Participatory Planning of Transit Corridors Using Tangible, Interactive & Accessibility-Based Tools
MBTA is staring down a financial paradox

Transit authority may not be able to afford its relatively average expenditures

The MBTA's outlays are in line with those of other large public transit systems around the country.

By David Scharfenberg | GLOBE STAFF | MARCH 09, 2015
Bus delay

Wednesday
October 7, 2015
8:30 AM

http://bostonography.com/bus/
Can we do better?
Can we do better?
Can we do better?
TEST CASE:
Bus Rapid Transit (BRT) – How does Boston feel about It?
TEST CASE:
Bus Rapid Transit (BRT) – How does Boston feel about it?
TEST CASE:
Bus Rapid Transit (BRT) – How does Boston feel about It?
PROBLEM
Local community suspicious & critical

State learns again that people don't like having things crammed down their throat

By adamg on Fri, 11/20/2009 - 3:51pm

And now the state loses out on $145 million in federal stimulus funds; money was to have gone to a fancy-shmancy Silver Line extension through Roxbury and Mattapan that state officials tried to foist on the neighborhoods as a fait accompli.

Lawmakers ask state to withdraw 28X proposal (from the Dorchester Reporter a couple weeks ago).

Steve Poftak is sad.
Can new technologies help the participatory planning process?
Hypothesis

Tangible, interactive planning tools in public engagement workshops enhance learning (single and *double loop* learning)

Better planning outcomes
Hypothesis

Tangible, interactive planning tools in public engagement workshops enhance learning (single and double loop learning)

Better planning outcomes
- think more rapidly
- revisit ideas more frequently
- better grasp spatial relations
- make new discoveries & more re-interpretations

- “imagination” (changed perception)
- “alignment” (other perspectives)
- “engagement” (shared views, others listened)
- attitude- and behavior-changing potential

(Maher & Kim, 2005; Goodspeed, 2013)
PROCESS
Combine two tools

Tangible User Interface: CityScope
• LEGO Bricks
• Processing
• Webcam

Accessibility Mapping: CoAXs
• GTFS + Open Street Planner
• Open Transport Analyst (Conveyal)
• Open Data (e.g. jobs)
PROCESS

Conceptualization

MULTI-SCALE INTERACTION

Regional Simulation

Streetscape Simulation

Neighborhood Simulation
PROCESS
Pre-Pilot
PROCESS
Student Test Group
PROCESS
Student Test Group
Neighborhood Scale

Station upgrade

Landmarks

Live route & traffic update
Regional Scale

Personalized Time Map

On-demand Dashboard

Route Editor

Route Scenario Selection
PROCESS
4 days, 6 workshops, 51 participants
Facilitated Workshop Overview

**Setup**
- Add points of interest to a map when arriving

**Participant Intros**
- Introduce themselves and discuss communication norms and the session goals

**Map Intro**
- Learn how to navigate the map

**Trips of Interest**
- Map travel times and describe trips between points of interest

**Connectivity Gaps**
- Compare the connectivity to jobs and other opportunities from chosen locations

**Modifications**
- Activate corridors and edit service levels

**Compare Different Locations**
- Compare Different Locations

**Create and Test Scenarios**
- Create and Test Scenarios
Methods

Better Transit?

**PRE-WORKSHOP SURVEY**

Username: _______

Welcome! Please help our MIT team evaluate new technologies by answering the following questions:

Age: ____________________

Occupation: ____________________

Please list any community organization(s) you are affiliated with: ____________________

Over the past year, how many public planning meetings have you attended?

(circle one option)  0  1-2  3-5  6+

At how many did you make a formal presentation? ____________________

At how many did you speak and share your opinion? ____________________

At how many did you learn new things about planned projects? ____________________

In the last week, how many times did you travel by:

Car? _______ Subway/Train? _______ Bus? _______

Are you familiar with the concept of bus rapid transit (BRT)? Yes I No

If yes, try to list four important elements of BRT: ____________________

How familiar are you with graphical representation of information and data? Not familiar 1 2 3 4 5 Very Familiar

To what extent do you agree with the statements...

"I can play an active role in the planning of the community where I live"

Disagree 1 2 3 4 5 Agree

"Public participation in planning advances the interests of my community"

Disagree 1 2 3 4 5 Agree

Better Transit?

**POST-WORKSHOP OVERALL SURVEY**

Username: _______

Thanks for coming. Please fill out both sides of this survey before you leave.

<table>
<thead>
<tr>
<th>(Disagree)</th>
<th>(Agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I learned a great deal in the workshop</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I learned through observing others using the tools</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I learned through listening and conversing with others</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I helped others learn</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I was able to get answers to the questions I asked</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Workshop participants discussed issues in an open way</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Participants were open to differences in opinion</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I would support recommendations created by the participants of the workshop</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I feel that I can play an active role in the planning of the community where I live</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I feel that public participation using the tools in this workshop would advance the interests of my community</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

If corridors like we discussed today are implemented, do you imagine yourself changing the way you travel? If so, how many times per week would you travel by:

Car? _______ Subway/Train? _______ Bus? _______

Try to list four important elements of BRT: ____________________

1. How do you think corridors like those discussed today might impact your travel?
2. How do you think corridors like those discussed today might impact others’ travel in the region?
3. What was the most interesting part of this workshop?
### Participants

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Number of participants</th>
<th>Number of valid responses (completed pre- and post-survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>51</strong></td>
<td><strong>45</strong></td>
</tr>
</tbody>
</table>

**Age distribution of participants (N=45)**
Overall responses: Reasonably positive

- I learned a great deal in the workshop: 22% Strongly Agree, 7% Agree, 14% Neither Agree nor Disagree, 14% Disagree, 11% Strongly Disagree
- I learned through observing others using the tools: 82% Agree, 14% Neither Agree nor Disagree, 0% Disagree, 7% Strongly Disagree
- I learned through listening and conversing with others: 84% Agree, 8% Neither Agree nor Disagree, 2% Disagree, 0% Strongly Disagree
- I was able to get answers to the questions I asked: 80% Agree, 14% Neither Agree nor Disagree, 7% Disagree, 2% Strongly Disagree
- Workshop participants discussed issues in an open way: 84% Agree, 0% Neither Agree nor Disagree, 2% Disagree, 2% Strongly Disagree
- Participants were open to differences in opinion: 89% Agree, 16% Neither Agree nor Disagree, 0% Disagree, 2% Strongly Disagree
- I would support recommendations created by the participants of the workshop: 80% Agree, 14% Neither Agree nor Disagree, 7% Disagree, 2% Strongly Disagree
- I feel that public participation using the tools in this workshop would advance the interests of my community: 82% Agree, 7% Neither Agree nor Disagree, 5% Disagree, 2% Strongly Disagree
- I helped others learn: 49% Agree, 16% Neither Agree nor Disagree, 14% Disagree, 23% Strongly Disagree
- I feel that I can play an active role in the planning of the community where I live: 70% Agree, 16% Neither Agree nor Disagree, 7% Disagree, 23% Strongly Disagree
# Single and Double-Loop Learning

<table>
<thead>
<tr>
<th>Single-Loop Learning</th>
<th>Double-Loop Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>I learned a great deal in the workshop</td>
<td>4%</td>
</tr>
<tr>
<td>I learned through observing others using the tools</td>
<td>7%</td>
</tr>
<tr>
<td>I learned through listening and conversing with others</td>
<td>2%</td>
</tr>
<tr>
<td>I was able to get answers to the questions I asked</td>
<td>7%</td>
</tr>
<tr>
<td>Workshop participants discussed issues in an open way</td>
<td>0%</td>
</tr>
<tr>
<td>Participants were open to differences in opinion</td>
<td>2%</td>
</tr>
<tr>
<td>I would support recommendations created by the participants of the workshop</td>
<td>7%</td>
</tr>
</tbody>
</table>

- Single-Loop Learning: 73% overall satisfaction
- Double-Loop Learning: 80% overall satisfaction
Subject Learning....about BRT (Pre/Post)

- Signal priority
- Platform-level boarding
- High frequency
- Pre-board payment
- Dedicated lanes

The chart shows the comparison between pre-workshop and post-workshop surveys.
Learning Effects: Pre/Post

- **Agency**: “I can play an active role in the planning of the community where I live.”
- **Impact**: “Public participation in planning advances the interests of my community.”

<table>
<thead>
<tr>
<th>Belief in Impact</th>
<th>25%</th>
<th>50%</th>
<th>25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belief in Agency</td>
<td>23%</td>
<td>48%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Negative Neutral Positive
Comparing the Tools
Usability

“The tool was easy to understand”. [Usability]
Relevance & Credibility

“The tool reflected my unique issues and concerns.” [Relevance]

“The tool used data and simulations that seemed credible.” [Credibility]
Design Lessons
“It won’t work on my street,”

“what made up the numbers?”

“can see changes as you go”
“tradeoffs are hard to see”

“too many numbers to figure out which ones to trust”
Regional Scale

Personalized Time Map

On-demand Dashboard

“people can see everything, where you are going”

“can try limitless variations; street model has only 9 variations”

“see transit desert”

“People can match their personal experience”
Data comparison & visualization most compelling

Comparison: 15
Impact: 7
Interactivity: 4
Play: 3
Facilitation: 2
Peer Presence: 1
How far can I travel in say... 1 hour?
DESIGN FEATURE

Make data personal

1 hour 15min?
DESIGN FEATURES

Instant, Comparable Output
Limitations

• Representativeness of participants and sample size….
• Cross-workshop variation…
• No control group
• Technical glitches
• Limited “interactivity”, block-box-“ness” remains
• Not enough time: 2-hour workshop windows (30 mins per tool)
Conclusions

- Some evidence of learning: individual and double-loop
- Learning mechanisms:
  - interaction with the tools
  - conversing with others and relating to their points of view
  - questioning of the tools and their assumptions, and
- Street-scale tool: easiest to use
- Regional-scale tool: most relevant and credible
- Findings indicative….
Partners:

MOBILITY FUTURES COLLABORATIVE
Changing Places MIT Media Lab
BUS RAPID TRANSIT ACROSS LATITUDES AND CULTURES
NUESTRA COMUNIDAD
THE ROXBURY INNOVATION CENTER

Sponsor:

Barr Foundation

Thanks to:

• Ryan Chin (co-PI), Ariel Noyman, Ira Winder, Kuan Butts, Allentza Michel, Deborah Perrotta, Marcos Paulo Schlickmann
• Conveyal: Matt Conway, Trevor Gerhardt, and Kevin Webb
CoAXs
Inputs and Analysis Modules

Land-use data (shapefile) → Conveyal Analyst → CoAXs

Transit schedules (GTFS) → Conveyal Analyst → CoAXs

Road network (OSM) → Conveyal Analyst → CoAXs

Conveyal Analyst
Data management, configuration, and batch analysis (Java)

Scenario modifications
Isochrones and accessibility results

CoAXs
Engagement interface (Angular.js, Leaflet, D3, etc.)

Open Trip Planner
or Conveyal R5

Multimodal routing engine (Java)

Selected origin and routing options

Travel times from origin to all shapefile zones/grid points