The **MIT** Center for Transportation & Logistics

Annual Review
2014-2015

Massachusetts
Institute of
Technology

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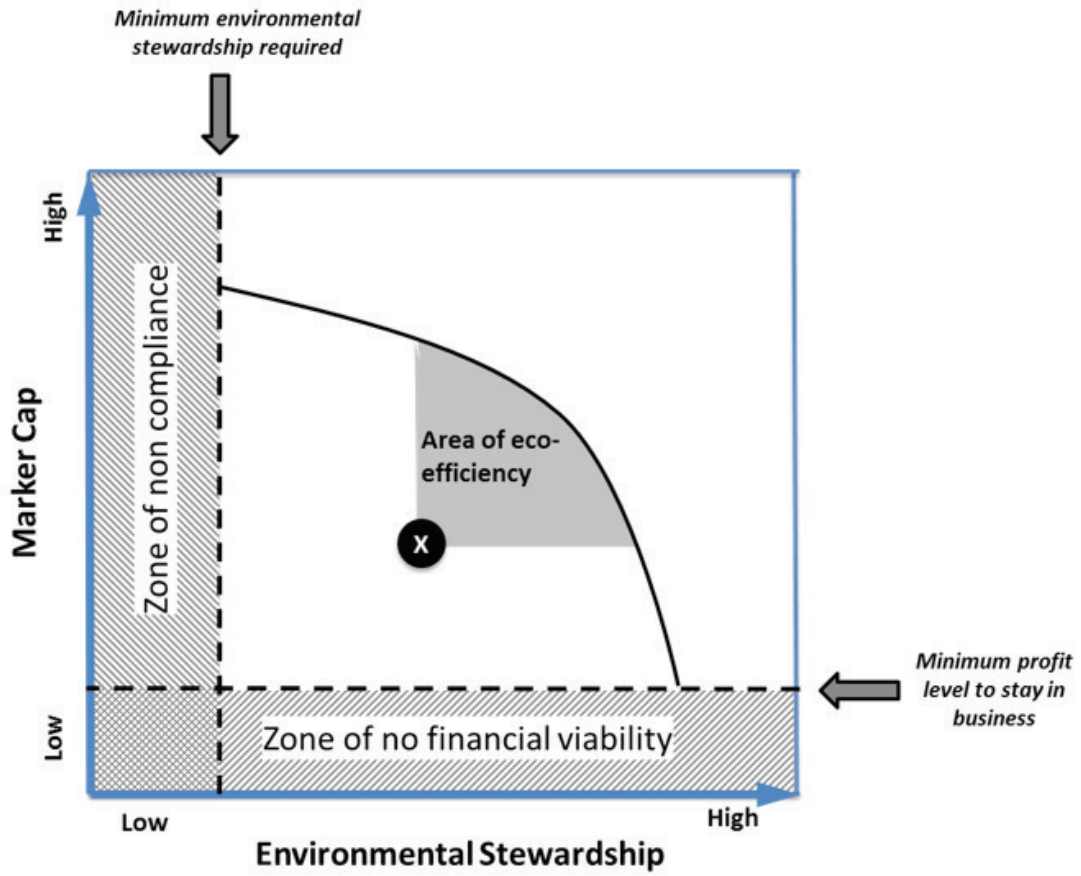
Sustainable Supply Chains

Developing strategies to help companies make their supply chains greener while reducing their carbon footprints and their use of critical resources.

Principal Investigators: Dr. Edgar E. Blanco, Dr. Alexis H. Bateman, Prof. Yossi Sheffi

Key Insights

- Moving beyond Eco-Efficiency requires supply chain thinking.
- Supply chain decisions are increasingly expected to embed lifecycle thinking to support sustainability goals.



The potential and limits of eco-efficiency thinking.

Achieving Eco-Growth[1]

Growth is imperative for corporate success and yet the environmental impact of this growth is not sustainable. Professor Sheffi and Dr. Blanco are developing a framework for thinking about the stages of tackling the environmental sustainability challenge. It ranges from eco- efficiency, which includes initiatives that reduce costs while reducing environmental footprint; eco-alignment, including initiatives requiring cooperation with suppliers and customers; eco-innovation, which includes initiatives based on innovative products and processes; and eco-growth which includes initiatives contributing to the company's growth, combining all the others.

A framework for analyzing the trade-off between shareholders' objectives and sustainability objectives has also been developed. It is based on the concept of the efficiency frontier and is used to tie to the four proposed stages of tackling environmental sustainable growth.

A forthcoming book on Green Supply Chain Management will further expand on these learnings.

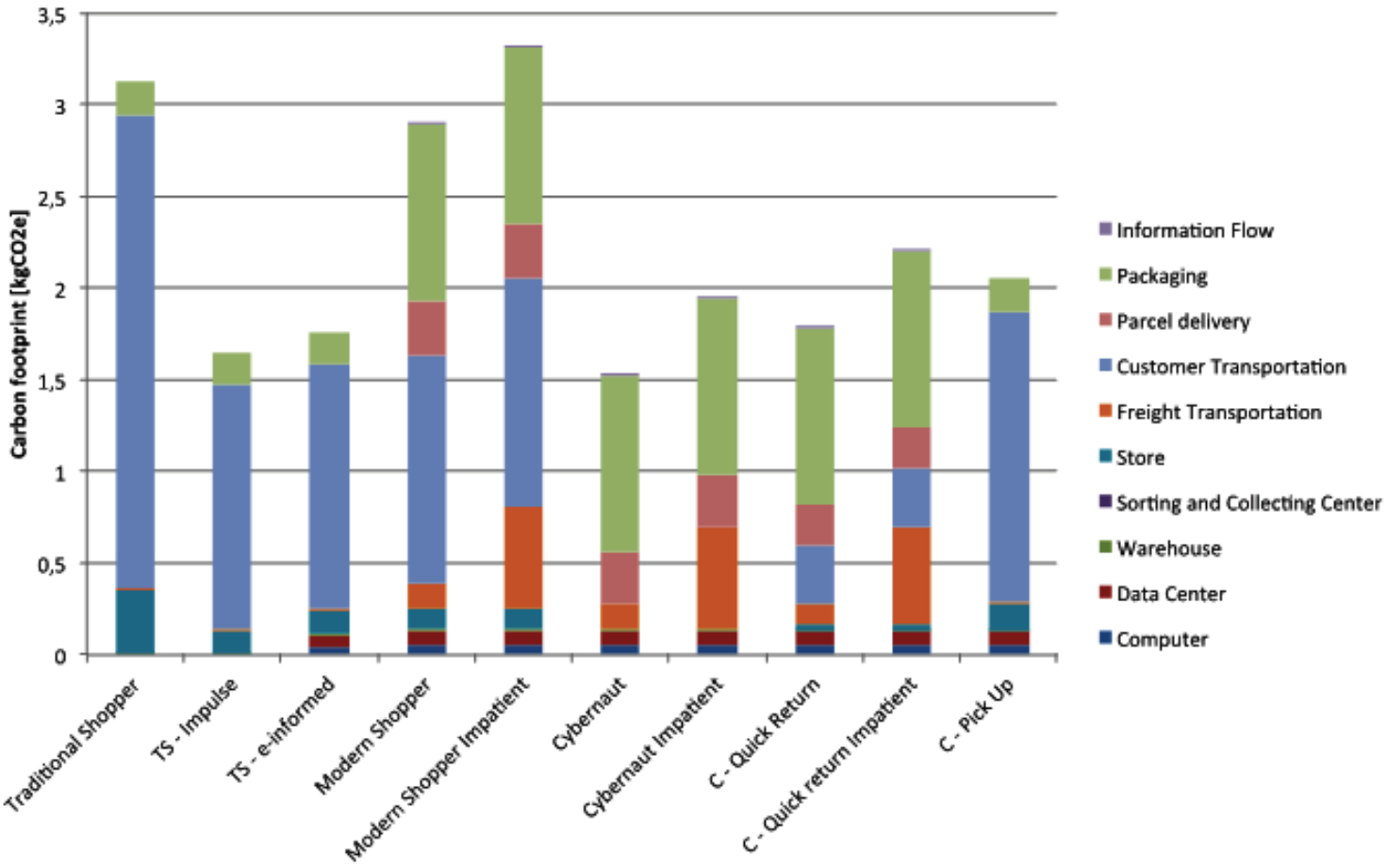
[1] See Blanco E.E. and Sheffi Y. (2015). Eco-Growth: A Framework for Sustainable Growth. ESD Working Paper ESD-WP-2015-03. Available at http://esd.mit.edu/WPS/2015/esd-wp-2015-03.pdf

The Carbon Footprint of E-Commerce[2]

A study directed by Dr. Blanco estimated and compared the carbon footprint of online vs. traditional retailing through ten consumer buying behaviors representing different combinations of the search, purchase and return phases of the shopping process for three representative products: a laptop, a doll and a t-shirt. Using the Monte Carlo Simulation, multiple scenarios of supply chain configurations, consumer transportation choices, urban density, packaging and item bundling were evaluated.

Online shopping was the most environmentally friendly option in a wide range of experiments. However, as more consumers leverage traditional brick-and-mortar alternatives to their online buying behaviors, such as in store return, some of the environmental savings quickly erode.

[2] Blanco E.E. et. al. (2015). The Carbon Footprint of E-Commerce: A Consumer Shopping Behavior Perspective. JBL. Under Review.



Carbon footprint of different online buying behaviors.

Engage

Please contact Edgar Blanco (eblanco@mit.edu) for more information. We are looking for companies to engage with us on:

- Case studies on green supply chain management initiatives.
- Large-scale environmental analysis of supply chain systems (e.g. carbon footprint, water footprint, waste, closed loop systems).
- Analysis and evaluation of multi-stakeholder sustainability projects (e.g. buyer-supplier, NGO, government).

MIT Megacity Logistics Lab

The MIT Megacity Logistics Lab – MegacityLab – conducts innovative theoretical and applied research to help companies operate better logistics for cities and governments to design better cities for logistics.

Principal Investigator: Dr. Edgar E. Blanco

Credit: "Pano Manhattan2007 amk" by user: AngMoKio - Own work. Licensed under CC BY-SA 2.5 via Wikimedia Commons.

Key Insights

- Nanostores are an important channel in megacities in Asia, Africa and Latin America.
- Future last-mile logistics networks will include urban transshipment points and multi-modality – pedestrian, bikes, small trucks, car sharing and public transport, among others.
- Creating the first city logistics toolkit to design better urban freight public policies (e.g. night deliveries, parking).

visit us at **http://megacitylab.mit.edu**
follow us at **@megacitylab**

Lab Team

Dr. Edgar E. Blanco, Founder & Director

Research Staff
Yin Jin Lee and Daniel Merchán

Affiliated Research Staff *(* indicates currently at MIT)*
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Why a Megacity Logistics Lab?

Designing city logistics operations requires in-depth understanding of consumers and channels combined with high-resolution, data-driven modeling.

Better Logistics for Cities

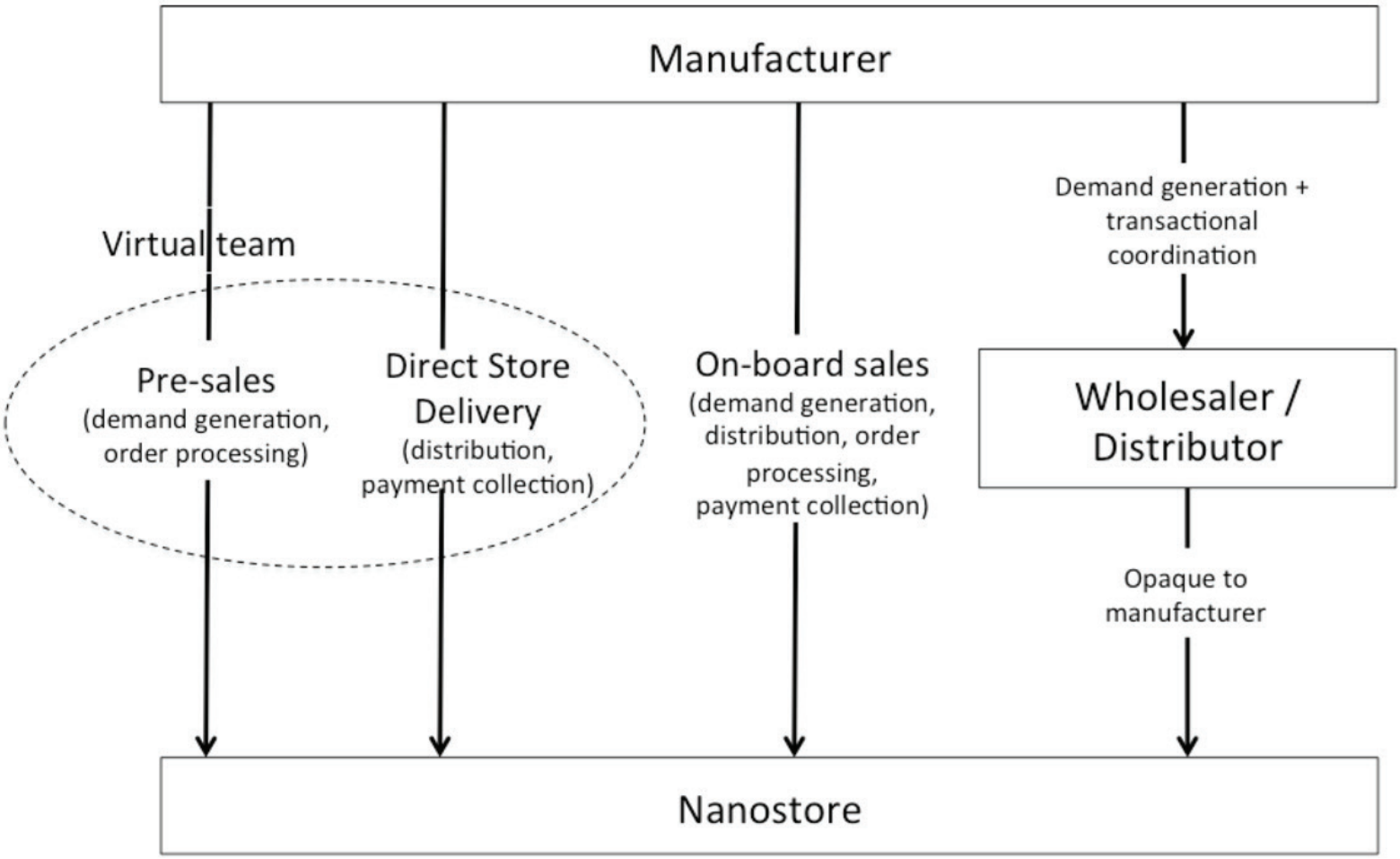
There are three major drivers of increased complexity of urban logistics networks.

First, urbanization is progressing at a fast pace. While in 1950 only 54.5% of the population in developed countries lived in urban areas, this number had risen to 77.7% by 2011 and is projected to reach 85.9% by 2050. Moreover, 25% of the world's population and almost 60% of the world's gross domestic product (GDP) will be found in the world's 600 largest cities by 2025.

Second, the growth of Internet and mobile phone based electronic commerce is triggering an increasing amount of direct shipments from manufacturers and retailers to individuals. Direct deliveries do not only increase complexity of last-mile urban transportation networks, they also lead to fragmentation of shipments and higher complexity and greater need for coordination between consumers, retailers and manufacturers to distribute goods efficiently.

Finally, on-going efforts from cities to invest in public transportation, limiting road access and parking spaces in favor of pedestrian and public transit infrastructure, disproportionally impact logistics operations. Since urban freight also generates an important share of congestion, pollution and other negative externalities, city logistics activities are always under pressure from regulatory actions.

Reaching 50 Million Nanostores[1]

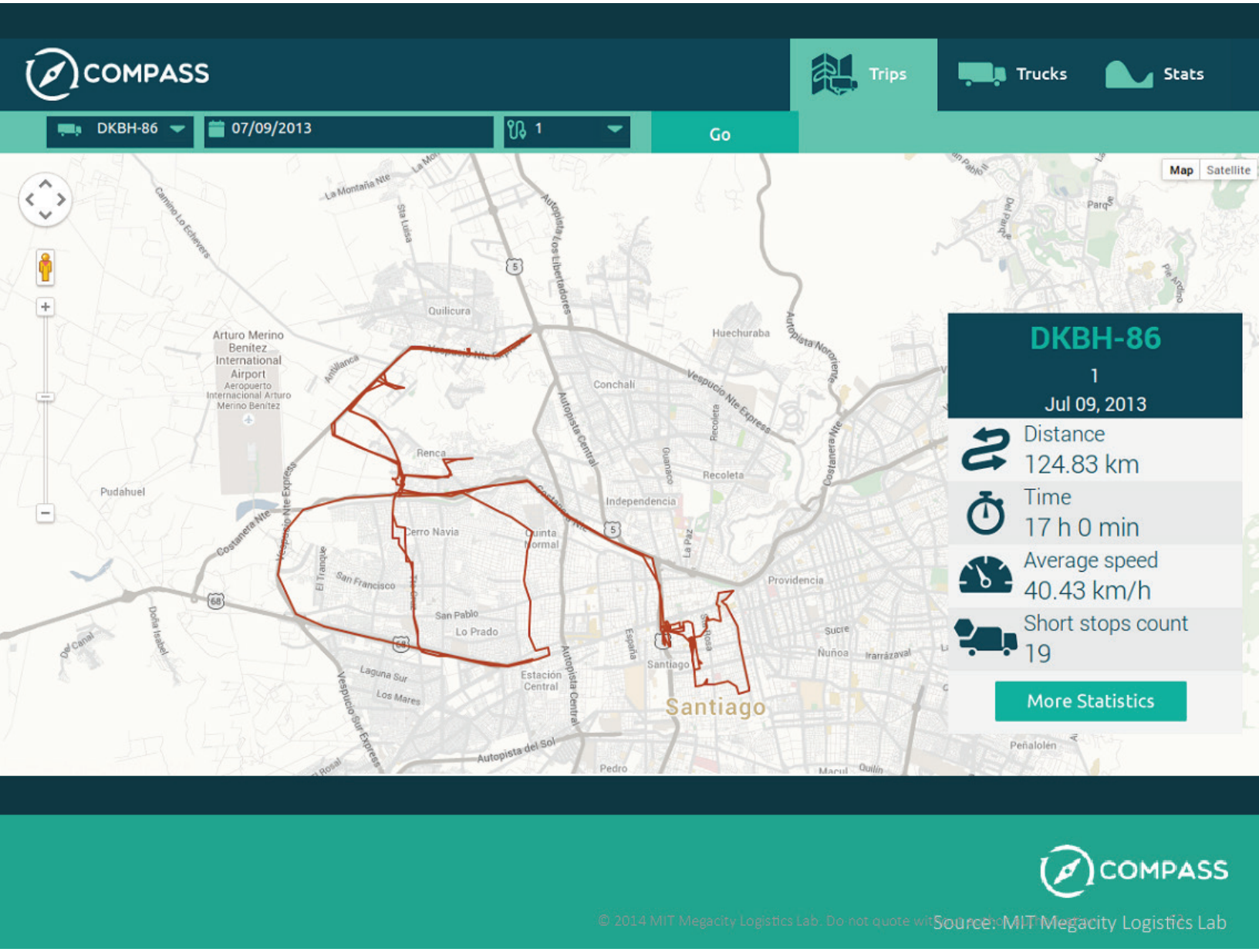


Supply chain design choices for nanostores.

City structures, income distributions, and shopping patterns in emerging megacities are very different from the ones in developed markets. A distinct retail characteristic is the presence of millions of very small, family owned and operated stores. We call these businesses *nanostores*. Reaching these nanostores with tailored logistics and channel strategies is the next opportunity in global retailing. A forthcoming book will include case studies showing a variety of strategies used by a dozen companies in Asia, Africa, Europe and Latin America that have achieved competitive advantage by serving these nanostores.

[1] Blanco, E.E. and Fransoo, J.C., "Reaching 50 million nanostores: retail distribution in emerging megacities", Working Paper WP-404 BETA Research School, Eindhoven University of Technology, 22 January 2013.

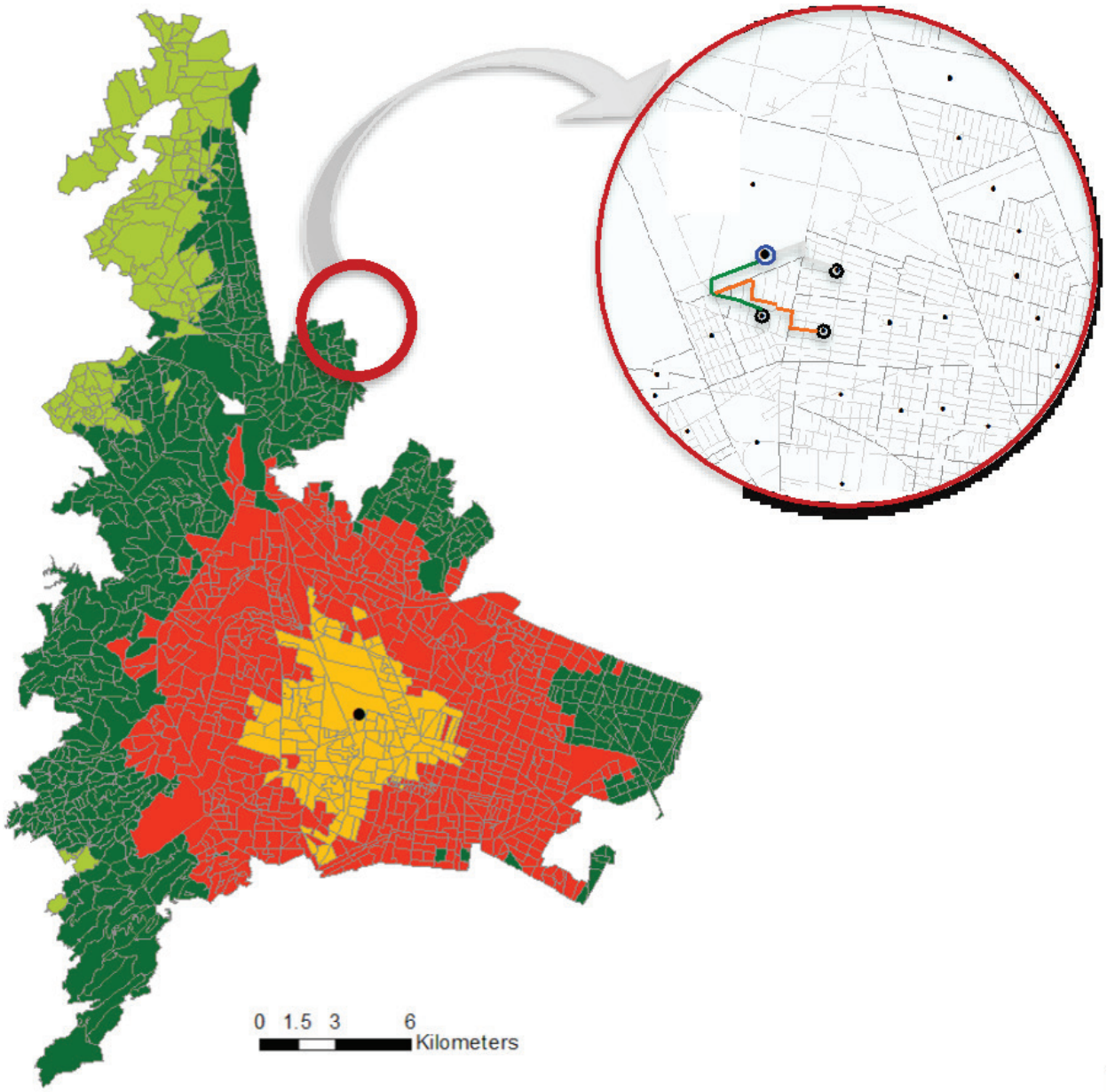
Big Data in City Logistics



Open source platform to visualize and analyze GPS traces. A prototype of this version is available at: http://lastmile.mit.edu/compass

Companies collect tens of thousands of data elements every day from a variety of systems and sensors in their logistics operations. Often, this data is archived and not used to improve or re-design their last-mile activities. Leveraging recent advances in data analytics, we are prototyping new algorithms that process GPS and cellphone traces to extract information on congestion, stop times and dynamic route choices.

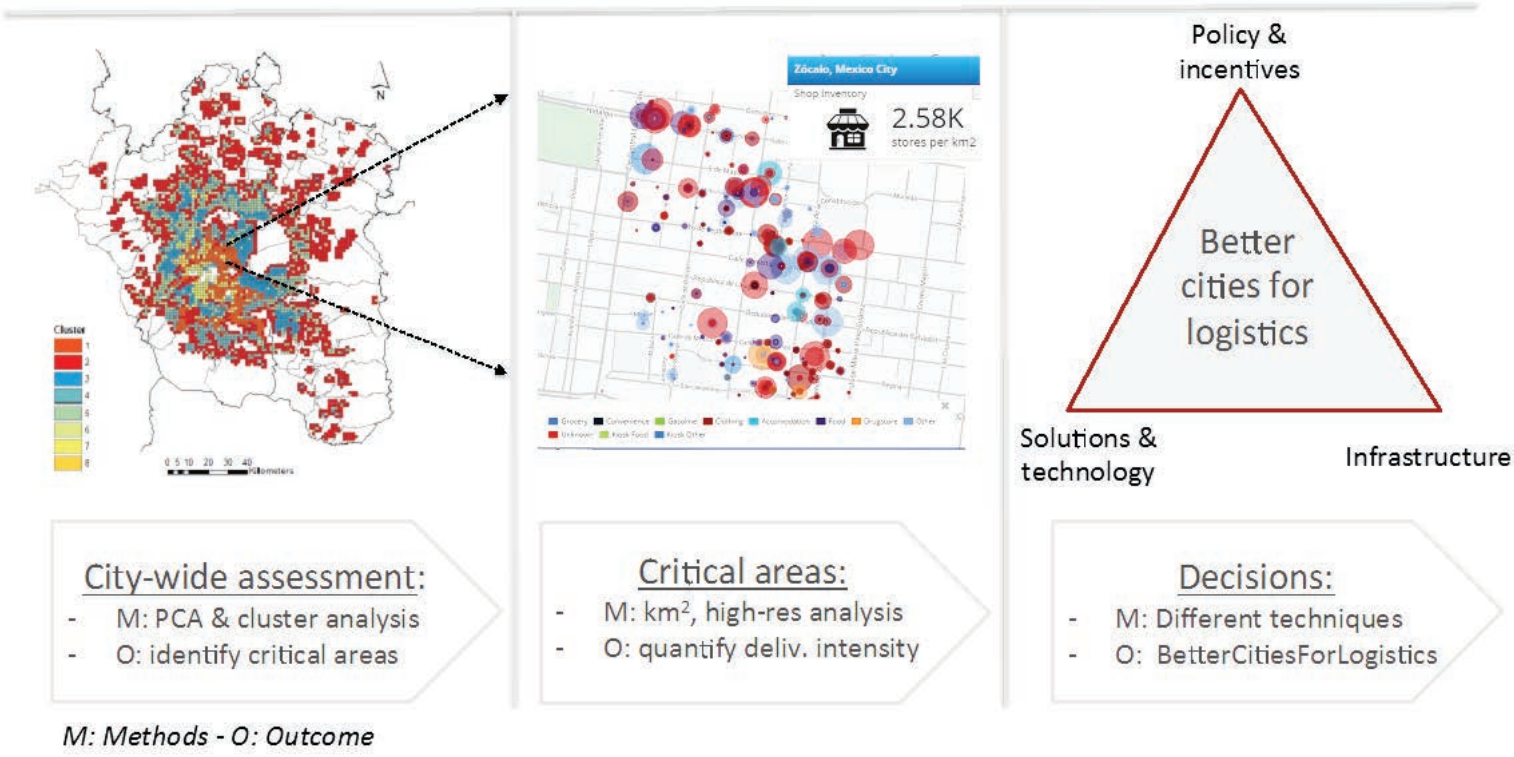
High-Resolution Urban Logistics Design



Ring-radial algorithm for territory design in Mexico City. Credit: Caballero, S.A. (2015). Analysis and design of a last mile distribution system to traditional retailers in high dense urban areas: a case study in Mexico City. Ph.D. Thesis. ITESM and MIT Megacity Logistics Lab.

Traditional algorithms used in logistics design – clustering, facility location or vehicle routing – do not adequately capture congestion or urban form, which are critical operational variables in urban logistics. By combining traditional optimization algorithms with GIS variables and efficient in-memory structures, we are developing the foundation for the next generation of logistics optimization tools.

Future City-Logistics Networks



Data-driven methodology to guide city logistics policy decisions.

The growth of e-commerce is pushing the limits of existing logistics network designs. We are re-imagining future city logistics networks that support omni-channel retail models, smaller store formats, increased intensity of deliveries, coordinate multiple transshipment points, engage a wider range of vehicle technologies – including public transport, electric and autonomous vehicles – while balancing complex inventory deployment strategies.

The toolkit is being prototyped in seven cities: Mexico City, Madrid, Lisbon, Rio de Janeiro, Santiago, Bogotá and Singapore.

Engage

Please contact Edgar Blanco (eblanco@mit.edu) for more information. We are looking for companies to engage with us on:

- City-Level GPS or cellphone CDR datasets for analysis and algorithm development.
- Case studies to design future last-mile networks in large urban areas (over 2 Million inhabitants), preferably including omni-channel dimensions or nanostores.
- Industry and/or government experiments to evaluate urban freight policies.
- Funding to continue open source tool development, including the city logistics toolkit.

Disaster Response Supply Chains

We have enough life-saving supplies to meet disaster victims' needs, but the supply chain to meet these needs is failing. MIT is developing new science and creating collaborative space for public, private and non-profit actors to improve these vital supply chains.

Between 2000-2013, disasters killed 1.3 million people and affected 3 billion others worldwide.[1] Major disasters continue to strike: 2010 Haiti earthquake (222,570 killed), 2011 Japan tsunami (15,840), 2013 Philippines typhoon (7,354)[2]. We continue to face an Ebola outbreak that threatens millions worldwide. The MIT Center for Transportation & Logistics, with over 40 years of industry collaboration, launched an initiative to improve disaster response. MIT, with its public, private, and NGO partners, is uniquely positioned to design supply chains that dramatically improve disaster response and seeks strategic funding to accelerate this effort to save lives.

[1] EM-DAT: The OFDA/CRED International Disaster Database, Data version: 12 March 2013 - v12.07.
[2] https://www.munichre.com/touch/naturalhazards/en/natcatservice/annual_statistics.aspx

Research Director: Jarrod Goentzel
Graduate Student: Lauren Seelbach
Postdoctoral Associate: Jaime Andrés Castañeda
Visiting Faculty: Marianne Jahre

visit us at http://humanitarian.mit.edu

Disaster Trends

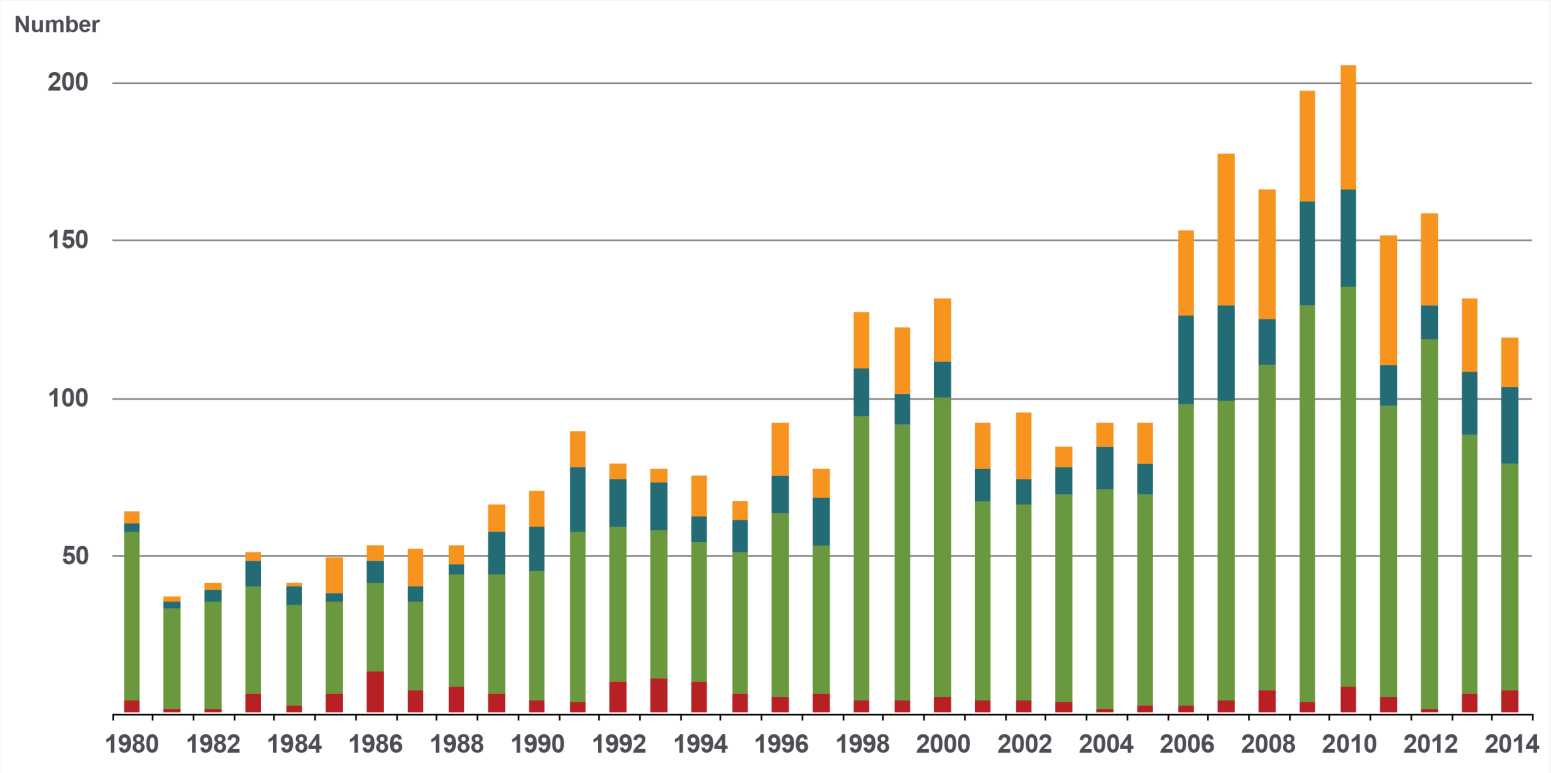
The population affected by disasters continues to rise due to the following trends: (1) the number of extreme-weather events, such as floods, storms, and droughts is increasing dramatically; (2) population and economic activity are concentrated in vulnerable locations such as coastlines, rivers, and earthquake faults; and (3) world population growth occurs in the urban areas of the less developed regions, where systems are weakest. In spite of these trends, there is ample supply of shelter, food, water, and medical products for affected populations, and individuals and politicians are increasingly inclined to offer the response resources required. Effective response hinges on a supply chain designed to move critical supplies to areas of need.

NatCatSERVICE

Loss events in the U.S. 1980 – 2014

Number of events

Munich RE



Supply Chain Solutions

The science to manage material flows among actors (e.g., manufacturing, transportation, warehouse, delivery) emerged in the past fifty years; by the 1990s, logistics costs as a percentage of GDP had dropped dramatically with better product availability. However, attempts simply to apply the same supply chain strategies and systems to the disaster context have failed, and response efforts are often inefficient and ineffective. Supply chain science must be further developed to incorporate the unique context of disasters: limited data, security risks, damaged infrastructure, population migration, volatile economies, and poor governance.

Developing new applied science requires researchers who are comfortable both in the lab on campus and in the field of action. MIT faculty, staff, and students have developed a practical research approach with numerous government, non-government, and private sector organizations, domestically and internationally, that is a cycle of observation, development, and application:

- Empirical research to develop theory on decision-making during crises and to characterize how supply chains adapt in resource constrained contexts.
- Scientific development to optimize product flows based on empirical insights and to incorporate new paradigms such as mobile technology and social media.
- Practical application by upgrading skills via education and training, and shifting policies in various organizations and communities.

Increasing Private Sector Role

Disasters create needs among citizens and operational disruptions for businesses. Increasingly, government agencies are leveraging private sector capacity during disasters to (1) increase efficiency and effectiveness for response efforts and (2) more rapidly restore local economies. For companies, active participation in disaster response not only provides enhanced public image (corporate social responsibility or CSR) but also contributes to rapid restoration of its own business operations (business continuity). The financial impact of restoring operations quickly are at least as important as CSR benefits of engagement in disaster response. The key is developing new designs and policies for public-private disaster response supply chains that benefit both citizens and companies.

Engage

We currently offer opportunities for corporate participation in two US-based studies:

- **Response Capacity Index:** MIT CTL has developed a robust model for quantitative analysis of disaster response capacity. We are currently working with the emergency management offices in Florida and Louisiana, along with FEMA, to assess the combined public-private capacity to provide key commodities (e.g. water, food, fuel) to a disaster affected population. This quantitative analysis is a foundation for developing a Response Capacity Index to be an overall framework for assessing and planning public and private operations for disaster response.
- **Retail Disaster Assistance (RDA) Points:** We seek to develop an operational model for private sector retail outlets to complement Red Cross shelters and FEMA Disaster Recovery Centers in providing recovery information and supplies for disaster survivors. Retail locations already known by community members then become a key point for connecting with public and private resources, In addition, RDAs outside the disaster-affected community could be established to channel donations from the public.

If you would like to learn more about these projects or our related work on international disaster response and economic development, please contact Jarrod Goentzel (goentzel@mit.edu).

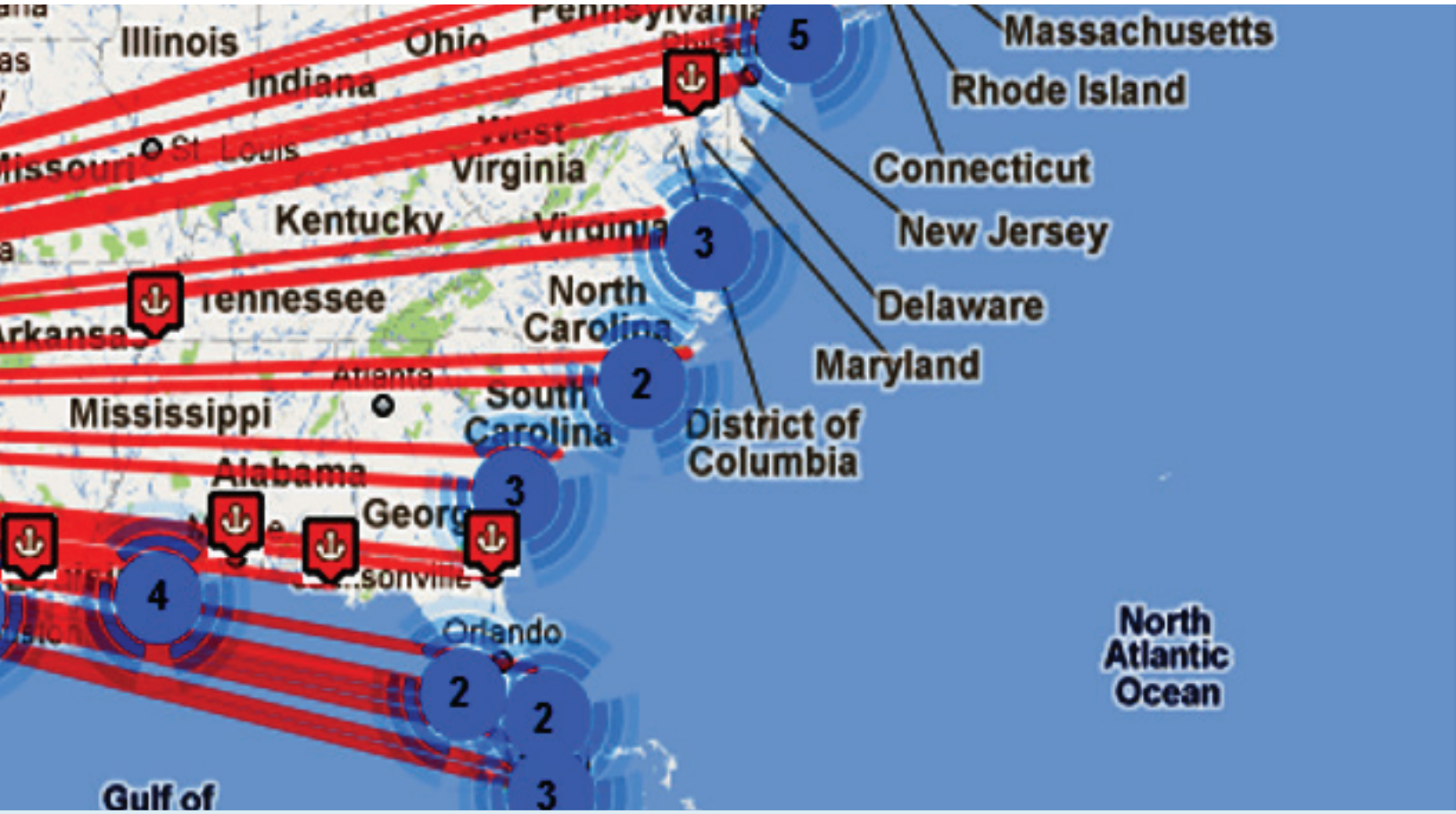
Supply Chain Risk Management: Supply Chain Resilience & Port Resilience

Key Insights

- **Port Resilience:** An online application called Port Mapper was developed by the research team, and it is currently being used by the USCG to aid in port disruption response. Guidelines for developing operational continuity in seaports were developed and serve as a foundation for the MTS resilience preparation and response.
- **Supply Chain Resilience:** This project has contributed multiple publications outlining the challenges and solution frameworks for creating secure and resilient supply chains, emphasizing response options, business continuity planning, various methods of achieving resilience (flexibility and/or redundancy).

This research initiative studies SCRM with a primary focus on resilience in supply chains, maritime transportation systems (seaports) and resilience to emerging cyber risks.

Principal Investigators: James B. Rice, Jr., Kai Trepte (Port Resilience)



Engage

Contact Jim Rice at jrice@mit.edu or 617.258.8584.

- **Port Resilience Project:** The Port Resilience project welcomes operators in the maritime transportation domain (vessel operators, terminal operators, port authorities, waterway operators, forwarders/brokers), government agencies (maritime security and law enforcement agencies, port infrastructure owners) and other related parties to participate in this project. The project team is interested in parties that can share port disruption experiences and actions taken to recover and also to make the seaport operations more resilient.
- **Supply Chain Resilience:** We are seeking companies willing to share their supply chain disruption and resilience experiences, as well as those interested in improving their supply chain resilience. We are also interested in companies that have suffered a cyber disruption to their supply chain and any companies taking actions to address cyber risks in their supply chain.

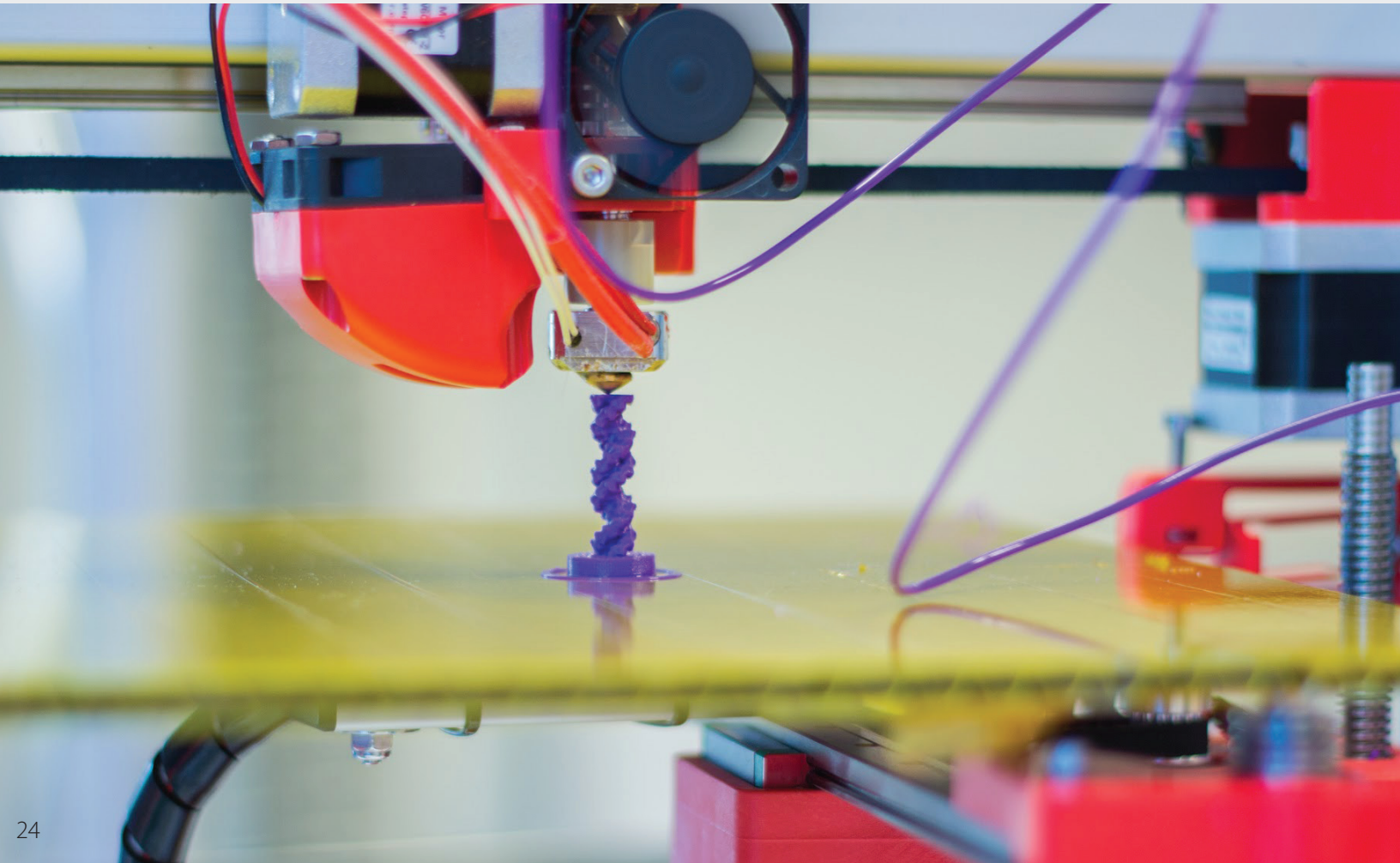
Supply Chain Innovation

This research initiative studies supply chain innovation (SCI) with a primary focus on building understanding of two primary types of supply chain innovation and the challenges associated with pursuing supply chain innovation.

Principal Investigator: James B. Rice, Jr.

Key Insights

- There are two types of supply chain innovations, sustainable and disruptive supply chain innovations. Most companies actively pursue sustainable SCIs but are enamored with disruptive SCIs.
- Disruptive SCIs result when a company changes the dominant supply chain design or design element within a particular domain or industry.
- All SCIs are the result of clever reapplication of known solutions with inventions and technology in carefully selected applications that are productive and scalable.
- The Innovators Dilemma applies to the supply chain domain.

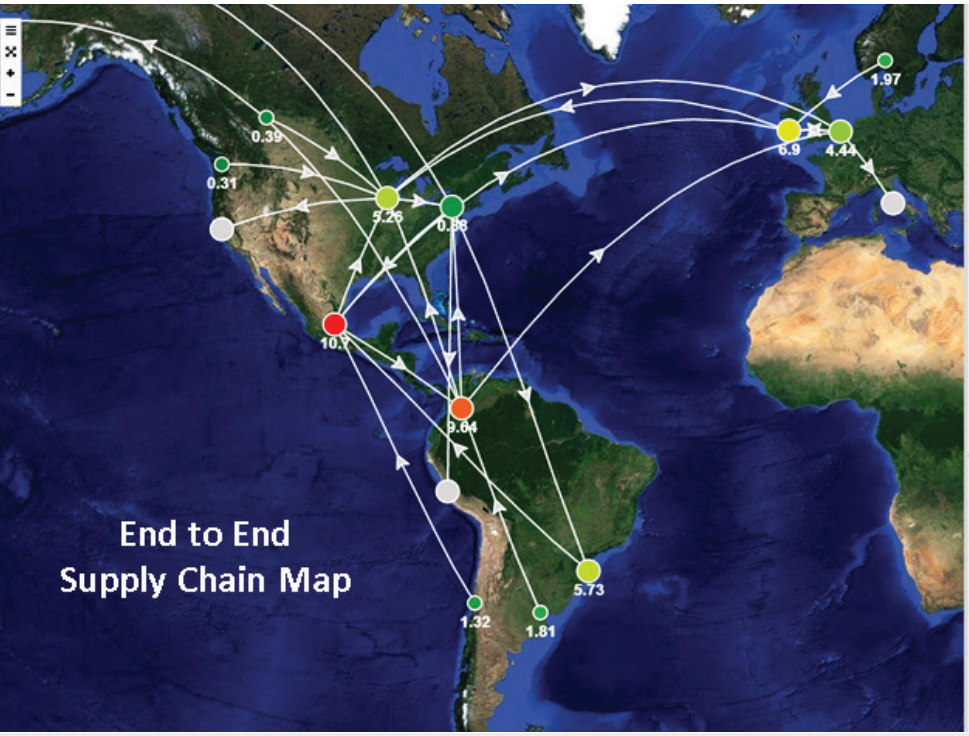


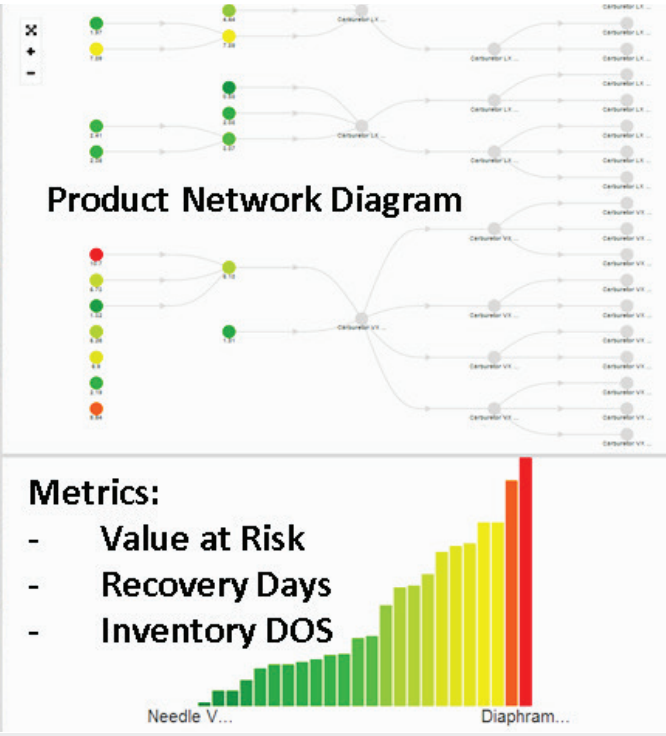
Engage

This project seeks companies interested to learn more about SCI and willing to share their opinions and experiences in pursuing supply chain innovations. Contact Jim Rice at jrice@mit.edu or 617.258.8584.

Hi-Viz Supply Chain

This project seeks to automatically display both a map and an end-to-end network diagram of a company's supply chain by extracting data from its corporate databases. It further seeks to automatically calculate and visually overlay key supply chain metrics including value at risk, inventory levels, recovery time, customer blackout days, and the locations of impending risks.





Key Insights

- Visual displays of supply chains with overlays of key metrics are a quick and effective way to communicate a call for action to the board room.
- Purchasing function ranking of supplier importance based on dollar spend is irrelevant and misleading in terms of supply chain risk.
- Key data on 1) supplier (factory) location and 2) time to recover from loss of supplier are not captured currently in corporate databases:
  - Major ERP systems provide no place to put such data currently
  - Purchasing could provide and enter this data if properly motivated and if a place in the ERP system was provided.
- Top management support of SC Risk Management will be needed before corporate IT managers will modify major (ERP) systems to support risk management.

Principal Investigators: Dr. Bruce C. Arntzen (Lead), Gitarthi Medhi (Research Assistant), Stephanie Buscher and Angel Poyato Ayuso (MIT SCM Graduate Students with a Hi-Viz based thesis project)

Methods

- Extract data from corporate databases (bills of materials, inventories, supplier names).
- Have purchasing fill in missing info (where-made locations, recovery times, splits).
- Use above information to draw 1) a map of the supply chain and 2) a network flow diagram.
- Display GeoEmergency Alerts on the map and link to impacted sites, lanes, and products.
- Use Financial Risk Ratings to calculate the probability of financial collapse of each supplier.
- Use Historical Natural Disaster data to calculate the probability of losing each supplier.
- Use Real-Time, Event Based Natural Disaster models to calculate loss probabilities.
- Combine probabilities to calculate Value At Risk for each site in the supply chain.
- Gather data and display Tier 2 supply base and risks.

Engage

Get Involved and model your supply chain risk! The Hi-Viz project is looking for additional sponsors to both model supply chain risks in their company and to help support the continued development of its tools. A sponsor is also needed to help fund a master's thesis to focus on both:

- Applying the Hi-Viz model to more actual supply chains to encounter and solve a greater variety of supply chain configurations and situations, and
- Further the adaptation of insurance industry property catastrophe models to the problem of "supplier loss" and incorporate these learnings into the Hi-Viz tool methodology.

Contact Bruce Arntzen at barntzen@mit.edu to learn more information.

Strategic Planning for Reverse Supply Chain

Many products retain significant residual value after their useful life is over, that is, at their end-of-life (EOL). In this project, we seek to understand how to manage a product's EOL and create a reverse supply chain strategy.

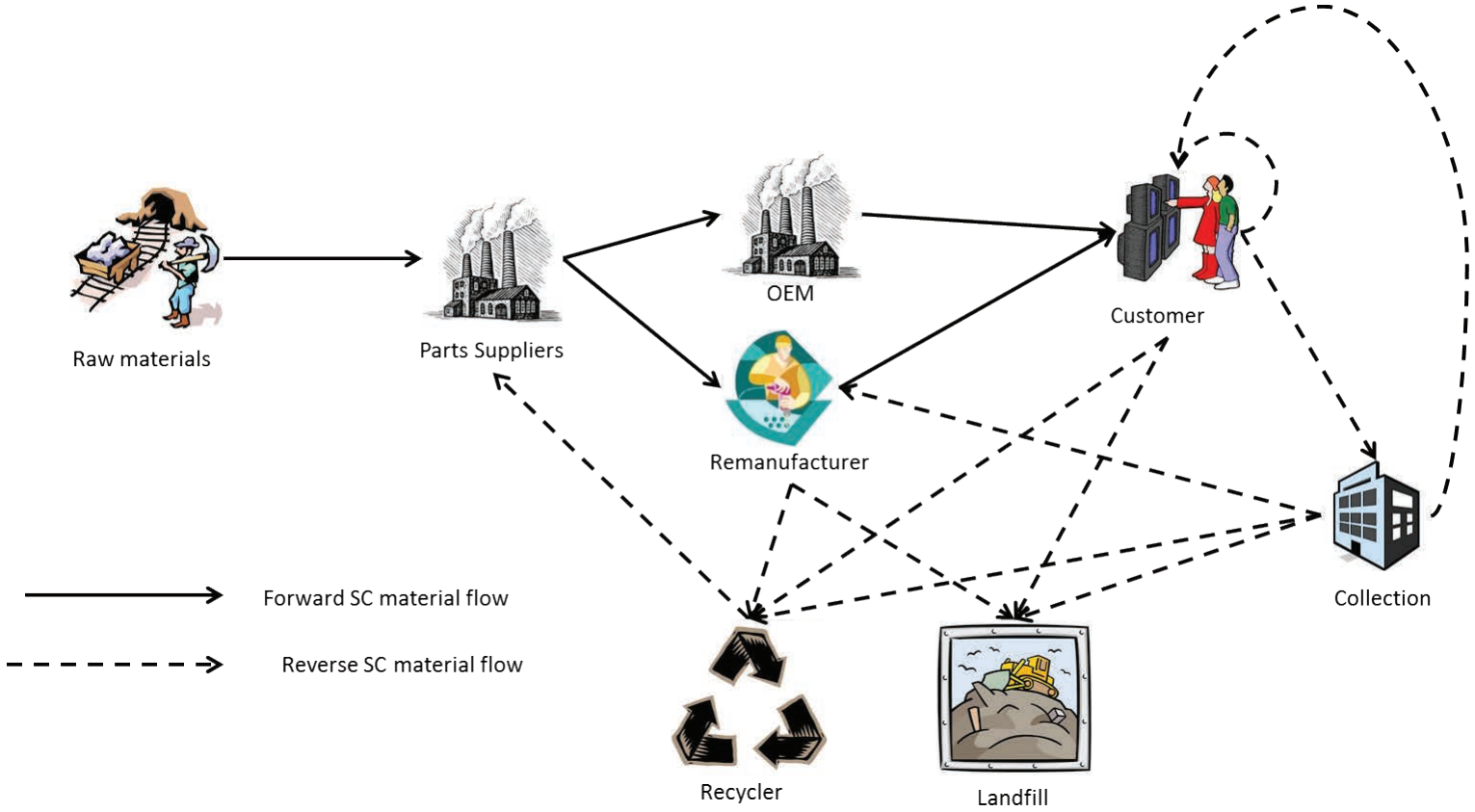
Principal Investigator: Dr. Daniel Steeneck

Key Insights

- The underlying principles determining a product's end-of-life option are quantifiable and are able to be simply expressed.
- A method for jointly determining a product's end-of-life option and product design (specifically, quality level of the product components) has been developed.
- Under the assumption of a monopolistic firm, we have found a procedure for pricing new and used/remanufactured versions of a product.

At the end of the useful life of a product, i.e., its end-of-life (EOL), an important decision must be made: how to dispose of the product. We refer to this disposal method as the product's EOL option. All too often, the easy decision is made to throw away the product. However, from both an economic and environmental standpoint, this may be the least desirable EOL option. Numerous other EOL options exist including recycling, part salvage, resale, and remanufacturing. The best option for a given product is dependent upon its design, the nature of its customers, and various other characteristics of the product (e.g. manufacturing cost, recovery cost, disassembly cost). Thus, the natural entity to manage the EOL of the product is the original equipment manufacturer (OEM). The objective of this project is to develop a framework under which an OEM decides on the EOL option for a product, taking into consideration the product's design, market, and other important characteristics.

The decision of EOL option is critical to both (1) designing the product and (2) understanding how to price the product (in view of the fact it may compete with its derivatives such as used and remanufactured versions of the product). In turn, we may then consider the design of the product's reverse supply chain (RSC).



Many key developments have been made so far. Firstly, the underlying principles that determine a product's EOL option from specific product characteristics have been established. These principles are quantifiable and can be simply expressed. Secondly, we have shown how to select the quality level of product components while taking into consideration the product's EOL option (these especially apply under an assumption of product leasing). Thirdly, methods for pricing the new and used/remanufactured versions of the product have been developed that apply to a monopolistic OEM.

Engage

We are actively looking for companies to partner with on reverse supply chain research projects. Consider how your company's products are managed at their EOL. Perhaps there are opportunities for improvement such as selecting a more beneficial EOL option, re-designing your product to better leverage your RSC, re-pricing new and used/remanufactured product to optimize market segmentation, or to even begin implementing product recovery practices.

Additionally, your company's reverse supply chain must be aligned with the EOL strategy for your products. How will products be recovered? Will customers be incentivized or contracted to return products or not? How should the RSC network be designed?

If your company is interested exploring any of these topics, let's discuss starting a research project or setting up a roundtable event on this topic. Contact Daniel Steeneck (steeneck@mit.edu) to learn more.

MIT FreightLab

FreightLab is dedicated to finding better ways to plan, procure, manage, and assess freight transportation across all modes and regions.

Principal Investigators: Dr. Chris Caplice and Dr. Francisco Jauffred

Key Insights

- Measuring and managing trade-offs is critical to transportation planning and design. These trade-offs include risk sharing between shipper and carrier (e.g., fuel costs), costs versus level of service, robustness versus flexibility, etc.
- Transportation networks are dynamic and are highly uncertain in most aspects to include demand levels, transit time, supply, costs, etc. These uncertainties need to be measured and managed. This can be handled through over capacity (robustness), back up planning (flexibility), or a combination of both. Most firms do NOT consider uncertainty when making their transportation design decisions.

Freight transportation is a critical link in virtually all supply chains since product has to move from the original source to final point of consumption. Transportation is one of the only functions that spans the entire supply chain from raw material suppliers to final customers (and back, for reverse supply chains). Transportation operations are also typically inter-firm as they usually involve three or more separate entities (shipper, receiver, carrier, 3PL, port operator, etc.). For these and other reasons, transportation is one of the more complex functions for a firm to manage.

The MIT FreightLab is dedicated to exploring and improving all aspects of freight transportation. We achieve this through a number of different mechanisms:

- **Events:** FreightLab holds both focused roundtables and larger symposia on different aspects of freight transportation. Past roundtable topics have included transit variability, ocean transportation management, robust planning, e-procurement, fuel cost risk sharing, etc.
- **Teaching:** FreightLab designed and delivers MIT's only freight transportation focused graduate level course (ESD.266 Freight Transportation Systems and Analysis). The course attracts students from the schools of engineering, management, and architecture and planning.
- **Student Thesis Projects:** In order to engage students even deeper into freight transportation, FreightLab sponsors and advises a number of graduate level theses each year that address real freight transportation problems with corporate sponsors. Past thesis sponsors have included Amazon, C.H. Robinson, Coyote Logistics, Anheuser-Busch InBev, Walmart, Chiquita, Ford, and many others.
- **Focused Research Projects:** In addition to a one-year thesis project, FreightLab engages with firms for more in-depth and focused research projects. These typically involve several researchers and last one or more years. Current and past research projects include: Optimal Freight Portfolio Management (Walmart), The Living Plan: Robust Transportation Planning (United States Transportation Command), Planning for Future Freight Flows (United States Department of Transportation), Ocean Transportation Reliability (Ford Motor Company), Distribution Strategies (Subway Restaurants), and Global Visibility (BASF).

Engage

We are always looking for firms to engage with us on their own pressing freight transportation challenges. If you are interested in becoming involved in any aspect of FreightLab's activities, please contact Chris Caplice (caplice@mit.edu) for more details.

Supply Chain 2020

Rethinking a supply chain strategy is a complex task. We have developed and tested a comprehensive, structured approach to help you accomplish it.

Principal Investigator: Dr. Roberto Perez-Franco, Director

Key Insights

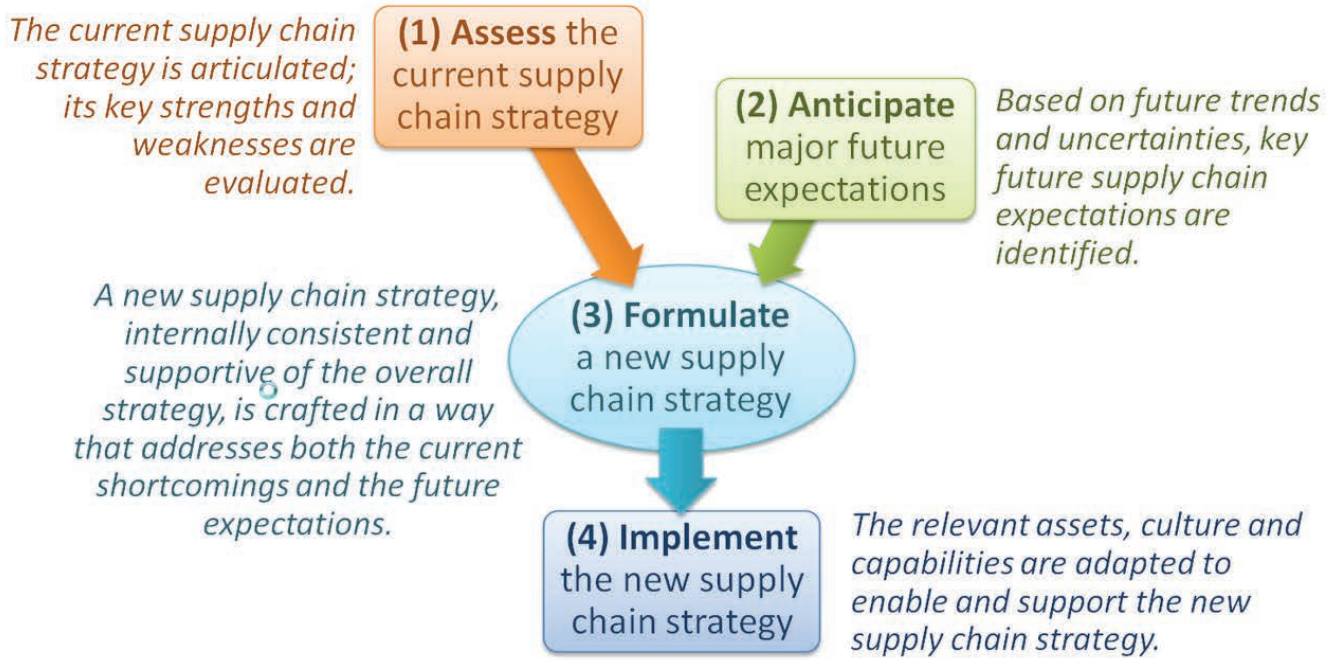
- SC2020 has developed an articulation and evaluation method to address the mid-term challenge of achieving operational excellence.
- SC2020 has also developed a visioning method to address the long-term challenge of preparing for an uncertain future.
- SC2020 has also developed a structured method to formulate a new supply chain strategy and implement it.

Business strategies change. Products progress along their life cycle, and new products are launched. Disruptive technologies appear. Regulations and consumer preferences evolve. All these changes require us to stop and reconsider our current supply chain strategy to ensure it remains sound, and adapt it if needed. Rethinking a supply chain strategy, however, is not a trivial problem. Supply chains are complex entities, and rethinking their strategy reflects this complexity. The absence of an established answer in the supply chain management literature on how to rethink a supply chain strategy further compounds what is already a daunting problem. That is why MIT's Center for Transportation & Logistics (MIT CTL) has been working on the problem of supply chain strategy as part of a project called Supply Chain 2020 (SC2020).

The project, launched in 2004 to address the issue of preparing supply chains for future challenges, has been dedicated since 2010 to the task of developing, documenting and disseminating a toolkit of methods to rethink a supply chain strategy. As SC2020 approaches its conclusion, the ideas it has generated have been thoroughly tested in multiple projects with world-class organizations, including several Fortune 100 companies. Significant progress has been made towards documenting its results in the form of an actionable guidebook that can be applied by practitioners. A first draft of this guidebook should be completed by the end of 2015.

Supply Chain 2020 Project

- How can supply chains prepare for future challenges?
- Rethinking a supply chain strategy for today and tomorrow



The SC2020 approach invites practitioners to decompose the problem of rethinking a supply chain strategy as a set of four interrelated challenges. The first challenge is to assess the current supply chain strategy in order to to identify its strengths and weaknesses. The second challenge is to anticipate the future supply chain needs that the organization may encounter. The third challenge is to craft a new supply chain strategy that can satisfy the anticipated future needs while retaining or improving all the good features of the current supply chain strategy, and fixing as many of its weaknesses as possible. The fourth and final challenge is to translate the new supply chain strategy into action. The SC2020 toolkit includes methods to accomplish each of these four challenges in a structured manner.

Engage

Please contact Roberto Perez-Franco at roberto@mit.edu if you are interested in learning more.

- The SC2020 method for strategy evaluation can help you better understand the internal consistency of your supply chain strategy, as well as its 'alignment' with your business strategy.
- The SC2020 method for scenario planning can help you anticipate the impact that many future threats and challenges may have on your supply chain.
- The SC2020 method for strategy formulation can help your team assemble a new supply chain strategy that retains the good, fixes the bad, and is ready for the future.

Supply Chain Team Dynamics

Have you ever wondered what makes a supply chain team effective? MIT CTL is looking under the hood to figure out how an array of different factors affect a team's dynamics and, ultimately, its performance.

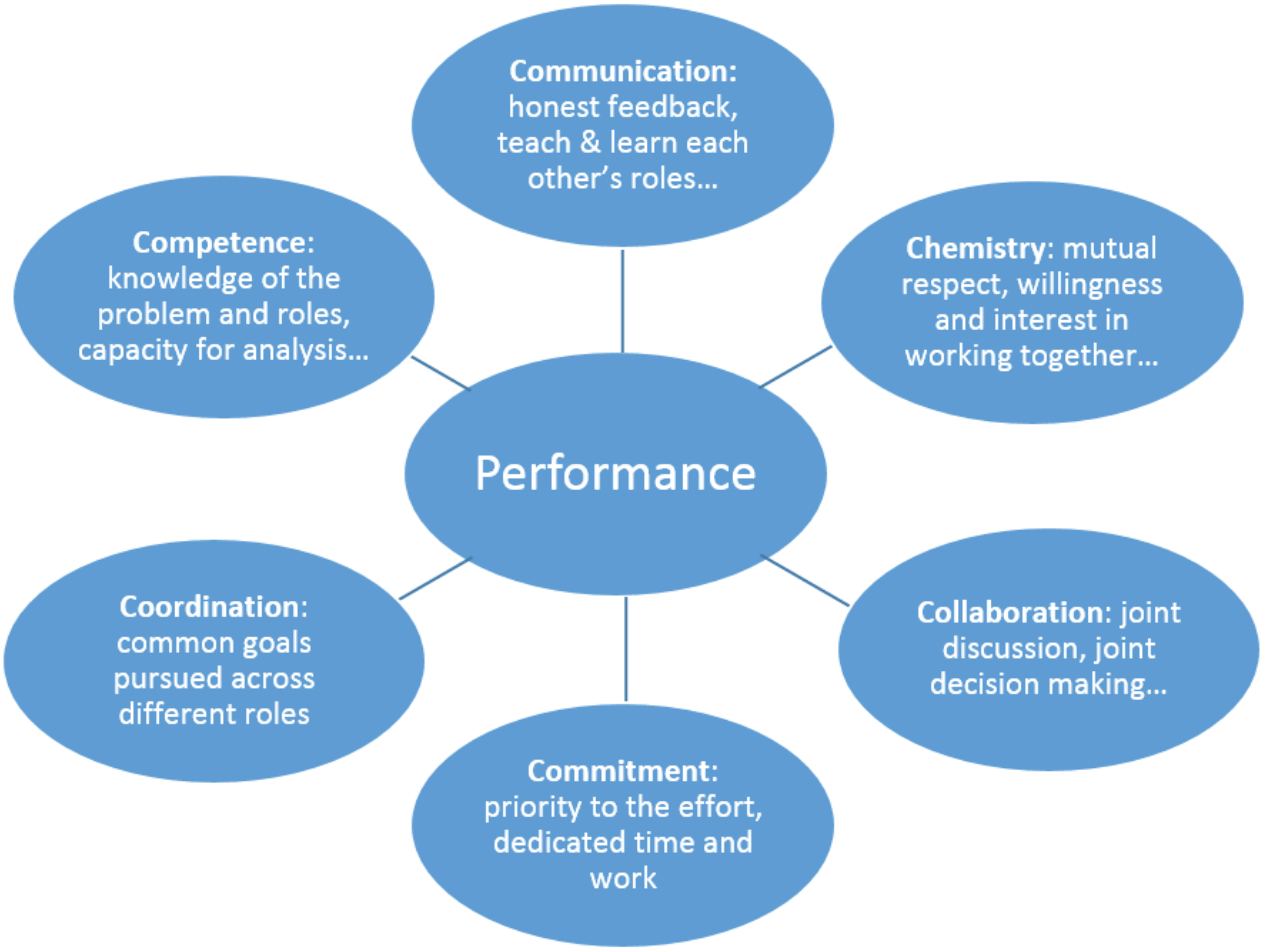
Principal Investigator: Dr. Roberto Perez-Franco, Director

Key Insights

- Good team chemistry does not guarantee success. However, it does seems to lead to failure, if not in the short term, for sure in the long run.
- Effective teams tend to communicate in several ways, including real-time meetings with voice and video.
- Effective teams do more preparation work before meetings, and are better at giving feedback and learning from their mistakes.
- Effective teams are composed of members that are committed, and whose commitment translates into work and time invested.

Supply chains operate across multiple functions, which often have competing - even conflictive - objectives among themselves. So, not surprisingly, the success of the overall supply chain depends on the ability of these functions to come together and collaborate as a team towards achieving the overall goals of the organization. Effective teams are fundamental to supply chain success.

But what do we know about effective supply chain teams? Surprisingly little, as it turns out. There is almost no literature on the subject of supply chain teams. Although some useful insights may be derived from what we know already about teams on the one hand and supply chains on the other, it is possible that there is something particularly key to effective supply chain teams.



To understand what makes supply chain teams effective, researchers at MIT CTL have been taking a closer look at the best - and the worst - student teams competing in a supply chain simulation over the past three years. The students conduct this simulation as part of their graduate training in supply chain management. They describe their team's dynamics through interviews, questionnaires and surveys.

Although the research is in its early stages and the data collected so far has yet to be thoroughly analyzed, a comparison of the team's dynamics to their performance yields some interesting insights. These and other early learnings make us think this is an area that is ready for in-depth, formal research. If you are interested in supporting this research, please contact us.

Engage

Please contact Roberto Perez-Franco at roberto@mit.edu if you are interested in learning more.

- You can support this research by providing us access to your supply chain team for observation.
- You can also support this research by funding a thesis project, based on your organization.

Partnership

Corporate Outreach

- **50** Supply Chain Exchange Partners
- **5** Strategic Partners: BASF, Intel, Procter & Gamble, Starbucks, UPS

Events

- *Crossroads 2014 - Biomanufacturing, Robots, and 4D Printing: The Next Decade of Disruptive Innovation*, March 25, 2014
- *Annual Partner Meeting*, March 26, 2014
- *Supply Chain Risk Roundtable* at Starbucks Headquarters, April 28-29, 2014
- *Last Mile Delivery Roundtable*, May 21, 2014
- *Research Fest* of student thesis final presentations, May 22, 2014
- *Supply Chain Leadership Workshop*, October 15, 2014
- *Doing Business Digitally: Practical Implications on Downstream SCs Roundtable*, October 16. 2014
- *Improving Containerized Flows Through Information Exchange Teleconference*, December 3, 2014
- *Environmentally Sustainable Supply Chains* at The Procter & Gamble Company Headquarters, January 12-13, 2015
- *Executive Education - Supply Chain Management: Driving Strategic Advantage*, June 10-13, 2014 & January 6-9, 2015
- *7th Annual MIT Global SCALE Network Supply Chain Student Research Expo and Networking Night*, January 21, 2015
- *Crossroads 2015*, March 24, 2015

Hosted Speakers

- **Kathrin Winkler**, Chief Sustainability Officer, EMC, January 20, 2015
- **Kevin Smith**, Chairman-elect, Council of Supply Chain Management Professionals, January 15, 2015
- **Jim Tompkins**, Chief Executive Officer, Tompkins International, January 13, 2015
- **Major General William E. Rapp**, Commandant, Army War College, January 13, 2015
- **Chris Sultemeier**, Executive Vice President of Logistics, Walmart U.S., January 8, 2015

Photo Credit: Brian Farber

- **Pier Luigi Sigismondi**, Chief Supply Chain Officer, Unilever, January 6, 2015
- **Robert Blackburn**, President of Information Services & Supply Chain Operations, BASF Group, January 7, 2015
- **Deverl Maserang**, Executive Vice President of Global Supply Chain, Starbucks, January 7, 2015
- **Anthony Foxx**, U.S. Secretary of Transportation, January 5, 2015
- **Zalmi Duchman**, Founder & Chairman, The Fresh Diet, December 2, 2014
- **Dave Wheeler**, Senior Vice President of Global Supply Chain, Cintas, October 10, 2014
- **Nicola Shaw**, Chief Executive Officer, High Speed 1, April 4, 2014
- **John Wiehoff,** Chief Executive Officer, C.H. Robinson, March 4, 2014
- **Randy Strang**, Vice President of Customer Solutions for the Retail Industry, UPS, January 15, 2014
- **Waheed Zaman**, Senior Vice President, Chief Corporate Strategy & Administrative Officer, The Hershey Company, January 8, 2014

"This program is an incubator for your corporate sales and operation planning or supply chain initiatives. By accessing the best-in-class theory and lessons learned, it will help you accelerate your program and minimize the risk of failure."

- Richard Bancel, Product Delivery Manager, Schlumberger, Singapore

Executive Education

- **1400+** Executives to date
- **2 Course Offerings** in January and June
- **7+** Instructors
- **Case Studies** in Talent Management, Supply Chain Strategy and Supply Chain Design
- **Simulations** in Global Supply Chain Business. **Interactive Exercises** in Supply Chain Distribution, Supply Chain Resilience, Supply Chain Working Capital, SC2020: Rethinking Your Supply Chain Strategy

All Supply Chain Exchange Partners get one complimentary seat in our executive education course per year. Learn more at **http://ctl.mit.edu/execed**

"We continue to get OUTSTANDING feedback on these courses from prior attendees. Most importantly, they are able to cite specific application of what they learned to their work."

- Andrew Byer, Associate Director, Supply Network Operations, Procter & Gamble

"This course makes you think; it stretches your mind. Supply chain can be used as competitive advantage, and this class makes you think that way."

- Mark Eisenberg, Director, Customer Solutions - Retail Sector, UPS

Publications

Yossi Sheffi

- "Amazon Versus the Delivery Giants: The Retail Saga Continues," Linkedin Influencer blog post, May 2014.
- "World Cup Plays that Build Winning Teams," Linkedin Influencer blog post, July 15.
- "The MOOC Has Arrived and Education Will Never be the Same Again," Linkedin Influencer blog post, August 11, 2014.
- "A Failure to Treat Workers with Respect Could Be Uber's Achilles' Heel", *MIT Technology Review*, September 22, 2014.
- "Let's Fix It: It's Time for a European-Style Gas Tax in the U.S.," Linkedin Influencer blog post October 12, 2014.
- "When the Heavy Hand of Big Government is Not a Burden," Linkedin Influencer blog post, November 2014.
- "Why We Need Better Measures of Supply Chain Success," Linkedin Influencer blog post, January 2015.

Chris Caplice

- "Impact of Macro Trends on Supply Chains: Densification," Supply Chain @ MIT Blog, January 2, 2014.
- "Impact of Macro Trends on Supply Chains: Diversification of Sales Channels," Supply Chain @ MIT Blog, January 16 , 2014.
- "Impact of Macro Trends on Supply Chains: Digitization of Products," Supply Chain @ MIT Blog, January 30, 2014.
- "A Better Approach to Infrastructure Planning," *Harvard Business Review* Blog Network, July 10, 2014. Co-authored with Dr. Shardul Phadnis.
- "Balancing Robustness and Flexibility in Transportation Networks," *Supply Chain Brain*, April 2014. With Francisco Jauffred.

Edgar Blanco

- "The Impact of Carbon Footprinting Aggregation on Realizing Emission Reduction Targets," *Flexible Services and Manufacturing Journal*, Volume 26, Issue 1 (2014).
- "Closing the Loop on a Circular Supply Chain," *Supply Chain Management Review*, September/October 2014. With Ken Cottrill.
- "Eco-Growth: A Framework for Sustainable Growth," *ESD White Paper Series*. ESD-WP-2015-03. January 2015. Available at: http://esd.mit.edu/WPS/2015/esd-wp-2015-03.pdf. With Yossi Sheffi.
- "Modeling The Cost of International Trade in Global Supply Chains," *ESD White Paper Series*, ESD-WP-2015-05, February 2015. Available at: http://esd.mit.edu/WPS/2015/esd-wp-2015-05.pdf. With Eva Ponce-Cueto.
- "Conceptual framework for measuring carbon footprint in supply chains." *Production Planning & Control* ahead-of-print (2014): 1-15. With Jairo Montoya-Torres and Edgar Gutierrez-Franco.
- "Freight Trip Generation in urban contexts: a comparison between Lisbon and Singapore", Accepted for CUPUM 2015. With Andre Alho, Chris Zegras, Yin Jin Lee and Jõao Abreu.
- "Urban Metrics for Urban Logistics: Building an Atlas for Urban Freight Policy", Accepted for CUPUM 2015. With Daniel Merchán and Alexis Bateman.
- "Collaboration the Key to Unblokcing Megacity Streets". C.H. Robinson Transportfolio Blog. August 2014.

Publications

Jarrod Goentzel

- "Travel Bans and Stockpiling Can Cripple the Ebola Response Supply Chain," Humanitarian @ MIT blog post, October 20, 2014.
- "Supply Chain Innovation Critical in Ebola Response," *Supply Chain Management Review*, Jan/Feb 2015.
- Gralla, E., Goentzel, J., and Chomilier, B. "Case Study of a Humanitarian Logistics Simulation Exercise and Insights for Training Design." *Journal of Humanitarian Logistics and Supply Chain Management* (JHLSCM). Accepted January 2015.
- Rancourt, M., F. Bellavance and J. Goentzel. "Market analysis and transportation procurement for food aid in Ethiopia." *Socio-Economic Planning Sciences*, Volume 48, Issue 3, pages 198–219, September 2014. doi: 10.1016/j.seps.2014.07.001.
- Juan, A., Goentzel, J. and Bektas, T. "Routing Fleets with Multiple Driving Ranges: is it possible to use greener fleet configurations?" *Applied Soft Computing*, Volume 21, pages 84–94, August 2014. doi:10.1016/j.asoc.2014.03.012.
- Gralla, E., Goentzel, J. and Fine, C. "Assessing Trade-offs among Multiple Objectives for Humanitarian Aid Delivery Using Expert Preferences." *Production and Operations Management*, Volume 23, Issue 6, pages 978–989, June 2014. doi: 10.1111/poms.12110.
- M.A. Zissman, M. Shattuck, E. Gralla, L.C. Ivers, and J. Goentzel. "Development and Use of a Comprehensive Humanitarian Assessment Tool in Post-Earthquake Haiti." *Proceedings of 2014 Humanitarian Technology Conference*. June 2014.

Jim Rice

- "Inapt Innovations Can Do More Harm than Good," *Supply Chain Management Review* Innovation Strategies column, January/February 2014 issue
- "Reshoring: New Day, False Dawn, or Something Else?" *Industry Week*, September 19, 2014 with Francesco Stefanelli.
- "Perseverance Pays in the Innovation Game," *Supply Chain Management Review*, Innovation Strategies column, May/June 2014. With Ashley Dorna.
- "Wanted: Innovative Responses to a New Security Threat," *Supply Chain Management Review*, Innovation Strategies column, November 2014.
- "An Initial Exploration of port capacity bottlenecks in the USA port system and the implications on resilience," *International Journal of Shipping and Transport Logistics*, Volume 6, No. 3. With Kai Trepte.
- "A more realistic approach." *Journal of Commerce*, December 2014.
- "Port Investment Strategies Under Uncertainty: The Case of a Southeast Asian Multipurpose Port." *Asian Journal of Shipping and Logistics*, Volume 30 Issue 3 December 2014, co-authored with Ioannis Lagoudis and Jason Salminen.

Roberto Perez-Franco

- "Is Your Supply Chain Strategy Holding Back Innovation?" *Supply Chain Management Review*, July/August 2014.
- "Why One-Size-Fits-All Supply Chains Frustrate Innovation." *Supply Chain Management Review*, March/April 2015.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Education

Class of 2014

38	Students
11	Countries
30%	Female
70%	Male
80+	Companies recruited
100%	Hired within 3 months of graduation
57%	Average salary boost
18	Thesis Research Partners

Class of 2015

40	Students
20	Countries
22%	Female
78%	Male
60+	Companies recruiting (March 2015)
60%	Have 1 or more job offers (March 2015)
20	Thesis Research Partners

The MIT Supply Chain Management Program

#1 Graduate Supply Chain Management Program by *U.S. World News & Report*.

Redesigned website at http://scm.mit.edu

MIT Supply Chain Excellence Award established at 10 undergraduate supply chain and industrial engineering programs at 9 leading US universities. Winners receive a **$50,000** scholarship to attend the MIT Supply Chain Management Program.

Women in Supply Chain Award awarding incoming female students with scholarships between **$5,000** and **$50,0000**.

Yellow Ribbon Program participation, awarding up to 3 U.S. veterans with a **$20,000** scholarship each academic year.

130 SCALE students presented **80** corporate-sponsored thesis projects at Research Expo on January 21, 2015, with over 250 supply chain executives in attendance.

Online Education

In the fall of 2014, MIT CTL launched a Massive Open Online Course (MOOC), CTL.SC1x Supply Chain and Logistics Fundamentals, on the edX online platform. SCx1 is the first of three MOOCs that CTL is developing. The other courses in the X-Series are CTL.SC2x Supply Chain Design and CTL.SC3x Supply Chain Strategy. Students completing all three courses will earn an MITx Supply Chain X-Series certificate.

The response for the first course was overwhelming with more than 30,000 people registering from almost 200 countries. A total of 2,200 students successfully passed the course requirements and earned a course certificate. To put this in perspective, a roughly equivalent course that is taught at MIT each fall consists of approximately 80 students each year. So, this first run of SC1x reached over 25 years' worth of students! Demand for this course exceeded our expectations so much that we are re-running it this summer. The remainder of the X-Series courses will be run this coming fall and winter.

The MIT X-Series in Supply Chain Management:

- **CTL.SC1x** – Supply Chain and Logistics Fundamentals. This first course is a survey of the fundamental analytic tools, approaches, and techniques used in the design and operation of logistics systems and integrated supply chains. *To be re-run in summer 2015.*
- **CTL.SC2x** – Supply Chain Design. The second course builds off of the concepts taught in SC1x and applies them to supply chain design. There is a greater focus on more complex and in-depth problems. *To be launched fall 2015.*
- **CTL.SC3x** – Supply Chain Strategy. The final course in the series extends the supply chain concepts previously covered and demonstrates how they impact and influence business strategy. *To be launched winter 2016.*

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