Urban logistics practices:

"Case Study: New York City Off-Hour Delivery Project"

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Overview of NYC

• Center of a metropolitan area of 20 million inhabitants that spans over New York, New Jersey, and Connecticut

• For every man, women, or child living in the region a total of 30 kg of cargo are transported every single day to satisfy the needs of commerce, construction, and manufacturing

• In Manhattan, in excess of 190,000 deliveries are made or picked by the more than 40,000 establishments in the island

• The rail lines terminate in New Jersey, this requires the use of trucks to transport the cargo headed for NYC over the six tunnels and bridges crossing the river
  – The economic costs of this process are staggering: every container moved in this way costs an extra US$150 (which is the same cost of transporting a container from Connecticut to Ohio).
Institutional framework and current transport logistics policies

• Institutional fragmentation:
  – Port Authority of NY and NJ → Ports, Airports, River Crossings
  – Metropolitan Transportation Authority → Transit, buses, subways
  – New York State Department of Transportation → State highways
  – New York City Department of Transportation → The rest in NYC

• Incoherent freight policies:
  – Port Authority of NY and NJ → Time of day tolls (ineffective per JHV)
  – Metropolitan Transportation Authority → None
  – New York State Department of Transportation → None
  – New York City Department of Transportation →
    • Municipal parking meters
    • Embraced off-hour delivery project
Thanks for supporting a “crazy” idea…!

• USDOT
  – Mr. Caesar Singh, Commercial Remote Sensing and Spatial Information
• New York City Department of Transportation
  – Commissioner Janette Sadik-Kahn
  – Mrs. Stacey Hodge, Mr. John Karras, Mr. David Woloch
• Industry participants
• Project partners
  – Prof. Kaan Ozbay and his team, Rutgers University
  – Prof. Alain Kornhauser and his team, ALK Technologies
  – Mrs. Marta Panero and her team, New York University
  – Prof. Satish Ukkusuri and his team, Purdue University
• …my students…that went beyond the call of duty…
The experience with time of day pricing

• Theory and empirical evidence agree that cordon time of day pricing are of limited effectiveness in moving urban delivery traffic to the off hours

• 2001 Port Authority of New York and New Jersey Time of Day Pricing Initiative
  – 20.2% of carriers changed behavior, though mostly by increasing productivity (not by reducing facility usage)
    • Only 9.0% of the sample increased rates, increases were relatively small, about 15%
  – 69.8% of the carriers that did not change behavior indicated it was due to “customer requirements”
  – Almost no change in facility use (same as London)
This project has been, at times…

- A science mystery
- A political thriller
- A melodrama
- A Greek tragedy
- A comedy
- A good drama with a happy ending…
The role of economic interactions
The decision about delivery time

- Is made jointly between receivers and carriers
  - 40% receivers, 38% receivers+carriers, 22% carriers

- Let’s take a look at the payoff matrix
  - The first sign represents the impact on carrier and the second the impact on receiver

<table>
<thead>
<tr>
<th>Carrier Strategy</th>
<th>Regular Hours</th>
<th>Off-hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular hours</td>
<td>(-, +) (I)</td>
<td>(-, -) (II)</td>
</tr>
<tr>
<td>Off-hours</td>
<td>(-, -) (III)</td>
<td>(+, -) (IV)</td>
</tr>
</tbody>
</table>

(These are non-feasible solutions)

(This is the solution preferred by most receivers)

(This is the solution preferred by most carriers)
Project Concept
Interlocking components

• Behavioral/economic components
  – Analyses of most promising industry segments
  – Incentives to receivers of cargo willing to do OHD

• Technology component
  – GPS to assess performance (cell phones, own systems)

• Network modeling component
  – Mesoscale traffic model to assess local impacts
  – Regional model to assess networkwide impacts

• Industry/Agency outreach component
  – To get feedback from all involved

• Small scale pilot test component
  – To assess real life impacts…
### Top Generators of Deliveries by SIC

<table>
<thead>
<tr>
<th>SIC</th>
<th>SIC Description</th>
<th>Estimated number of deliveries in Manhattan</th>
<th>Estimated number of deliveries in NYC</th>
</tr>
</thead>
<tbody>
<tr>
<td>58</td>
<td>Eating And Drinking Places</td>
<td>19,314</td>
<td>36,834</td>
</tr>
<tr>
<td>54</td>
<td>Food Stores</td>
<td>7,941</td>
<td>28,122</td>
</tr>
<tr>
<td>20</td>
<td>Food And Kindred Products</td>
<td>153</td>
<td>898</td>
</tr>
</tbody>
</table>

**Food Sector**

- Estimated total for all SIC codes: 27,408 (24.24%) in Manhattan, 65,854 (25.63%) in NYC.

**Consumer Goods**

- Estimated total for all SIC codes: 65,751 (58.15%) in Manhattan, 134,458 (52.33%) in NYC.

### About 82% of ALL deliveries are in Food and Retail sectors:

- Shifting 5% to off-hours = 4,200 deliveries/day
- Shifting 10% to off-hours = 8,400 deliveries/day
- Shifting 20% to off-hours = 16,800 deliveries/day

**Total for all SIC codes (including those not shown above):**

<table>
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<tr>
<th></th>
<th>Estimated number of deliveries in Manhattan</th>
<th>Estimated number of deliveries in NYC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textile Mill Products</td>
<td>415</td>
<td>763</td>
</tr>
<tr>
<td>Total</td>
<td>113,069</td>
<td>256,956</td>
</tr>
</tbody>
</table>
Key Results:
Pilot Test of Off-hour Deliveries

Skip
Pilot Test

- Initial efforts delayed by Wall Street collapse, and skepticism on the part of the industry…
- Original plan: Sysco and Whole Foods
- Foot Locker/New Deal Logistics asked to join test
- Three separate stages to accommodate them:
  - Foot Locker (10 stores)/NDL (Oct. 2 - Nov. 14, 2009)
  - Whole Foods (four stores) (Dec. 28, 2009-Jan. 31, 2010)
  - Sysco (twenty one stores) (Dec. 21, 2009-Jan. 23, 2010)
- About 35 receivers, 20 trucks/vendors
  - Half doing staffed OHD
  - Half doing unassisted OHD
Participants in Pilot Test
Regular vs. Off-Hour Deliveries (1 of 2)
Regular vs. Off-Hour Deliveries (2 of 2)
Typical results from satisfaction surveys

- Scale: 1= Very favorable, 5= Very unfavorable
- Whole Food Vendors: 1.55
- Participating drivers:
  - Travel speeds = 1.33
  - Congestion = 1.11
  - Parking = 1.11
  - Stress levels = 1.11
  - Time to deliver goods = 1.38
  - Time to complete the route = 1.44
  - Driver’s feeling of safety = 1.86
• Sysco’s customers:
  – Impression of off-hour deliveries = 1.50
  – How likely are you to off-hour deliveries = 1.42
  – If all liability issues were addressed, would you be interested in receiving unassisted deliveries (e.g. driver places goods in a secure location at your establishment)?
    = 2.17
Average space travel speeds

More than twice as fast
Average service times

More than three times as fast
After the end of the pilot

• All of the receivers doing staffed OHD reverted back to the regular hours
• Almost all the receivers doing unassisted OHD remained in the off-hours
  – Reliability of OHD
The Economic Bottom Line
Economic Impacts

• Implementing various forms of off-hour delivery policies in Manhattan leads to:
  – Travel time savings to all highway users of about 3-5 minutes per trip
  – Travel time savings to carriers that switch to the off-hours of about 48 minutes per delivery tour
  – Savings in service times (per tour) could be in the range of 1-3 hours

• Depending on the extent of the policies, economic savings are between $100 and $200 million/year in travel time savings and pollution reduction
Not surprisingly, a lot of press…

- Secretary of Transportation:

- Wall Street Journal:
  [http://online.wsj.com/article/SB10001424052748704334604575339292960610492.html](http://online.wsj.com/article/SB10001424052748704334604575339292960610492.html)

- New York City Department of Transportation:

- Journal of Commerce:
  - “New York Delivers at Night” Journal of Commerce Issue 10 Vol. 35

- BLOG Coverage
  - [http://www.theepochtimes.com/n2/content/view/38422/](http://www.theepochtimes.com/n2/content/view/38422/)
Next steps: To explore areas of great potential

- **Unassisted deliveries:**
  - Technologies/systems that enable OHD without the need for staff of the receiving business would produce the same benefits as regular OHD, at minimal cost
  - Must address the liability concerns of receivers

- **Large Traffic Generators:**
  - Large buildings and establishments generate hundreds of truck trips per day
    - 100 such buildings $\rightarrow$ 4% of the truck traffic
    - Adding large establishments $\rightarrow$ 8% of truck traffic
  - They could implement OHD very cost effectively and without inconveniencing the receivers

- To be designed as part of another phase
Chief conclusions

- Removing the constraints imposed by receivers (either by providing financial incentives, or using un-assisted OHDs) works! as it is
  - More effective than freight road pricing
  - A truly win-win-win-win-win-win policy:
    - Benefits regular hours travelers
    - Benefits the environment, improves quality of life
    - Benefits the business community, enhances economy
    - Noise impacts (no complaints received) $\rightarrow$ electric truck, low-noise technology/practices
    - Benefits participants in OHD
  - Political appeal, implementable as a voluntary program
• NYC decided to adopt off-hour deliveries as a critical element of its sustainability strategy!
Reactions?

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