation of advanced packaging technologies for international food aid, which considers the cost and quality for a range of commodities, shipping options, and foreign warehouses.

HRL began the second year of its four-year, \$3.5 million project with the USAID mission in Uganda by facilitating a three-day [Agricultural Market Systems Workshop](#). Using an

approach developed by HRL and its collaborators at [George Washington University](#), 168 participants systematically characterized how to improve Uganda's agricultural markets and developed a pipeline of actionable opportunities to inform future programs. The team also produced two research studies: one on the supply chain of agricultural inputs and one on the market conditions that enable farmers to receive higher prices for better quality crops.

HRL began the second of its two-year CDC award for [post-Ebola capacity building work](#) with the Ministry of Health in Liberia. The work focuses on improving information systems and developing supply chain management course curricula for the University of Liberia School of Pharmacy.

In January 2017, HRL received a grant from the Bill and Melinda Gates Foundation to study the feasibility of establishing a [Supply Chain Center for Excellence in Nigeria](#). The study seeks to characterize the demand for supply chain professionals and the academic capacity to develop talent in Africa, resulting in suggestions for educational capacity building; identify research opportunities in consultation with the government and private sector; and develop a strategy and business plan for a potential MIT-affiliated academic entity in Nigeria.

In June 2017, HRL joined an MIT consortium led by Lincoln Laboratory to conduct a two-year study with the Federal Emergency Management Agency on alternatives for disaster-related housing assistance.

HRL researchers published a July 2016 article with model results for assessing emergency response capacity in the top operations management journal. In December 2016, the authors gave an invited presentation of the work to the logistics leadership and the analytical working group at the Federal Emergency Management Agency. In February 2017, the authors presented a new model-based analysis to the Emergency Supply Pre-positioning Strategies (ESUPS) Working Group at the United Nations [Humanitarian Networks and Partnership Week](#).

In March 2017, HRL alum Emily Gooding won the Best Master's Thesis in Humanitarian Logistics award, sponsored by the Hanken School of Economics in Finland, for research that built on the [2014–2015 HRL Ebola response operations in Liberia](#). The same month, [Ms. Gooding began a Fulbright Award](#) research project on public and private sector health supply chains in Nigeria.

HRL co-organized the ninth annual [Health and Humanitarian Logistics Conference](#), which was hosted by UNICEF from June 7 to June 9 at the United Nations City in Copenhagen. The event drew more than 200 attendees from 39 countries and 127 organizations, including government and UN agencies, companies, foundations, and academic and non-governmental organizations. The agenda featured 53 break-out presentation and workshop sessions, 31 posters, three plenary panels, and a keynote speech by Dr. Richard Brennan, director of emergency operations for the World Health Organization.

HRL is also involved in [a number of other projects](#).

Sustainable Supply Chains

Sustainability is intimately connected with supply chains. Although a number of surveys show that most consumers say they want sustainable products, sales data show that only a small percentage, at best, are actually willing to pay more to buy sustainable products. This gap between “say” and “pay” puts companies in a difficult position. The supply side exacerbates this gap. The developing world emphasizes livelihood and economics rather than sustainability, so companies routinely violate their home countries’ laws, sometimes with the implicit “understanding” of the authorities, in the name of providing jobs. Thus, companies face seemingly incompatible requirements when accounting for sustainability, costs, and jobs.

This research presents a rationale for corporate sustainability efforts, whereby companies attempt to bridge the gap between the conflicting constraints imposed by customers, competitors, investors, environmental activists, and regulators. It describes and illustrates many of the choices companies face; their efforts up and down the supply chain; the tools they use to assess the impact of those efforts, both environmental and financial; and the conflict and cooperation between companies, non-governmental organizations, and government agencies.

MIT FreightLab

The [MIT FreightLab](#) was established in 2008 to advance the art, science, and practice of how shippers, carriers, and third parties design, procure, and manage freight transportation across the globe. In academic year 2016, the work was focused on master’s thesis work. Projects included:

- “Multi-Stop Trucking: A Study on Cost and Carrier Acceptance” with C. H. Robinson
- “Efficient Supply Chain Design for Highly Perishable Foods” with Starbucks
- “Prioritizing Inbound Transportation” with Walmart

Both the Starbucks and Walmart projects were nominated for, and recipients of, best thesis awards.

New England University Transportation Center

MIT was awarded the US Department of Transportation’s Regional University Transportation Center grant. The consortium of universities includes MIT as the lead institution along with the universities of Connecticut, Maine, and Massachusetts, and Harvard University.

The grant will be used to support students, researchers, and faculty in further developing a living laboratory in Cambridge, called the Massachusetts Avenue Area Living Laboratory, which includes urban landscape from Harvard Square to Memorial Drive. A new grant, beginning in 2017 and running for four years, was announced in spring 2016.

AgeLab

AgeLab is a multidisciplinary research program that works with businesses, government, and non-governmental organizations to improve the quality of life of older people and those who care for them. AgeLab enjoys sponsorship from corporations in multiple industry sectors addressing the needs of an aging society (e.g., property/casualty insurance, retail, automobile, financial services, pharmaceuticals, consumer electronics, and consumer products). Sample companies include AARP, the Bank of America, CVS, Google, Panasonic, the Hartford, Transamerica, a number of car manufacturers, Liberty Mutual, and others.

In 2016, the AgeLab conducted experiments and fieldwork that engaged more than 1,000 experimental subjects on campus and nearly 10,000 subjects in field trials of hardware, surveys, focus groups, and in-depth interviews in multiple countries. Outpacing 2015 publication numbers, the AgeLab authored 23 peer-reviewed journal publications, three book chapters, multiple student poster sessions and peer-reviewed paper presentations as well as numerous publications in the business press, e.g., the *Wall Street Journal*, *MarketWatch*, and so on. Five events were convened that engaged more than 600 participants, including the chief executive officers of major companies, with participation by AARP as well as by the US secretary of transportation and the administrator of the National Highway Traffic Safety Administration. Event topics included the future of home services, the future of autonomous vehicles and older adult mobility, the future of advice seeking in retirement, the internet of things, and aging in place.

AgeLab is recognized worldwide as an innovator in understanding the demands of the evolving longevity economy and its impact on various complex systems, including transportation, health, finance, and community development. Collaborating with multiple departments, including the Media Lab (livable communities), Department of Urban Studies and Planning (future of real estate), Brain and Cognitive Sciences (Aging Brain Initiative), Civil Engineering (transportation), Mechanical Engineering, and the Computer Science and Artificial Intelligence Laboratory (ubiquitous computing and autonomous systems), AgeLab is surveying new ground in thinking about retirement, information presentation and design, autonomous vehicle systems, and home services that offer both convenience and care across the life span.

MIT Micro Supply Chain Management Initiative

Micro-sized and small firms constitute 99% of the businesses operating in Latin America. Despite the clear value of small companies in terms of employability and gross domestic product, only a fraction of such firms survive in the short term and develop into high-growth firms. One of the main reasons is a lack of supply chain expertise—an issue that has received scant attention from researchers until now. This knowledge gap is being addressed by a new research project from the MIT Center for Transportation and Logistics: the MIT Micro Supply Chain Management project. This initiative is part of an emerging discipline that focuses on improving the efficiency and survival of micro-sized and small firms by leveraging their SCM decisions.

In the first stage, begun in July 2016, CTL conducted nine workshops in five countries (Peru, Mexico, Uruguay, Colombia, and Bolivia) with owners and managers of small firms,

with the purpose of studying their challenges and how better practices in supply chain management could improve their efficiency and likelihood of survival. CTL also conducted a pilot project that involved on-site research at approximately 200 enterprises across nine countries in Latin America (Uruguay, Argentina, Peru, Ecuador, Colombia, Bolivia, Brazil, and Mexico), in collaboration with 12 of the region's top universities. These universities have taken part in this initiative by including in their curricula the content of the Micro SCM project, which has affected more than 200 students who took part in this research.

The Micro SCM initiative has captured the attention of a variety of government authorities. For instance, the [MIT Enterprise Forum](#), supported by [El Instituto Nacional del Emprendedor](#) of the government of Mexico, has provided a couple of unrestricted grants to operate the initiative in this first stage. In addition, the Inter-American Development Bank has become a partner of the Micro SCM project through the regional project known as [connectamericas.com](#). The bank has provided more than 100,000 records of small firms operating in Latin America.

In addition, CTL hosted five undergraduate students from Latin American universities and one intern from Harvard University over the summer to work for six weeks on this project under the supervision of CTL Director Yossi Sheffi. Results included a comprehensive methodology to assess the potential for survival of small firms and a mobile app to standardize the data collection process and scale up the participation of small firms.

MIT Sustainable Logistics Initiative

Although different economic sectors, such as manufacturing and power generation, account for the largest share of carbon dioxide (CO₂) emissions, studies show that transportation (particularly road transportation), is the fastest-growing major source of CO₂ in the US. The MIT Sustainable Logistics initiative focuses on analyzing the implications of considering CO₂ emissions in logistics decisions.

Previous projects with industry partners show that companies may be able to achieve important reductions in carbon emissions by making better logistics decisions (e.g., truck assignment, replenishment strategies, vehicle routing, and so on). This year, CTL hosted a visiting master student from École Polytechnique Fédérale de Lausanne, Switzerland, who worked under Director Sheffi's supervision on the impact of topography on high-resolution fuel-based routing decisions. This research was conducted with real data from one of the largest brewery companies in the world, which operates in Mexico. One result was an academic paper intended for publication in an international journal.

Recently, we have signed a one-year research agreement with Coppel Mexico, which is one of the largest retail companies in Latin America. The objective is to improve the fuel consumption and CO₂ emissions of the national distribution network by improving logistics decisions.

Quantifying Resilience

This research will extend CTL's research on resilience to what has been a lingering issue for practitioners—identifying how to make the case for risk management investments, particularly resilience in the organization. Over the past 15 years, CTL researchers

have come to understand the need for resilience and have identified many different options for creating resilience. Organizations are challenged to make the financial case for making investments in resilience, competing for growth-oriented investments. The project will study how firms go about making risk management and resilience investment decisions, and will solicit companies to participate by sharing their practices to identify the frontier of practice in making these kind of investments. Subsequent phases of the study intend to develop methods for making the case for financial investment in resilience.

Outreach

The foundation of CTL's corporate outreach is the Supply Chain Exchange—believed to be the largest and most active membership program in the supply chain management field.

Corporate Relations

During FY2017, CTL dropped one company from the Exchange: BNSF. Ten companies were added as partners to the exchange: Adidas AG, American Industrial Partners, CHEP, FEMSA, Infor, Inspectorio, MacroPoint, MSC, Nippon Express, and Uber Technologies Inc.

Outreach Events

In FY2017, CTL organized nine events.

- CTL hosted the eighth Annual Partners Meeting on April 3, 2017. This meeting convened key contacts from CTL's partner companies for a review of research and customer feedback and input sessions.
- This year's CTL Crossroads Conference (April 4, 2017) focused on innovations that are driving another decade of revolutionary change in the supply chain world. The conference featured experts from MIT speaking about the technologies that will likely affect supply chain management in the future.
- CTL held two sessions of its principal supply chain management executive education course in January and June: Supply Chain Management: Driving Strategic Advantage. The June session was also attended by 65 executive master's of business administration students from the Antwerp Business School in Belgium.
- CTL conducted custom executive education courses at partners' locations in the US and Europe.
- On January 25, 2017, CTL held its ninth annual networking night and poster session. More than 140 students from all SCALE Network programs (CTL, ZLC, CLI, and MISI) presented more than 80 thesis projects to more than 80 representatives from 50 companies.
- CTL also hosted the following events for CTL Supply Chain Exchange Partners:
- Research Fest of student thesis final presentations, May 25, 2017
 - Innovations in Transportation Roundtable, October 6, 2016
 - Omni-Channel Distribution Strategies Roundtable, November 3, 2016
 - Supply Chain Financial Analysis Workshop, November 20–December 1

Personnel Changes

In FY2017, new hires and appointments at CTL included Christine M. Adams, CTL Supply Chain Exchange communications and marketing coordinator; Dr. Bobbie Bredfeldt, research scientist; Dr. Jaya Chimnani, research scientist; Dr. Rafael Diaz, research affiliate; Christopher Adam Felts, technical associate I; Samuel Matthew Gordon, SCM SCALE communications and marketing coordinator; Arthur John Grau IV, communications officer; Dr. Jinping Guan, postdoctoral fellow; Margaret Calais Harding, administrative assistant II; Iliyana D. Krivcheva, administrative assistant I; Connor Michael Makowski, research associate; Dr. Ashley Nunes, research scientist; Andrew J. Sipperley, research support associate; Dr. Ozgu Turgut, postdoctoral associate; and Dr. San Y. Wang, research affiliate.

Visitors to CTL included visiting military scholars Colonel Peter Crandall, Lieutenant Colonel Kimberly Tschepen, and Lieutenant Colonel Charles Weko. International visiting scholars included Professor Ana Cerqueira de Sousa Gouveia Carvalho, Professor Adriana Gabor, Professor Huan Jin, Professor Desiree Knoppen, and Professor Bo Li.

Departures from CTL included those of William H. Angell, Andre Carrel, Olivia DaDalt, Jonathan Dobres, Omar Sherif Elwakil, Nils Fredrik Mattias Eng Larsson, Erin L. Hasselberg, Ahmad Hemmati, Joonbum Lee, Hale McAnulty, Roberto Joaquin Perez-Franco, Petar Radanliev, and Daniel W. Steeneck.

Yossi Sheffi

Director, Center for Transportation and Logistics
Professor of Civil and Environmental Engineering
Elisha Gray II Professor, Engineering Systems