a brief introduction
to city logistics
Logistics @ Cities

• Logistics processes coordinate flow of goods & information to deliver business value

• Cities are “dense” human settlements
  – Unique regulatory context to facilitate cohabitation (e.g. land-use, noise, pollution)
  – Increase flow of goods and services
  – Additional transportation services

• Cities + Logistics $\rightarrow$ a complex interaction ...
  – Logistics $\rightarrow$ Customer is king (e.g. $$)
  – City $\rightarrow$ Citizen is king (e.g. policy)
## Typical Logistics Decisions
*(with complexity in city context)*

<table>
<thead>
<tr>
<th>Logistics Decision</th>
<th>City Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Location</td>
<td>Land-use regulation, real estate pressure, highway planning</td>
</tr>
<tr>
<td>Vehicle Routing</td>
<td>Congestion, traffic restrictions, security</td>
</tr>
<tr>
<td>Order fulfillment</td>
<td>Parking areas, hours of service, noise &amp; pollution</td>
</tr>
<tr>
<td>Returns management</td>
<td>Disposal, recycling</td>
</tr>
</tbody>
</table>

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Ex: Paris logistics hubs pushed out

Average distance of terminals to center of gravity increased from 6 to 16 km

Average distance of jobs to center of gravity has increased by 2 km

Source: Laetitia Dablanc TURBLOG, 2010)
Traditional city logistics policy focus on the symptoms...

• Truck routes
• Urban freight information and maps
• Vehicle weight and size regulations
• Truck lanes & loading zones
• Road charging systems
• Urban consolidation centers
... why is **city logistics** strategic today?

and megacities specifically in the developing world
Urbanization today

- Global population and GDP, 2007
  - 100% = 6.6 billion
  - $55.5 trillion

- Rural areas
  - 51

- Small cities and other urban areas
  - 15

- Other Cityscope (~1,400 cities)
  - 12

- City 600
  - 22

- Number of cities
  - Global GDP, 2007 (height of box)

- Megacities
  - 23

- Middleweights
  - 577

- Developed 7

- Developing 16

- Developed 170

- Developing 407

1. Estimate based on global GDP not including agriculture and mining; and GDP contribution of smaller Cityscope cities.
2. Megacities include cities with over 10 million inhabitants in 2007.
3. Middleweight cities have a current population between 150,000 and 10 million.

SOURCE: McKinsey Global Institute Cityscope 1.0
(Mega)cities with population > 5M

1900s

(1)
London ~ 6.5M
Osaka(?), New York ~ 4M
Paris, Berlin ~ 3M
Tokyo ~ 1.5

1950s

(5)
Tokyo ~ 13M
New York ~ 12M
Osaka ~ 9M
London ~ 8M
Paris, Shanghai ~ 5M

2000s

(78)
Tokyo ~ 35M
Mumbai, Mexico City ~ 20M
São Paulo, New York ~ 19M
Shanghai ~ 17M
Kolkata, Delhi ~ 16M
Beijing, London ~ 15M
LA, Buenos Aires ~ 12M
Rio, Paris, Manila ~ 11M
Moscow, Istanbul ~ 10M
.... 45 more

Source: E.Blanco (MIT) - MGI, Forbes, University of Cologne
Megacities with population > 5M
(mega)city logistics complexity grows faster than policy

unique dynamics in the developing world
Megacity Dynamic 1: Accelerating growth
Megacities keep growing

• 100 “large” cities represent 38% of global GDP
• Projected to double by 2025
• Complex environment ...

Source: MGI (2011)
Megacity Dynamic 2: Urban density to “new” levels
Putting density in Perspective

<table>
<thead>
<tr>
<th>Rank</th>
<th>City / Urban area</th>
<th>Country</th>
<th>Population</th>
<th>Land area (in sqKm)</th>
<th>Density (people per sqKm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mumbai</td>
<td>India</td>
<td>14,350,000</td>
<td>484</td>
<td>29,650</td>
</tr>
<tr>
<td>2</td>
<td>Kolkata</td>
<td>India</td>
<td>12,700,000</td>
<td>531</td>
<td>23,900</td>
</tr>
<tr>
<td>3</td>
<td>Karachi</td>
<td>Pakistan</td>
<td>9,800,000</td>
<td>518</td>
<td>18,900</td>
</tr>
<tr>
<td>4</td>
<td>Lagos</td>
<td>Nigeria</td>
<td>13,400,000</td>
<td>738</td>
<td>18,150</td>
</tr>
<tr>
<td>5</td>
<td>Shenzhen</td>
<td>China</td>
<td>8,000,000</td>
<td>466</td>
<td>17,150</td>
</tr>
<tr>
<td>6</td>
<td>Seoul/Incheon</td>
<td>South Korea</td>
<td>17,500,000</td>
<td>1,049</td>
<td>16,700</td>
</tr>
<tr>
<td>7</td>
<td>Taipei</td>
<td>Taiwan</td>
<td>5,700,000</td>
<td>376</td>
<td>15,200</td>
</tr>
<tr>
<td>8</td>
<td>Chennai</td>
<td>India</td>
<td>5,950,000</td>
<td>414</td>
<td>14,350</td>
</tr>
<tr>
<td>9</td>
<td>Bogota</td>
<td>Colombia</td>
<td>7,000,000</td>
<td>518</td>
<td>13,500</td>
</tr>
<tr>
<td>10</td>
<td>Shanghai</td>
<td>China</td>
<td>10,000,000</td>
<td>746</td>
<td>13,400</td>
</tr>
<tr>
<td>11</td>
<td>Lima</td>
<td>Peru</td>
<td>7,000,000</td>
<td>596</td>
<td>11,750</td>
</tr>
<tr>
<td>25</td>
<td>Sao Paulo</td>
<td>Brazil</td>
<td>17,700,000</td>
<td>1,968</td>
<td>9,000</td>
</tr>
<tr>
<td>27</td>
<td>Mexico City</td>
<td>Mexico</td>
<td>17,400,000</td>
<td>2,072</td>
<td>8,400</td>
</tr>
<tr>
<td>28</td>
<td>Santiago</td>
<td>Chile</td>
<td>5,425,000</td>
<td>648</td>
<td>8,400</td>
</tr>
<tr>
<td>35</td>
<td>Rio de Janeiro</td>
<td>Brazil</td>
<td>10,800,000</td>
<td>1,580</td>
<td>6,850</td>
</tr>
<tr>
<td>36</td>
<td>Monterey</td>
<td>Mexico</td>
<td>3,200,000</td>
<td>479</td>
<td>6,700</td>
</tr>
<tr>
<td>39</td>
<td>Guadalajara</td>
<td>Mexico</td>
<td>3,500,000</td>
<td>596</td>
<td>5,900</td>
</tr>
<tr>
<td>42</td>
<td>Madrid</td>
<td>Spain</td>
<td>4,900,000</td>
<td>945</td>
<td>5,200</td>
</tr>
<tr>
<td>43</td>
<td>London</td>
<td>UK</td>
<td>8,278,000</td>
<td>1,623</td>
<td>5,100</td>
</tr>
<tr>
<td>46</td>
<td>Buenos Aires</td>
<td>Argentina</td>
<td>11,200,000</td>
<td>2,266</td>
<td>4,950</td>
</tr>
<tr>
<td>90</td>
<td>Los Angeles</td>
<td>USA</td>
<td>11,789,000</td>
<td>4,320</td>
<td>2,750</td>
</tr>
</tbody>
</table>
Megacity Dynamic 3:
Dramatic socio-economic contrasts
Diverse city profiles

- 279 habs per store
  Per capita COL$2.0195K

- 242 habs per store
  Per capita COL$2.185K

- 151 habs per store
  Per capita COL$237K

- 155 habs per store
  Per capita COL$186K

- 121 hhabs per store
  Per capita COL$469K

- 148 habs per store
  Per capita COL$267K

Fuente: MEIKO 2009+ DANE 2009
Megacity Dynamic 4: People mobility is the priority

... and boxes do not vote
Grinding halt...

Table 4-6. Average, evening peak auto and bus speeds in Brazilian cities

<table>
<thead>
<tr>
<th>City</th>
<th>Auto</th>
<th>Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belo Horizonte</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>Brasilia</td>
<td>45</td>
<td>27</td>
</tr>
<tr>
<td>Campinas</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>Curitiba</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>João Pessoa</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>Juiz de Fora</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>Pôrto Alegre</td>
<td>29</td>
<td>20</td>
</tr>
<tr>
<td>Recife</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>Rio de Janeiro</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>São Paulo</td>
<td>16</td>
<td>11</td>
</tr>
</tbody>
</table>


Source: BRT Across Latitudes; Gakenheimer & Zegras (MIT)
Edgar Blanco’s Stats (Sao Paulo)

- Airport to Hotel
- Distance= 28 km
- Travel Time
  - Min 42 min = 40 km/h
  - Avg 1.5 hrs = 18 km./h
  - Max 3 hrs = 9 km/h
Shrinking freight-friendly infrastructure

Source: BRT Across Latitudes
Megacity Dynamic 5: 
**Small stores** matter 
(and they only take cash)
Source Nielsen
Megacity Dynamic 6:
More **fragmented logistics** operations

More store locations
Smaller shipment sizes
More empty miles
More congestion
Ex: Routing Activity in Bogota
Megacity logistics dynamics

1. Accelerating **growth**
2. **Urban density** to “new” levels
3. Dramatic socio-economic **contrasts**
4. **People mobility** is the priority
5. **Small stores** matter
6. More **fragmented logistics** operations
The megacity dilemma...

• Increasing wealth, eroding accessibility
• Disconnected actors
  – Regional urban planning
  – Land use
  – Passenger transport planning
  – Companies
• Not a good understanding of the logistic system and its dynamics
  – Physical, information, monetary flows
Proactive & **innovative**
megacity logistics strategies
needed...

Beyond compliance

Scalability & speed
Ex: Multi-stakeholder logistics analysis

• Off-hour deliveries
  – Are they beneficial?
  – Why are receivers/carriers not using it?
  – What are the right incentives?

• City of New York Night Deliveries Pilot

• Dr. Holguin-Veras, RPI (2010)
Route Service Times

More than three times as fast

Source: Holguin-Veras (2010) - RPI
Ex: High-resolution urban retail geometry

Source: Sevtsuk (2010) - MIT
Figure 12: Reach-to-residents within a 2,000ft network radius from each building in Cambridge & Somerville, MA (Source: Census 2,000).

Source: Sevtsuk (2010) - MIT
Ex: Nestle “Venta Directa a Changarros”
Complete logistics re-design

- 24 months: 13 cities, 140,000 “changarros”, 500 trucks
- Total logistics cost, strategic positioning
  - Structure/assortment
  - Processes
  - Technology
- EBIT = 19%

Source: Nestle, Lideres event at CLI (2010)
Ex: Tokyo high-rise 3PL

• Inefficient distribution to high-rise buildings in Tokyo Shinjuku area
  – 130,000 workers in 20 high-rise buildings
  – Individual deliveries to office areas

• Creation of Shinjuku Matenro Staff 3PL to deliver goods
  – Collaboration of carriers
  – Micro-urban distribution center

• For-profit venture

Source, Junichi Yashiro (TURBLOG, 2011)
Shinjuku, Tokyo

![Map of Shinjuku, Tokyo with buildings to be delivered and distribution center marked.](image-url)
Shinjuku X-Docking Process

Sort the goods with buildings to be delivered

Making a final check of the delivery tickets

Loading up the sorted goods in the truck

Leave at 9:30 am for “Morning 10”

Other trucks successively leave

Unload at building and truck leaves to next building
The Wonder Of Dabbawallas Unfolded

NUTAN MUMBAI TIFFIN BOX SUPPLIERS ASSOCIATION

Web Site : mumbaidabbawala.org
ABOUT NMTBSA

- **History**: Started in 1890
- **Charitable trust**: Registered in 1956
- **Employee Strength**: 5000
- **Avg. Literacy Rate**: 8th Grade Schooling
- **Total area coverage**: 60 Kms to 70 Kms
- **Number of Tiffins**: 2,00,000 Tiffin Boxes

  400,000 transactions every day (including return)

  i.e. 400,000*25 days*12 months = 120,000,000

  (120 million or 12 crore transactions per year)

- **Time taken**: 8 to 9 Hours
  
  Morning 3 Hours Wartime

  *(9 A.M. to 12 P.M. for the Collection and Delivery)*
The Dabba coding system evolution

Coloured threads
End of the 19th century to the mid 20th century

Coloured cloth tags
Mid 20th century till the early 1970s

Oil paint shapes
1970s till the late 1980s

Alphabates
A, B, Mu...Z

The Current coding system- Alphanumericics in oil paint.

Area collected from within Vile Parle (E means Hanuman road)

Origin railway station (VLP means Vileparle station)

Area to be delivered within Churchgate zone (9 means Nariman point)

Building to be delivered within Nariman point (AI means Air India building)

Floor to be delivered to in Air India building. (Although 12th floor is mentioned, all dabbas are delivered at the ground floor only in high rises)

Destination railway station (3 means Churchgate station)

The name of the dabba owner or address is seldom put on the dabba

Different groups use different colour coding within the same zone

Amit Rangnekar Aug'06
Shared transport/freight Infrastructure

Suburban Rail Network

- **2 Zones** – Western (80 km) & Central (120 km, Harbor-100 km)
- **Extensive reach:** 300 km / 95 stns. transporting 6.9 Mill. Daily
- **Avg. 4,500 pass. packed in 9 car rakes** (Cap: 1,700)
- **3 rakes in each train dedicated to freight**

*Source, Deepak Baindur (TURBLOG, 2011)*
Final thoughts...

• Recognize uniqueness of (mega)city dynamics and their impact in logistics
  – Dynamics + Topology

• Collaboration between government & industry sorely needed in freight planning
  – Beyond “constrained-based” policy

• Aim for innovation, not reaction
  – Localized research & collaboration needed
  – Embrace complexity
  – Opportunities for disruptive technology investments
“Innovation is not invention, still less is it scientific discovery”

“(…) allow individuals or organizations to do valuable things they could not do before, or they reduce the costs and difficulties of doing something already valued”

Jason Pontin, Editor MIT Technology Review
April 2012
Thanks!

Edgar E Blanco

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