



Urbanization, Data & Last-Mile Delivery

MIT CTL Executive Education

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Cambridge, MA
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MIT Megacity Logistics Lab: Lead Researcher




Matthias Winkenbach, Ph.D.
 Director, MIT Megacity Logistics Lab
 MIT Center for Transportation & Logistics

- M.Sc. in Business with specializations in Finance and Economics, WHU – Otto Beisheim School of Management, Germany
- Studies at NYU Stern School of Business, New York City, and the École des Hautes Études Commerciales (HEC) Montréal, Canada
- Ph.D. in Logistics and Supply Chain Management from WHU
- Visiting Ph.D. Candidate under Dr. Edgar E. Blanco and Visiting Scholar at MIT CTL before joining as a Research Associate in 2015
- Winner, Science Award for Supply Chain Management in 2014 by the German Logistics Association (BVL)
- Finalist, 2015 Daniel H. Wagner Prize for Excellence in Operations Research Practice
- Recent publications in Transportation Science, Interfaces, the Wall Street Journal, and the MIT Sloan Management Review
- Professional experience with Volkswagen in South Africa, Deutsche Telekom in Germany, McKinsey & Company in the United States and in Germany, as well as various other projects in the mining, shipbuilding, consulting and logistics industries

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As urbanization continues...

THE RISE OF MEGACITIES



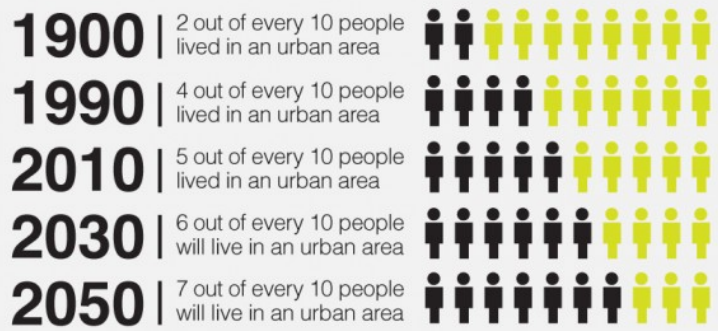
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Urbanization keeps changing the way we think about last-mile delivery



Urbanization

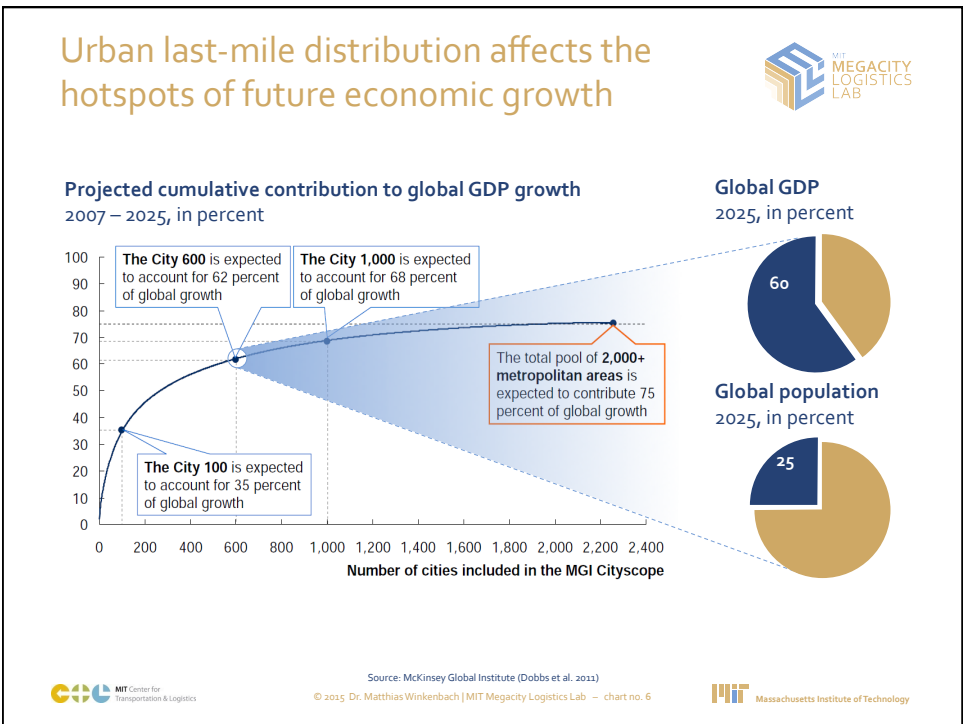
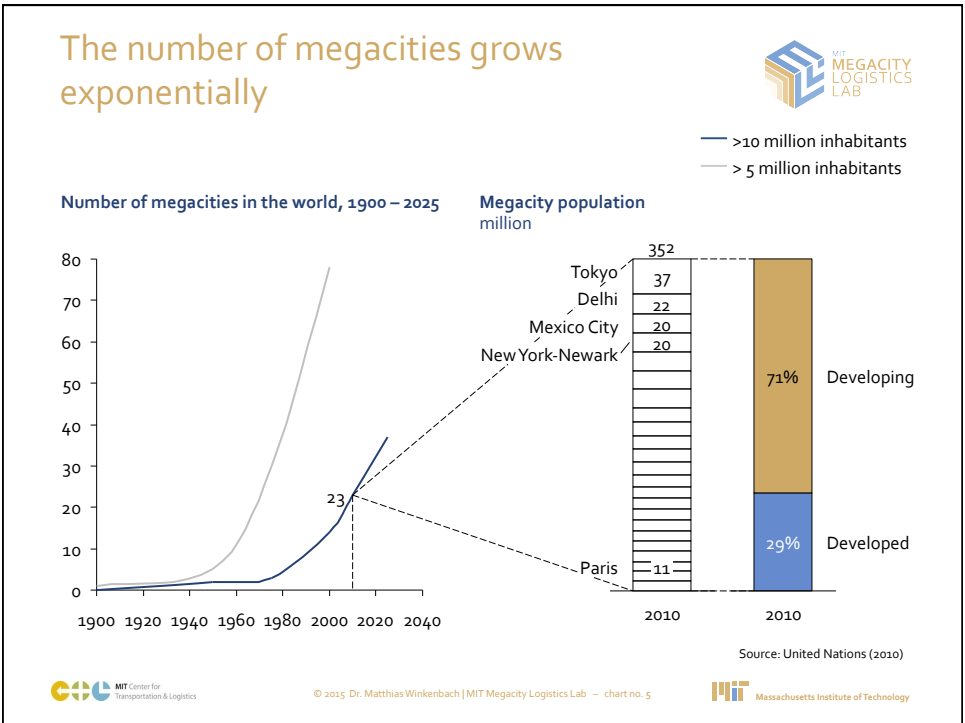


Source: WHO, 2012. Urban area defined 100,000 or more inhabitants.
Graphics: http://catalystreview.net/wp-content/uploads/2012/09/infographic_urbanization.jpg



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We consider urban last-mile distribution from two complimentary perspectives



Better logistics for cities.
Better cities for logistics.



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Our research focuses on three major building blocks



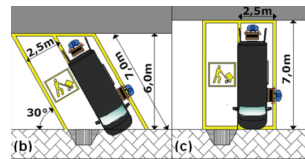
Distribution Network Design

- Multi-tier distribution
- Multi-modal distribution
- Multi-/omni-channel distribution



Urban Freight Policy & Practices

- Freight policy and regulation
- Infrastructure investments
- Best practices for urban freight



Data Analytics & Technology

- Low-cost sensor technologies
- Big Data analytics
- Augmented reality
- Robotics and automation



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A close collaboration with industry & public partners ensures our real-world impact



Active First-Tier Project Partners



...and others

Prospective Partners for Future Projects

Public Sector



Private Sector (For-Profit)



Non-Profit Organizations



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Beyond size...

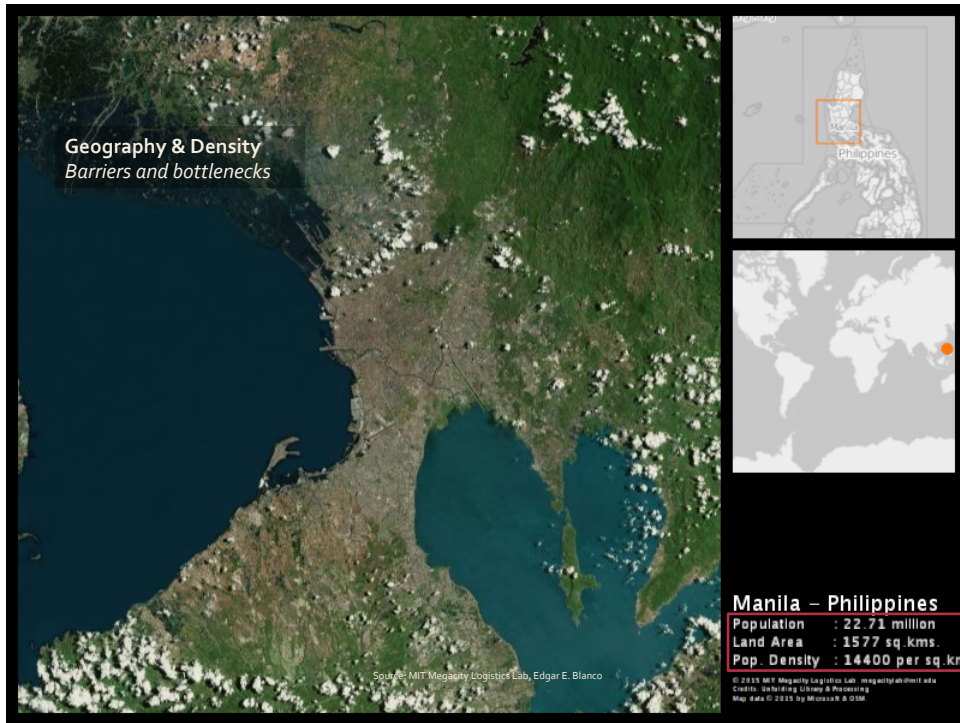
CITIES LOOK DIFFERENTLY



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Looking closer...

CITIES HAVE GROWN DIFFERENTLY

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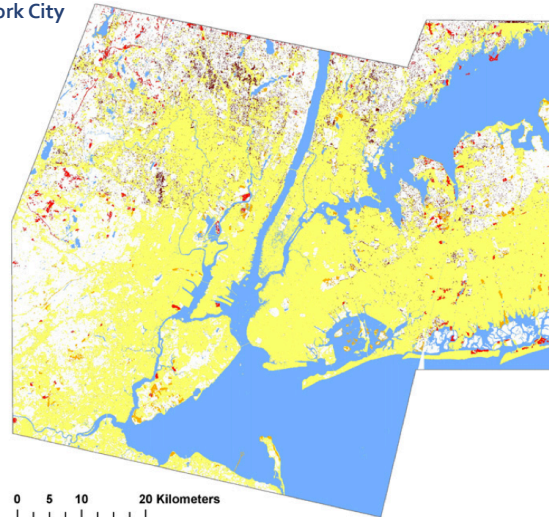
MIT Massachusetts Institute of Technology

The slide features the MIT Megacity Logistics Lab logo at the top left. Below it is a horizontal bar with the text 'Looking closer...'. The main title 'CITIES HAVE GROWN DIFFERENTLY' is centered in large blue letters. At the bottom, there are three logos: the MIT Center for Transportation & Logistics logo on the left, the copyright notice '© 2015 Dr. Matthias Winkenbach | MIT Megacity Logistics Lab – chart no. 14' in the center, and the MIT Massachusetts Institute of Technology logo on the right.

Cities have different histories and growth patterns



New York City



- Maximum overlapping area
- Urbanized area ca. 1975
- Urbanized area ca. 1990
- Urbanized area ca. 2000
- Urbanized area ca. 2010

0 5 10 20 Kilometers

Source: Taubenböck et al. (2012)



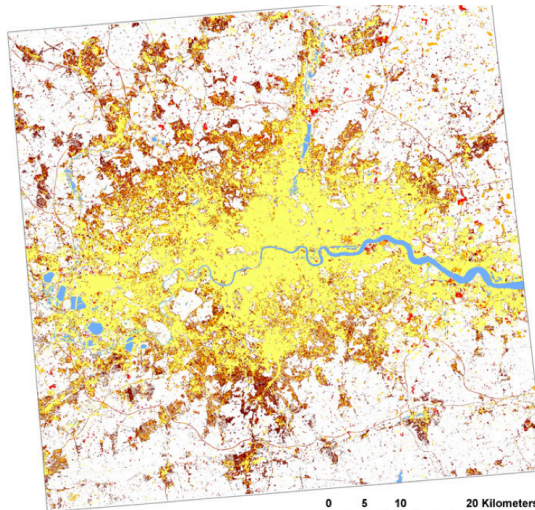
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Cities have different histories and growth patterns



London



- Maximum overlapping area
- Urbanized area ca. 1975
- Urbanized area ca. 1990
- Urbanized area ca. 2000
- Urbanized area ca. 2010

0 5 10 20 Kilometers

Source: Taubenböck et al. (2012)



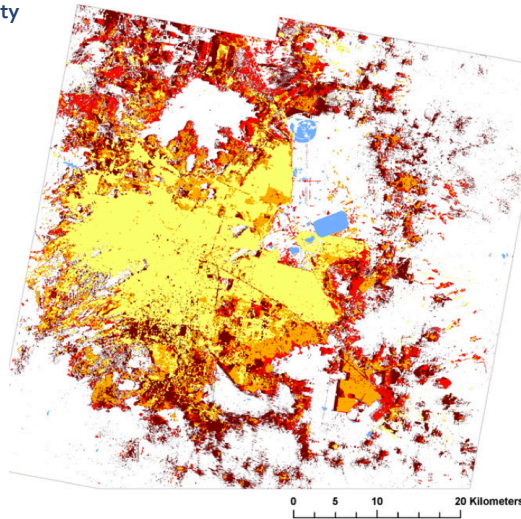
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Cities have different histories and growth patterns



Mexico City



- Maximum overlapping area
- Urbanized area ca. 1975
- Urbanized area ca. 1990
- Urbanized area ca. 2000
- Urbanized area ca. 2010

Source: Taubenböck et al. (2012)



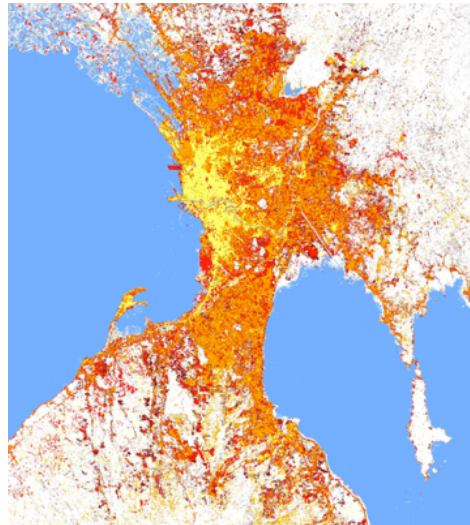
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Cities have different histories and growth patterns



Manila



- Maximum overlapping area
- Urbanized area ca. 1975
- Urbanized area ca. 1990
- Urbanized area ca. 2000
- Urbanized area ca. 2010

Source: Taubenböck et al. (2012)



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São Paulo

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Urban landscape
*How does it affect how people consume?
How does it affect urban mobility?
How do you reach your customers?
And where?*



MIT Center for Transportation & Logistics Source: Barbieri, USP (2012) © 2015 Dr. Matthias Winkenbach | MIT Megacity Logistics Lab – chart no. 19 **MIT Massachusetts Institute of Technology**

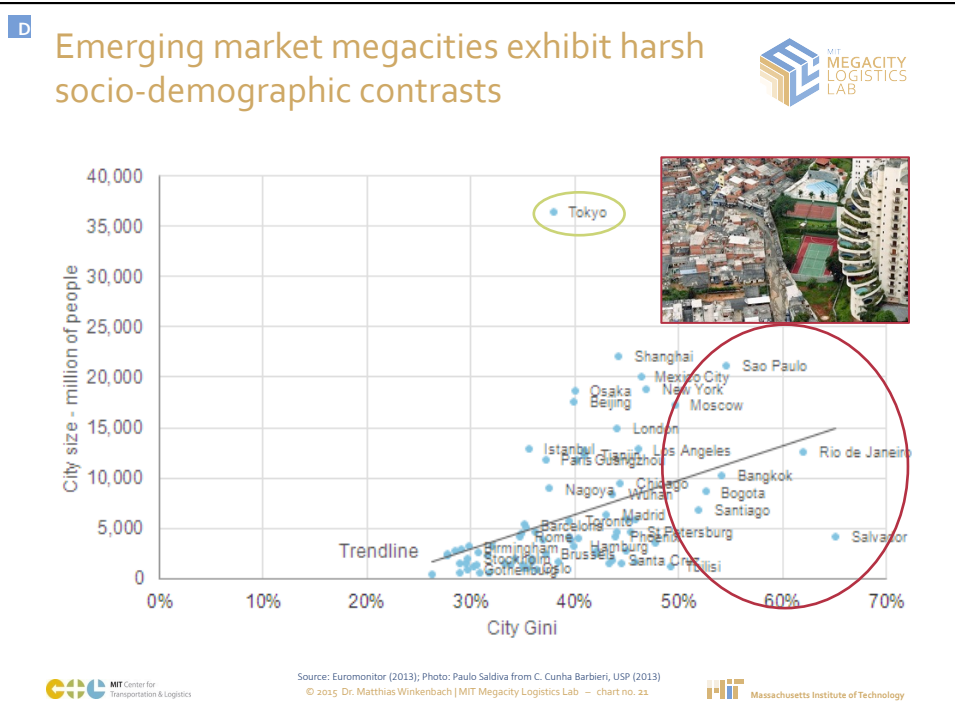
Mexico City

MIT MEGACITY LOGISTICS LAB

Urban landscape
*How does it affect how people consume?
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And where?*



MIT Center for Transportation & Logistics Source: Pablo Lopez Luz, Reddit © 2015 Dr. Matthias Winkenbach | MIT Megacity Logistics Lab – chart no. 20 **MIT Massachusetts Institute of Technology**



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Fat and slim...

DENSITY AND THE SHAPE OF CITIES

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Extreme levels of population density



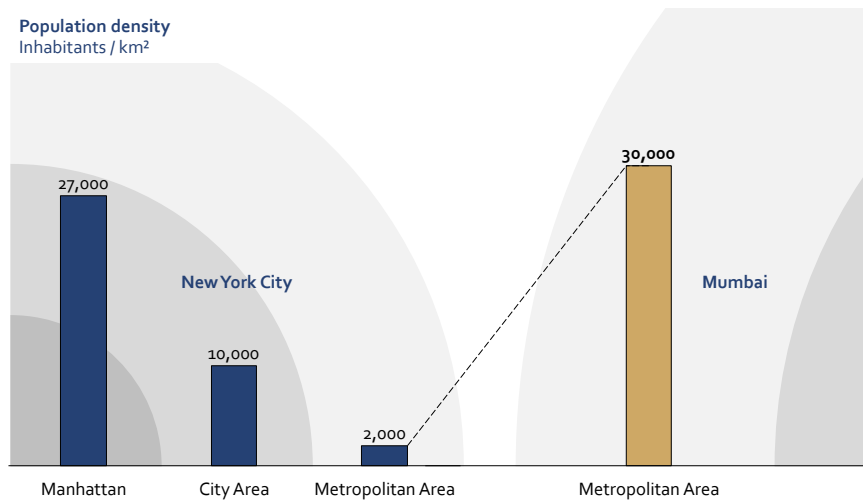
Source: Google Street View of Bogotá (2015)
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Extreme levels of population density



Population density
Inhabitants / km²



Source: Blanco and Fransoo (2013)



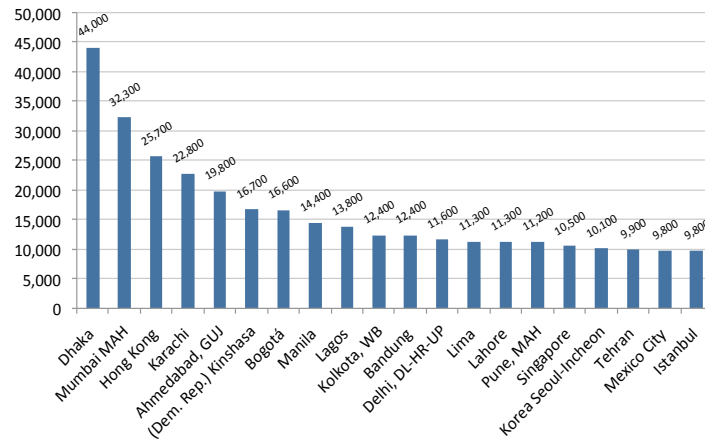
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Extreme levels of population density



Population density, metropolitan area
Inhabitants / km²



New York?

Source: MIT Megacity Logistics Lab, Demographia



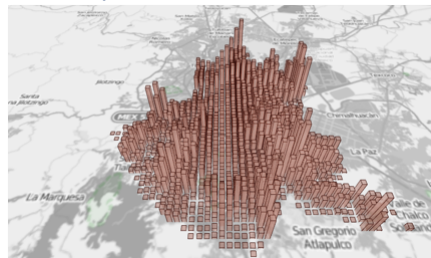
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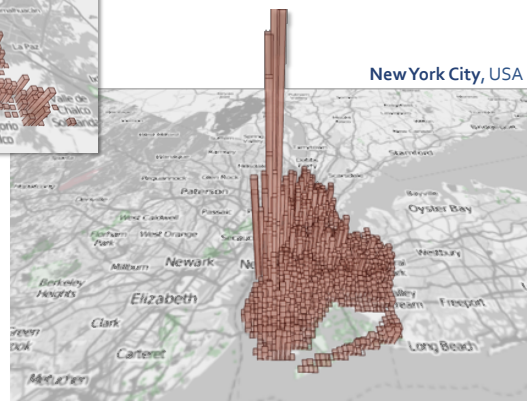
Average vs. local density: Mexico City vs. New York City



Mexico City, Mexico

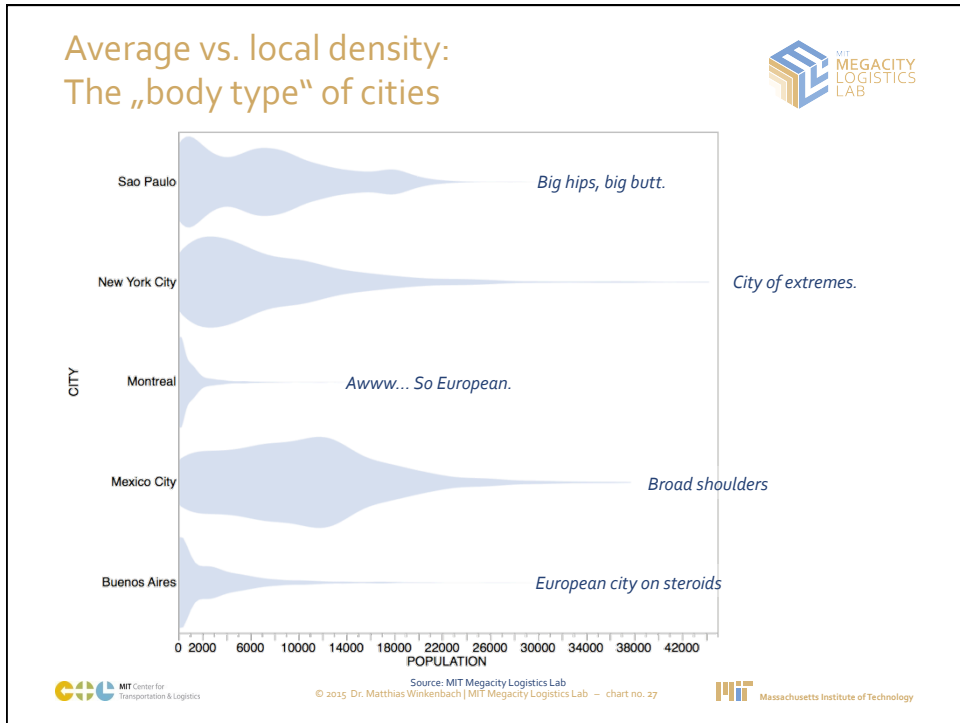


New York City, USA



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Where do all these people shop?

RETAIL DYNAMICS IN EMERGING MARKET MEGACITIES

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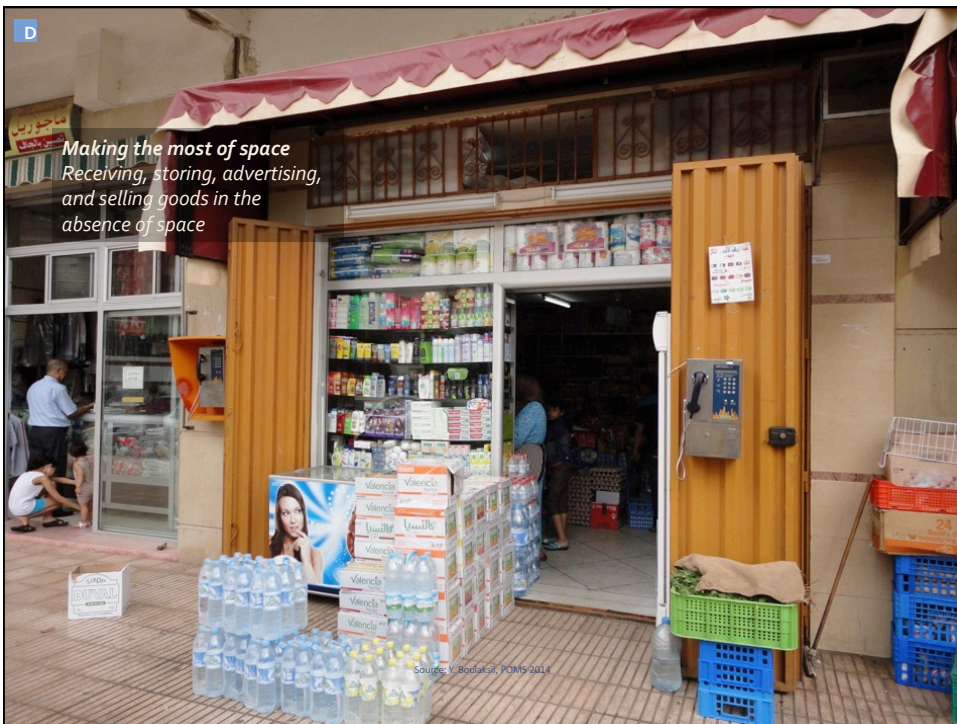
Where do all these people shop?
Here!



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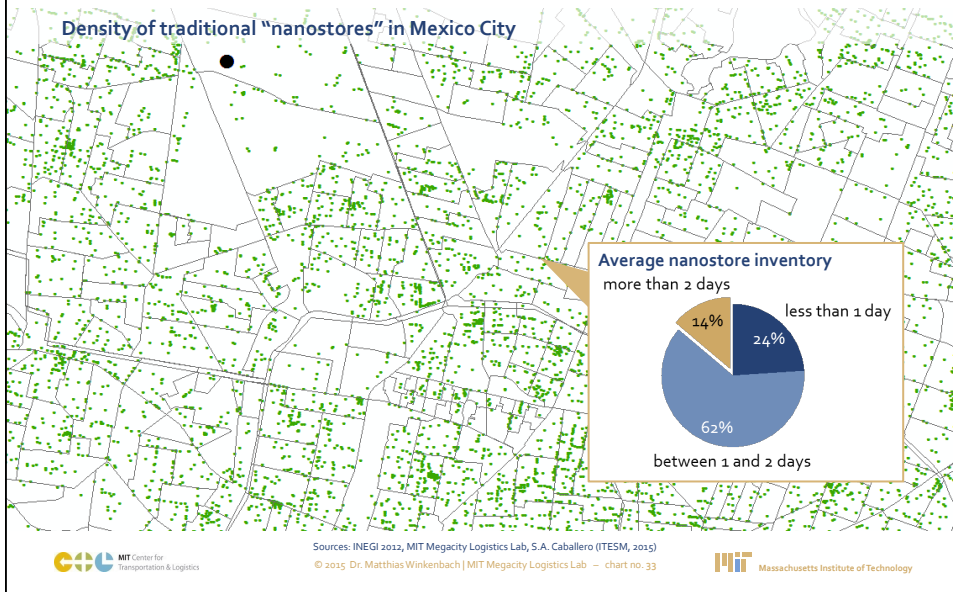
Source: V. Boulikas, POMS 2014



In the emerging markets, last-mile delivery suffers from density and fragmentation



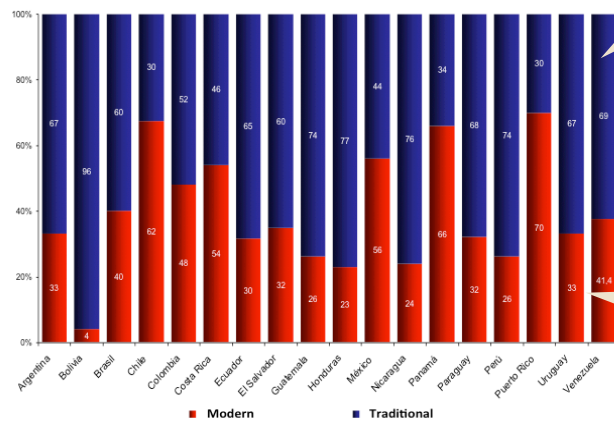
Density of traditional "nanostores" in Mexico City



Why is traditional retail so dominant? Why do nanostores survive?



Market share of traditional vs. modern retail channel
Percent of sales



Barriers of access to modern channel

- No access to required transport infrastructure
- Insufficient cash / formal credit

Advantages of traditional channel

- No transport required
- Informal, relationship-based credit
- Small package sizes / single item purchases
- Low barrier of entry
- Interest of CPG manufacturers to have them survive (higher margin, growth)
- In-store consumption
- Convenience



Source: Blanco (2012); Blanco and Fransoo (2013)
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How and where will all these people shop?

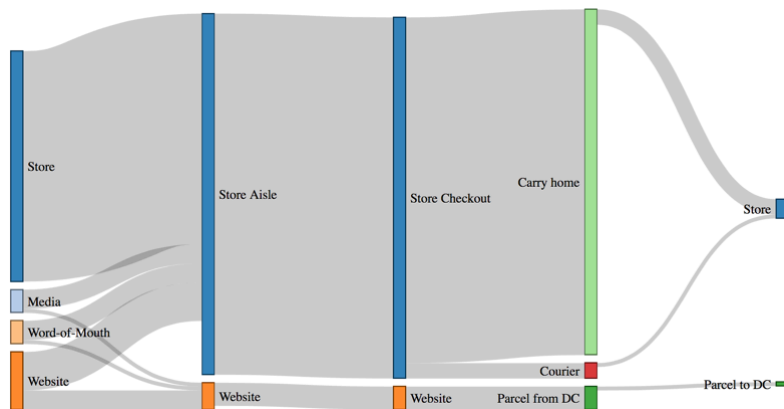
FUTURE RETAIL DYNAMICS IN MEGACITIES



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The multi-channel retail buying process



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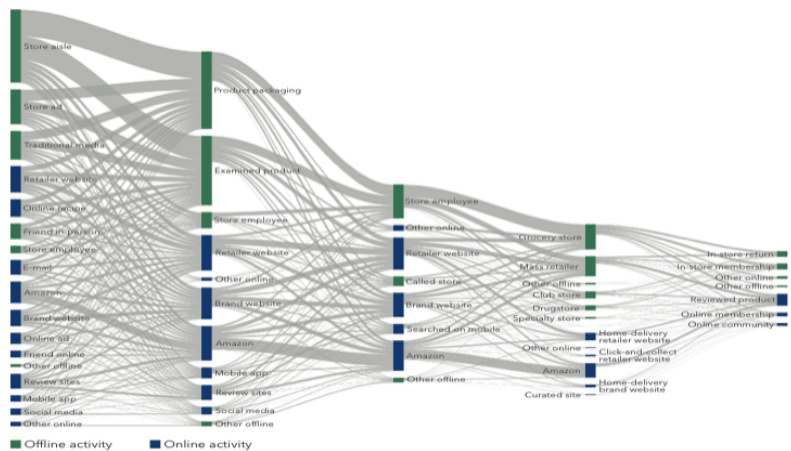
January 7, 2007 changed everything.



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On the way towards an omni-channel retail buying process



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How mobile internet and omni-channel disrupted the buying process



The iPhone and its ecosystem

- accelerated cellphone adoption
- affordable mobile internet access
- user-friendly "mobile websites"
- millions of "trained" customers
- high-end sensors "one touch away": GPS, gyroscope, camera, light sensor, WiFi, Bluetooth, NFC, ...
- birth of "big data"

The new buying process

- Discover anywhere, search anywhere, buy anywhere, request delivery anywhere, return anywhere...
- ...as long as you are in a city
- Before: Stores or parcel-based e-Commerce provided "economies of scale" to offer same buying experience to cities and rural areas.
- Now: "Buy / deliver anywhere" is convenient and affordable (only) in high density areas.



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Density means reach and scale



10.9 mph
average daytime speed in NYC

*Where can a taxi take you in 7 minutes?
~ 1.27 mile radius or 6 km²*

Manhattan population density = 25,000 / km²

150,000 people
within 7 minutes



Source: Sustainable Streets Index 2011, NYC DOT and author
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What will it be?

THE FUTURE OF LAST-MILE DELIVERY



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The future of last-mile delivery builds on innovations in...



Customer Interaction

- Big box retailers
- Hyperlocal retailers
- Home delivery
- Unattended delivery
- Dynamic, on-demand delivery
- Omni-channel delivery



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In the future, technology will enable new ways of customer interaction

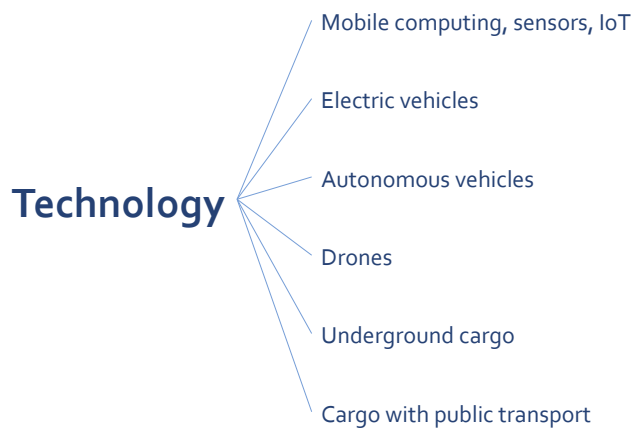


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The future of last-mile delivery builds on innovations in...



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Drones – more than just a buzz?



FOX NEWS




ROBOTS
Amazon gets FAA approval for drone testing

Source: Amazon (2014), Amazon Prime Air
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Autonomous electric vehicles are probably 5 – 10 years down the road

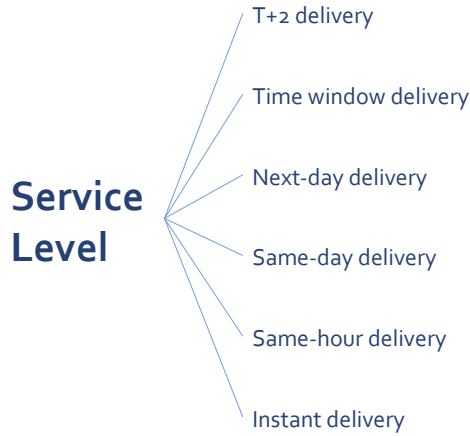


STARSHIP

Source: MIT Media Lab
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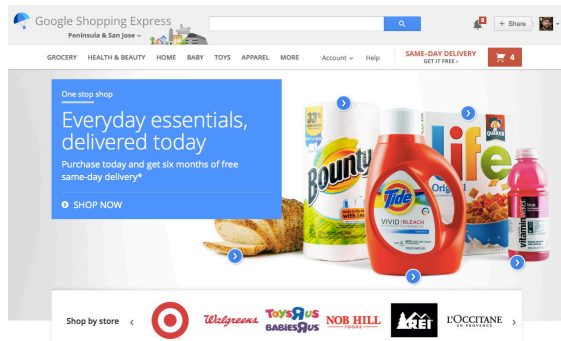
The future of last-mile delivery builds on innovations in...



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On-demand, same-day delivery is already transforming personal shopping



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D Rising service level expectations:
Amazon free same-day delivery coverage




amazon

Fast and free is now even faster

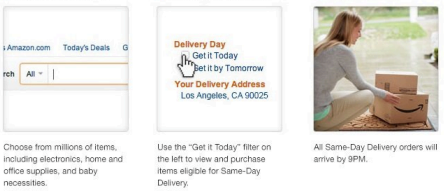
Prime members in 27 metro areas receive FREE Same-Day Delivery on qualifying orders over \$35. Order in the morning (typically until noon), and your package will be delivered by 9pm, seven days a week. Order in the afternoon or evening, and get FREE One-Day Delivery. [See program terms & details.](#)

NEW: FREE Same-Day Delivery is now in Charlotte, Cincinnati, Fresno, Louisville, Milwaukee, Nashville, Central New Jersey, Raleigh, Richmond, Sacramento, Stockton, and Tucson.



Find Same-Day Delivery Items in Three Easy Steps...

- 1 Search for items**
Amazon.com Today's Deals
rch All = |
- 2 Filter your results**
Delivery Day
Get it Today
Get it by Tomorrow
Your Delivery Address
Los Angeles, CA 90025
- 3 Get it today!**
All Same-Day Delivery orders will arrive by 9PM.




Choose from millions of items, including electronics, home and office supplies, and baby necessities.


Use the "Get it Today" filter on the left to view and purchase items eligible for Same-Day Delivery.

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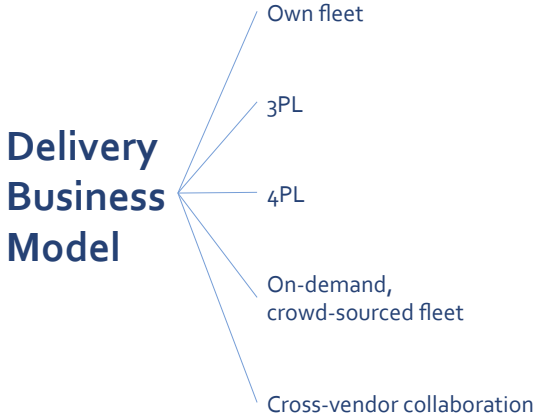


The future of last-mile delivery builds on innovations in...




Delivery Business Model

- Own fleet
- 3PL
- 4PL
- On-demand, crowd-sourced fleet
- Cross-vendor collaboration





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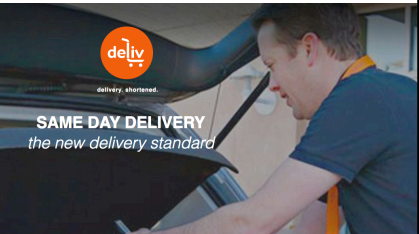
On-demand delivery services for individuals and small businesses...

UberRUSH
CONSIDER IT DELIVERED

UberRUSH is the fastest, most reliable way to get things from here to there in New York City. Request, track, and confirm your delivery right in the Uber app. Use the promo code **TRYRUSHNYC** to try UberRUSH for free.

FOR IPHONE FOR ANDROID




deliv delivery. shortened.

SAME DAY DELIVERY
the new delivery standard


AS SEEN ON: Forbes RetailWeek Today CNBC Internet Retailer VIEW MORE

DELIV IS CROWDSOURCED, SAME-DAY DELIVERY


Deliv bridges the last mile gap between retailers and customers. This new delivery option is easily added into existing ecommerce site or in store checkout and gives shoppers more — a great deal more — choice and convenience. Deliv enables the ultimate customer experience. Items when you want them. Where you want them.



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...as well as large enterprises. For last-mile...



UBER RUSH SMALL BUSINESS SOLUTIONS ENTERPRISE SOLUTIONS

MEET YOUR ON-DEMAND DELIVERY FLEET

Build the power of on-demand delivery right into your business with the UberRUSH API.

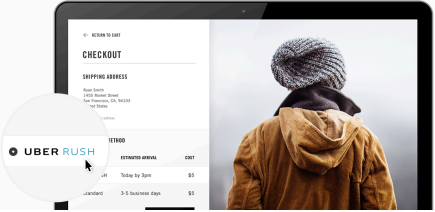
[REQUEST ACCESS](#)

Magical for your customers


Moving at the speed of your business

Built into your systems


Integrate UberRUSH with the checkout flow on your website or app. Or use it to power faster deliveries and returns. It's flexible for you and a life saver for your customers—especially when they need you now.



METHOD	ESTIMATED ARRIVAL	COST
UberRUSH	Today by 5pm	\$5
Standard	3-5 business days	\$5




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...as well as long-haul.

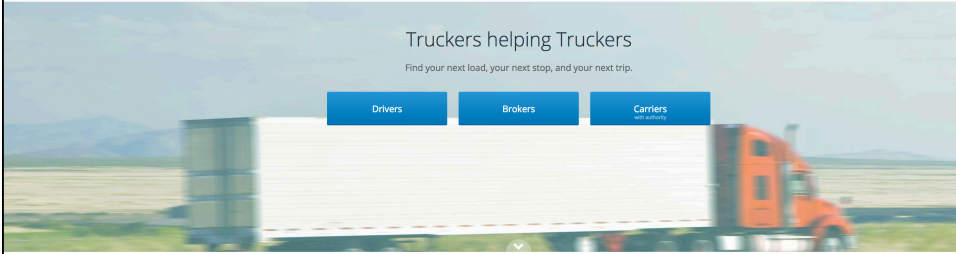


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Truckers helping Truckers

Find your next load, your next stop, and your next trip.

Drivers Brokers Carriers with authority

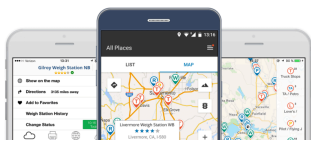


TRUCKER PATH

Trucker Path Pro

The tool truckers use to tell each other about parking, weigh stations, and stops that matter for life on the road.

Get it now for free



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