Emotional Travel

Behavioral Foundation for Mobility Future

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How to change behavior?
Laziness knows no boundaries...
Behavior : Theory
Rational Agent Assumption

• Perception rationality
• Preference rationality
• Process rationality

Utility maximization framework
homo econ
vs.
homo sapiens

Subconscious mind

Conscious mind
Homo Sapiens

Behavioral deviation

- loss aversion
- overweighing small probability
- mental accounting
- hyperbolic discounting
- framing effects
- altruism
- price saliency
Is Travel Social?

Is Travel Emotional?

Is Travel Time Absolute?
• “sensing” behavior
• “nudging” behavior
• “socializing” behavior
Is Travel Time Absolute?
In transportation

Travel time is wasted, of negative utility, and to be reduced.
In Newtonian physics

Time is linear, one-directional, and absolute.
The Persistence of Memory, Salvador Dalí, 1931
Re-interpreting Travel Time

1. Artist’s view
2. Einstein’s view
3. Psychologist’s view
4. Transportation view

Dali
Time Dilation
Cognitive Time
+/- Utility of Travel
Information manipulation and Perception of time
Is Travel Emotional?
"A man who, beyond the age of 26, finds himself on a bus can count himself a failure." – Lady Margaret Thatcher

The Mayor in London proudly sent their red Buses to Beijing to receive the Olympic flag for 2012

“The man on the Clapham Omnibus”: a typical Londoner in an ordinary part of London.
Is travel a mundane daily chore or does it have a higher meaning attached to it?

Food, clothing, sheltering, traveling:

_all have an element of _utility_ and an element of _vanity_
Beijing 1982

Bicycle Mode Share in Beijing

- 1986: 63%
- 2000: 39%
- 2005: 30%
- 2009: 20%
- 2010: 16%
Kingdom of Bicycles
Underlining Factors

- built environment
- income growth
- policy and regulation
- bicycle industry
- social and attitudinal
“I would rather cry in a BMW than smile on your bike.” – Ma Nuo

Bicycle as a Symbol of Modernity

- Urban Elite
- Luxury
- Open
- Modern
Bicycle as a Symbol of Women Liberation

- Freedom
- Active
- Fashionable
Mentality shift: what defines a successful life?

Modernity → Failure → Active lifestyle
Is travel social?
Transportation planners and engineers, models, processes, and business cases,... do not think so
In what ways is travel social?

1. Do we make our own decision?
2. Doing good or doing well
3. Why ants don’t get into traffic jam?
4. Mingle while traveling
5. Is ZipCar/UBER Social?

1. Social norm, Peer Pressure and Social Network Analysis
2. Social Image Motivation
3. Psychology of Cooperation
4. Transportation as public space
5. Preference of Sharing
Social Network Analysis
Martha Stewart follows Snoop Dogg, P. Diddy, Rachel Maddow and Jimmy Fallon and, in turn, and is followed by Michael Phelps, Jane Fonda and nearly 200,000 other people.

US Big Companies with shared Board Members

Source: http://blog.freebase.com/2008/04/09/visualizing-corporate-america/
Spread of Obesity in a Social Network

Source: The Spread of Obesity in a Large Social Network Over 32 Years
Nicholas A. Christakis, James H. Fowler, New England Journal of Medicine 357 (4)
Actual Mode Choices

Randomly generated network
Average percent of friends who use the same mode as the ego

Observed: 0.46
Random: 0.39
T-test: 57.9
Emergency Evacuation
Probability

\[
P(i \mid C_n) = P[U_{in} \geq U_{jn} \forall j \in C_n]
\]

\[
= P[U_{in} = \max_{j \in C_n} U_{jn}]
\]

**Multinomial Logit**

\[
P(i \mid C_n) = \frac{e^{V_{in}}}{\sum_{j \in C_n} e^{V_{jn}}}
\]
Probability

\[ V_1 = V_2 \]

\[ P_1 = P_2 = 50\% \]
Emergency Evacuation
Is Travel Social?

Is Travel Emotional?

Is Travel Time Absolute?
Theory of Behavioral Choice

McFadden, Simon, Khaneman, Thaler, Tversky, Ariely, …
What do we do with it?
• “sensing” behavior

• “nudging” behavior

• “socializing” behavior
Salience in Transportation Pricing
“Sensing” behavior
Anxiety of Bus Waiting
Take my brain for a bus ride

Neuroscience

- EEG Neuro-headset
Mode-ism: Implicit social status bias in car vs. bus mode choice

Joanna Moody, Jonathan Campbell, Lauren Alexander, Gabriel Goulet-Langlois, Jinhua Zhao
Social Status Bias in Bus vs. Car Mode Choice

Bus and Negative Social Status

Car and Positive Social Status
Implicit Association Test (IAT):

**Congruent**

shorter response time
1. Is there a difference in the explicit and implicit measures for social status bias for mode choice?

   Implicit and explicit measures for social status bias are independent

2. Which measure influences actual behavior

   Mode choice model:

   implicit (IAT) > explicit (Likert)
“Nudging” behavior
Ten Instruments for Behavioral Change

Nudge

Improving Decisions About Health, Wealth, and Happiness

Richard H. Thaler and Cass R. Sunstein

Revised and Expanded Edition

“One of the few books I’ve read recently that fundamentally changes the way I think about the world.” —Steven D. Levitt, coauthor of Freakonomics
BC1: changing perceptions of time & space
BC2: manipulating information
BC3: pricing and psychology of money
BC4: nudging active travel
BC5: social norm
BC6: can we share?
BC7: shame or pride
BC8: let people try
BC9: enhancing self control and motivation
BC10: inducing emotion & principles of persuasion
BC11: behavioral change by design
BC12: paradox of choices
We manipulate information all the time!
London Underground: Map vs. Reality

Schematic Map

Reality
Correlation: Actual vs. Map Distance

$r=0.22$

Transit map represents only 4% of the variation of actual distance in the London Underground.
<table>
<thead>
<tr>
<th>Types of information</th>
<th>Impact on behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distortion</td>
<td>Location choice</td>
</tr>
<tr>
<td>Restoration</td>
<td>Mode Choice</td>
</tr>
<tr>
<td>Codification</td>
<td>Path Choice</td>
</tr>
<tr>
<td>Cognition</td>
<td></td>
</tr>
</tbody>
</table>
### Map Impact on Path Choice

<table>
<thead>
<tr>
<th>Variables/models</th>
<th>Base model</th>
<th></th>
<th>Map model</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficients</td>
<td>$t$</td>
<td>Coefficients</td>
<td>$t$</td>
</tr>
<tr>
<td><strong>Control path variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry/exit walking</td>
<td>-0.288</td>
<td>-9.0</td>
<td>-0.281</td>
<td>-7.9</td>
</tr>
<tr>
<td>Initial waiting</td>
<td>-0.362</td>
<td>-7.4</td>
<td>-0.299</td>
<td>-6.4</td>
</tr>
<tr>
<td># of Transfers</td>
<td>-2.270</td>
<td>-11.6</td>
<td>-2.690</td>
<td>-12.1</td>
</tr>
<tr>
<td>Transfer walking</td>
<td>-0.322</td>
<td>-8.9</td>
<td>-0.350</td>
<td>-9.6</td>
</tr>
<tr>
<td>Transfer waiting</td>
<td>-0.197</td>
<td>-4.6</td>
<td>-0.193</td>
<td>-6.4</td>
</tr>
<tr>
<td><strong>Control station variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baker St.</td>
<td>-0.512</td>
<td>-2.8</td>
<td>-0.298</td>
<td>-1.6</td>
</tr>
<tr>
<td>Bank/Monument</td>
<td>-0.638</td>
<td>-3.0</td>
<td>-0.430</td>
<td>-2.1</td>
</tr>
<tr>
<td>Bond St.</td>
<td>1.198</td>
<td>4.4</td>
<td>1.110</td>
<td>3.9</td>
</tr>
<tr>
<td>Earl’s Court</td>
<td>1.417</td>
<td>3.9</td>
<td>1.671</td>
<td>4.7</td>
</tr>
<tr>
<td>Embankment</td>
<td>-0.301</td>
<td>-0.9</td>
<td>0.469</td>
<td>1.3</td>
</tr>
<tr>
<td>Euston</td>
<td>-0.462</td>
<td>-2.0</td>
<td>-0.618</td>
<td>-2.3</td>
</tr>
<tr>
<td>Green Park</td>
<td>0.763</td>
<td>4.0</td>
<td>0.766</td>
<td>3.7</td>
</tr>
<tr>
<td>Holborn</td>
<td>0.620</td>
<td>2.8</td>
<td>0.448</td>
<td>2.1</td>
</tr>
<tr>
<td>Leicester Sq.</td>
<td>-0.120</td>
<td>-0.5</td>
<td>0.107</td>
<td>0.4</td>
</tr>
<tr>
<td>London Bridge</td>
<td>0.096</td>
<td>0.2</td>
<td>-0.073</td>
<td>-0.2</td>
</tr>
<tr>
<td>Oxford Circus</td>
<td>0.592</td>
<td>3.3</td>
<td>0.960</td>
<td>5.7</td>
</tr>
<tr>
<td>Paddington</td>
<td>-1.896</td>
<td>-4.7</td>
<td>-2.178</td>
<td>-4.8</td>
</tr>
<tr>
<td>Piccadilly Circus</td>
<td>-0.516</td>
<td>-1.7</td>
<td>-0.275</td>
<td>-1.0</td>
</tr>
<tr>
<td>Victoria</td>
<td>-0.060</td>
<td>-0.3</td>
<td>0.683</td>
<td>3.1</td>
</tr>
<tr>
<td>Warren St.</td>
<td>-1.523</td>
<td>-4.3</td>
<td>-1.211</td>
<td>-3.0</td>
</tr>
<tr>
<td>Waterloo</td>
<td>-0.501</td>
<td>-2.1</td>
<td>-0.560</td>
<td>-2.2</td>
</tr>
<tr>
<td>Westminster</td>
<td>0.249</td>
<td>0.9</td>
<td>0.452</td>
<td>1.6</td>
</tr>
</tbody>
</table>

**Actual travel experience**

| Actual in-vehicle time | -0.554     | -21.1   | -0.169    | -3.8    |

**Map attributes**

| Map distance | -1.129 | -8.8 |
| # of stations | -0.259 | -5.4 |

**Model attributes**

| $N = 18,894$ | 0.579 |
| $N = 18,894$ | 0.604 |

Adjusted rho-square:
## Elasticity Comparison

<table>
<thead>
<tr>
<th>Elasticity</th>
<th>Actual In-vehicle time</th>
<th>Map Distance</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>All passengers (N=18,894)</td>
<td>-0.0194</td>
<td>-0.0416</td>
<td>2.14</td>
</tr>
</tbody>
</table>
Map as a Planning Tool?
Lexington Ave Line
- most used rapid transit line in the US
- > 2nd largest subway system in DC
- at 120% capacity

Solution 1: 2nd Ave Subway
- 86,000 more riders at peak hours
- $17 billion, 10 years, 3,000 workers

Solution 2: Redraw Map
- 30% longer, switch 17,000 riders
- $10k, 1 week, 2 workers
Washington DC Metro Map Redesign
Make Route Decision

Decision

1

Route A

Route B

Submit
Map A (Current Map) vs. Map B

5.65 %
“Socializing” travel
In what ways is travel social?

1. Do we make our own decision?

2. Doing good or doing well

3. Why ants don’t get into traffic jam?

4. Mingle while traveling

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4. Transportation as public space

5. Preference of Sharing
Sharing Economy
Hyper Production

Hyper Consumption

Couture Consumption
David Lachapelle, 1999
“The Sharing Economy is an economic model based on providing access to goods and services rather than their outright ownership.”

Physics

Santi, Paolo, et al. 2014, Quantifying the benefits of vehicle pooling with share-ability networks.
mobipool is the car pooling service for the PISA CNR research area.

320 spots saved
1460 kg reduced

recent posts
- CNR car pooling service launched in Pisa
  June 15, 2015
- Successful Project Review
  April 30, 2015
- Mobiwallet Project Review
  April 29, 2015
Preference of Sharing
\[ U = \beta \times X + \varepsilon \]

Behavior

Preferences

Environment (time & costs)
Properties of Sharing Preference

- Heterogeneity
- Dynamics
- Matching
Heterogeneity of preference
Dynamics of preference
Matching
Commodity markets

Fruit market

NY Stock Exchange
Commodity markets can be arms-length and anonymous

- When buying 100 shares of AT&T on the New York Stock Exchange, you don’t need to worry about whether the seller will pick you.

- The price does all the work.
But in many markets prices don’t do all the work

- College admissions
- Kidney donation
- Courtship and marriage
- each is a two-sided matching market that involves searching and wooing on both sides
Shared Mobility

Commodity Market?

Matching Market?
Psychology of travel
TRUST AND SHARE
A mode of social interaction
"Every time, I'm always like, 'Oh, I hope it's a cute girl,'"
Encounter —> relationship
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